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REVIEW

Attention Deficit Hyperactivity Disorder: A Holistic Approach. Parte 2

Trastorno por Déficit de Atención e Hiperactividad: Un Enfoque Integral. Parte 2

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ABSTRACT

Introduction: intelligence has been a fundamental object of study within psychology and other sciences, evolving in its definition and measurement. During the 20th century, the intelligence quotient (IQ) was consolidated as a method of cognitive evaluation, based on the work of Binet and Simon, later perfected by Terman. However, various approaches have questioned the validity of IQ as the only indicator of intelligence, postulating alternative models such as Gardner's theory of multiple intelligences and Sternberg's triarchic theory.
Development: of the concept of intelligence has been explored through various theories and psychometric tests. Since the creation of the first tests, IQ measurement has been refined, including instruments such as the Stanford-Binet Scale and the Wechsler Scale. These tests have made it possible to assess general cognitive abilities, but they have also generated controversy regarding their application and validity in different contexts. The assessment of IQ has evolved over time, incorporating factors such as working memory, processing speed and verbal comprehension. Intelligence, rather than a unitary capacity, is now understood as a set of interrelated abilities. Likewise, the importance of the sociocultural context in its development has been emphasized, highlighting the influence of education and the environment.
Conclusions: the study of intelligence has moved from traditional psychometric models towards more integrative approaches. Current understanding recognizes that intelligence is multifaceted, influenced by biological, psychological and environmental factors. Future research will continue to explore new, more inclusive and representative forms of assessment.

Keywords: Intelligence; IQ; Psychometrics; Cognitive Assessment; Psychological Theories.

RESUMEN

Introducción: la inteligencia ha sido un objeto de estudio fundamental dentro de la psicología y otras ciencias, evolucionando en su definición y medición. Durante el siglo XX, se consolidó el coeficiente intelectual (CI) como método de evaluación cognitiva, basado en los trabajos de Binet y Simon, posteriormente perfeccionados por Terman. Sin embargo, diversos enfoques han cuestionado la validez del CI como único indicador de la inteligencia, postulando modelos alternativos como la teoría de las inteligencias múltiples de Gardner y la teoría triárquica de Sternberg.
Desarrollo: el concepto de inteligencia ha sido explorado mediante diversas teorías y pruebas psicométricas. Desde la creación de los primeros test, la medición del CI se ha perfeccionado, incluyendo instrumentos como la Escala Stanford-Binet y la Escala Wechsler. Dichas pruebas han permitido evaluar habilidades cognitivas generales, pero también han generado controversias respecto a su aplicación y validez en distintos contextos. La evaluación del CI ha evolucionado con el tiempo, incorporando factores como la memoria de trabajo, la velocidad de procesamiento y la comprensión verbal. La inteligencia, más que una capacidad unitaria, se entiende hoy como un conjunto de habilidades interrelacionadas. Asimismo, se ha enfatizado la importancia del contexto sociocultural en su desarrollo, destacando la influencia de la educación y el entorno.

Conclusiones: el estudio de la inteligencia ha transitado desde modelos psicométricos tradicionales hacia enfoques más integradores. La comprensión actual reconoce que la inteligencia es multifacética, influenciada por factores biológicos, psicológicos y ambientales. La investigación futura continuará explorando nuevas formas de evaluación más inclusivas y representativas.

Palabras clave: Inteligencia; Coeficiente Intelectual; Psicometría; Evaluación Cognitiva; Teorías Psicológicas.

INTRODUCTION

Intelligence has been a subject of great interest in psychology and other disciplines throughout history. Its study has generated extensive debate and different theoretical approaches that have attempted to define its nature, components, and ways of measurement. Since ancient times, different cultures have reflected on human beings' cognitive capacity, although it was in the 20th century that it became consolidated as a field of scientific research with the formulation of theories and the creation of psychometric tests that allowed for its objective evaluation.

The intelligence quotient (IQ) is one of the main tools used to measure intelligence, and it is based on tests designed to quantify general cognitive abilities. Its origins can be traced back to the work of Alfred Binet and Théodore Simon at the beginning of the 20th century, who developed a scale to identify children with learning difficulties in France. This scale was later adapted and perfected by Lewis Terman at Stanford University, giving rise to the famous Stanford-Binet Intelligence Scale. Since then, IQ measurement has evolved with new methodologies and theoretical approaches that have broadened the understanding of human intelligence.

However, the measurement of intelligence is not without controversy. Some positions question the validity of IQ as the sole indicator of cognitive ability, arguing that intelligence is a multidimensional concept that cannot be reduced to a numerical score. Researchers such as Howard Gardner have proposed alternative models, such as the theory of multiple intelligences, which posits the existence of different types of intelligence, including linguistic, logical-mathematical, musical, spatial, bodily-kinesthetic, interpersonal, and intrapersonal. On the other hand, Sternberg developed the triarchic theory of intelligence, which emphasizes the interaction between analytical, creative and practical intelligence.

The study of IQ has also generated reflections on its application in various contexts, such as education, clinical psychology, and the workplace. While intelligence tests can be helpful tools for identifying cognitive strengths and weaknesses, it is essential to interpret them cautiously and within an ethical framework that considers individual differences and sociocultural factors. In this sense, intelligence should not be seen as an unchangeable trait but as a dynamic capacity that can be developed throughout life with the proper stimulation and access to learning opportunities.

DEVELOPMENT

Intellectual Coefficient

We are complex creatures — we gravitate between determinism and uncertainty; we are neither fully comprehensible nor fully controllable.

Taken from an information brochure designed for a socialization event of the School of Complexity Thinking, June 2015.

Intelligence

The study of intelligence has been one of the most characteristic areas of psychology throughout the 20th century (Andrés-Pueyo & Colom, 1999). It generates debate, often in reaction to the idea that each person has a general mental capacity that can be measured and quantified using a number (Santrock J., 2006). The concept of intelligence, or cognitive ability, is prevalent in the Western philosophical and cultural tradition, perhaps somewhat more so than in other cultural traditions in which, although we find references to this ability, they do not play the same role as ours (Juan-Espinosa, 1997).

David Wechsler mentioned over 45 years ago that "intelligence is one of the psychological phenomena that we know best and about which we have the most information when compared to many other psychological phenomena" (Wechsler D., 1971). However, Stemberg and Powell (1989) mentioned that "theorists of intelligence have not departed from their theories often enough to ascertain the relationships that exist between the different theories of intelligence and between each of the theories of intelligence as a whole" (Molero, Saiz, & Esteban, 1998).

However, it can be asserted that the current trend in scientific research has focused on dividing intelligence into specifiable fragments instead of focusing on a unitary concept, somehow transferring the controversy about what intelligence is, how it can be conceived and consequently measured, and worked on, to what

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are the fundamental components of intelligence and what factors can explain individual differences in performance. (Molero, Saiz, & Esteban, 1998). In this sense, discoveries have been made about the genetics of intelligence, how it functions in the later period of human development, the role of environmental variables in the development of this capacity, and the usefulness and effectiveness of its measurement (Andrés-Pueyo & Colom, 1999). However, this was achieved by an enormous theoretical and scientific process of almost one hundred and fifty years.

The history of IQ tests began in America in 1916. But the context of what would later become the "IQ" mania was born much earlier. Its roots lie not only in the laboratory but also in the classroom, in the city ghetto, and, above all, in the disordered society of the first two decades of the 20th century in the United States (Fass, 1980).

Historical background in the measurement of intelligence

Several authors credit Wilhelm Wundt (1832-1920) with initiating experimental psychology and establishing the first psychology laboratory. The laboratory was established in Leipzig, Germany, in 1879, a project previously published in his work Principles of Physiological Psychology years earlier (Morris, 1997). However, as Gregory (2012) mentioned, Wundt had already been involved in measuring mental processes since at least 1862.

In its modern form, psychological evaluation originated in laboratory studies on sensory discrimination, motor skills, and reaction time. Galton (1822-1911) developed the first battery of tests, a curious collection of sensory and motor measurements (Gregory, 2012).

Although Sir Francis Galton was more interested in the problems of human evolution than in psychology itself, as reflected in his two most influential works: Hereditary Genius, an empirical analysis that sought to demonstrate the importance of genetic factors in the achievement of excellence and Investigations into the Faculty of Human Faculties and its Development, another series of essays that highlighted individual differences in mental faculties, boring (1950) considers that this last work represented the beginning of mental tests and the arrival of the scientific psychology of individual differences (cited in Gregory, 2012).

James McKeen Cattell presented the development of modern assessment in a classic work entitled Mental Tests and Measurements (Gregory, 2012), where the term "mental test" is used for the first time in psychological literature. This article describes a series of annual tests administered to university students to determine their intellectual level. The tests included measuring muscle strength, speed of movement, sensitivity to pain, visual and auditory acuity, weight discrimination, reaction time, memory, and similar aspects. He shared his opinion regarding the possibility of obtaining a measurement of intellectual functions using sensory discrimination and reaction time instruments (Anastasi & Urbina, 1998). In 1892, the same author published On the Perception of Minor Differences, in which he introduced detailed statistical analyses of the errors of judgment made by subjects in traditional psychophysical experiments (Brennan, 1999). He presented the purposes and applications of his instruments to the agenda of modern evaluation:

"Psychology cannot achieve the certainty and accuracy of the physical sciences unless it is based on experimentation and measurement. Applying a series of mental tests and measurements to a large number of individuals will enable progress in this direction. The results would be of considerable scientific value in discovering mental processes' constancy, interdependence, and variation in different circumstances. Furthermore, individuals would find their tests interesting and perhaps useful regarding training, lifestyle, or the indication of illness. The scientific and practical value of such tests could be considerably increased if a uniform system were adopted so that determinations made at different times and places could be compared and combined" (Cattell, 1980), cited by (Gregory, 2012).

Some years later, Clark Wissler, who incidentally was a student of James Cattell, probably the most influential figure in the early history of psychological assessment, showed that there was practically no tendency for mental test scores, applied to 300 students at Columbia University and Barnard College, to correlate with academic achievement, as measured by the student's academic grades. With the publication of Wissler's (1901) discouraging results, experimental psychologists abandoned the use of reaction time and sensory discrimination as measures of intelligence (Wissler, 1901); cited in (Gregory, 2012).

Although the advancement of an objective methodology in psychology was a significant step forward, pioneers such as Wundt, Galton, Cattell, and Wissler demonstrated that it was possible to subject the mind to scientific scrutiny and measurement (Gregory, 2012); however, the significant problem at the beginning of experimental psychology was evidently to confuse simple sensory processes with intelligence.

The vacuum generated by the abandonment of Galton's tradition did not last long; in Europe, significant advances were made in the development of psychological assessment. Emil Kraeplin (1856-1926), a German psychiatrist considered to be the founder of scientific psychiatry, psychopharmacology and psychiatric genetics, and the founder of the Deutschen Forschungsanstalt für Psychiatrie (Research Center for Psychiatry) in 1917 (Eysenck, Arnold, & Meili, 1982), he was (1895) particularly interested in the clinical evaluation of psychiatric patients, for which he prepared a series of tests to measure what he considered essential factors in the characterization of the individual. The tests mainly used arithmetic operations and measured the effects of practice, memory, susceptibility to fatigue, and distraction (Anastasi & Urbina, 1998).

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In Germany itself, another scientist, Hermann Ebbinghaus (1850-1909), in his 1885 work Ueber das Gedächtnis (On Memory), describes his methodology and his discoveries, including his famous memory retention curve showing forgetting over time from initial acquisition (Brennan, 1999). Later (1897), he published a method for testing the mental capacity of school children, the Ebbinghaus completion test, which applied tests of arithmetic calculation, memory, and sentence completion to schoolchildren; the latter, which was the most complex, was the only one that showed a clear correspondence with the performance of the schoolchild (Anastasi & Urbina, 1998).

In an article published in France in 1895, Binet and Henri criticized that almost all the tests available were sensory and unduly concentrated on simple specialized skills. Furthermore, they argued that great precision is not required when measuring more complex functions since individual differences are more significant in such functions. They proposed a long and varied list of tests covering functions such as memory, imagination, attention, comprehension, susceptibility to suggestion, aesthetic appreciation, and many others, in which one can recognize the tendencies that ultimately led to the development of Binet's famous intelligence scales (Anastasi & Urbina, 1998).

In 1904, the Ministry of Education commissioned Binet to study procedures for the education of mentally disabled children. In relation to these objectives, he prepared, in collaboration with Simon, the first Binet-Simon scale (Binet-Simon, 1905, cited in Anastasi & Urbina, 1998).

This scale, known as the 1905 scale, consisted of 30 problems or tests arranged in ascending order. The level of difficulty was established empirically by applying them to 50 normal children aged 3 to 11 and some mentally disabled children and adults. In the second scale, that of 1908, the number of tests was increased, some of the unsatisfactory tests from the first scale were eliminated, and they were grouped into age levels based on the performance of around 300 normal children between the ages of 3 and 13. In this way, all the tests that were passed by 80 to 90 percent of typical three-year-olds were placed at the three-year level, those that were passed by the same percentage of children of that age were placed at the four-year level, and so on up to 13 (Anastasi & Urbina, 1998).

In 1911, the year in which Binet died unexpectedly, the third revision of the Binet-Simon Scale appeared, which did not present significant modifications, except for minor revisions and some changes in the location of some tests, the addition of several other age levels and the extension of the scale to the adult level. The term "mental level" was replaced by "mental age," the ease of understanding of which undoubtedly contributed to the popularization of intelligence tests" (Anastasi & Urbina, 1998).

In 1916, the first revision of the Binet-Simon Scales was published by Terman and his collaborators at Stanford University (Terman, 1916, cited in Anastasi & Urbina, 1998). The changes and additions included were so many that they finally represented a new instrument [...] the complete scale was standardized with a US sample of approximately 1,000 children and 400 adults, detailed instructions were provided for its application and scoring, and IQ was used for the first time in a psychological test (Anastasi & Urbina, 1998).

The second revision of the Stanford-Binet Scale, published in 1937, was expanded and re-standardized with a new sample of the US population. However, despite efforts to achieve a representative population sample, the 3,184 examinees had a higher socioeconomic level than the US population, contained an excess of urban cases, and only included whites. The third revision, published in 1960, incorporates the best items from the previous two in a single form (Anastasi & Urbina, 1998).

The current edition, the Stanford-Binet SB-IV, of this renowned scale represents its most extensive revision (Delaney & Hopkins, 1987; Thorndike, Hagen, and Sattler 1986a, 1986b, cited in Anastasi & Urbina, 1998), which at the same time retains the main advantages of previous editions as a clinical instrument for individual application, reflects advances in both the theoretical conceptualizations of intellectual functions and in the methodology for test construction. At the same time, the content covered extended beyond the predominantly verbal orientation of previous forms to adequately cover quantitative, spatial, and short-term memory tasks. The current instrument was designed to be administered from age two to adulthood. Since each type of item is used in as wide an age range as possible, it facilitates comparison in the evaluation between age levels (Anastasi & Urbina, 1998).

The KAIT Adolescent and Adult Intelligence Test was designed as an intelligence measure for ages 11 to 85 or older. This represented an attempt to integrate the theory of fluid and crystallized intelligence proposed by Horn and Cattell with the ideas of other theorists who have expounded on adult intelligence, such as Golden (1981), Luria (1980), and Piaget (1972) (cited in Anastasi & Urbina, 1998). It also includes a brief mental status exam to evaluate the attention and orientation of examinees with cognitive damage too significant to face the application of the complete battery (Anastasi & Urbina, 1998).

The Kaufman Brief Intelligence Test (K-BIT) (Kaufman & Kaufman, 1990) was designed as an instrument for rapid estimation of intellectual functioning. It consists of a verbal subtest consisting of 45 items of expressive vocabulary and 37 definitions and a nonverbal subtest consisting of 48 matrices. The three scores provided by the K-BIT are expressed as IQ deviation. Furthermore, given the length of the subtests, their reliability coefficients are higher than in other scales (Anastasi & Urbina, 1998).

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Intellectual Coefficient

Again, it should be noted that intelligence tests were originally designed to sample a wide variety of abilities in order to estimate an individual's general intellectual level (Gregory, 2012).

Far from all previous attempts, two events contributed to uniting the theory of stable intelligence with an evaluation method (Howell, Hewards, & Swassing, 1998). The first has to do with the objective method developed in 1905 by Binet and Simon, mentioned above, to differentiate students with learning difficulties from others. The second relates to the translation into English of the developmental scales of intelligence measurement, adapted by Terman of Stanford University, to the American population. The instrument was published in 1916 under the name of the Stanford-Binet Intelligence Scale, which has been revised repeatedly throughout the 20th century. It became (according to Howell et al., 1998, p. 447) "the scale (established norms) for comparing all other intelligence scales" (Pueyo, 1997, p. 29).

The result of all this gave rise to the appearance of a single measurement called the intelligence quotient or IQ, which represents the general intellectual capacity of people. Hence, IQ tests were recognized as the main instruments for determining the intellectual differences between human beings. From then on, psychometric techniques opened up a wide channel for research into intelligence differences (Secadas, 1999, cited in Peña del Agua, 2004).

People generally do not identify IQ with the score on a particular instrument but tend to use the term as a shorthand designation for intelligence. This custom has become so common that we cannot ignore or deplore it as an erroneous popular belief. When considering the numerical value of a given IQ value, it is essential to specify which test it was obtained from because the different instruments that produce such a value not only differ in their content but also in other aspects that influence the interpretation of their scores (Anastasi & Urbina, 1998).

Firstly, intelligence should not be considered an explanation but a description. IQ is simply the expression of the level that an individual shows at a particular moment according to the available age norms. However, no intelligence test can explain the causes of this performance. Therefore, attributing failure in an instrument or everyday life to "inadequate intelligence" is a mistake that contributes nothing to understanding the individual's problems and, on the contrary, makes us postpone efforts to explore the true causes of their disadvantage in their personal history (Anastasi & Urbina, 1998).

The second point is that intelligence is not a unitary capacity but a composite of various functions. The specific abilities included in this composite, as well as their relative weights, vary according to time and place; consequently, the conditions required for achievement can be expected to differ in dissimilar cultures, in different historical periods of the same culture, and even in the individual's life cycle, from childhood to adulthood. A relative skill tends to increase or decrease with age in those functions whose value is emphasized or diminished by the culture or subculture to which one belongs (Anastasi & Urbina, 1998).

In the scholastic sense, IQ can reflect previous educational achievement and predict subsequent educational performance. As the functions taught in the educational system are essential in modern, technologically advanced cultures, the score on an academic intelligence test also predicts performance in various occupations and other everyday activities (Anastasi & Urbina, 1998).

Finally, intelligence scales measure an individual's ability in relatively global areas such as verbal comprehension, perceptual organization, or reasoning and, therefore, allow one to determine one's potential for school work or for certain occupations (Gregory, 2012).

Ethics in IQ assessment

The application and evaluation of psychological tests, like all the professional activities of the psychologist, are guided by ethical and professional standards that regulate them. The responsible and ethical use of these psychological evaluations is defined in guidelines written and published by professional and governmental associations such as the Mexican Society of Psychology (2009), the Ministry of Health (2016), and the American Psychological Association (2010), among others.

Another guideline for correct evaluation is the careful and effective writing of the results report and feedback to the test taker, sensitively and reflectively informing them to clarify any doubts or concerns. It should be emphasized that the evaluator has the final responsibility for the administration of a psychological test and its proper handling. The professional must possess adequate knowledge of administration, evaluation, and measurement.

Validation

Efforts to understand what intelligence tests measure include statistical procedures for construct validation, such as factor analysis, and the application of information processing techniques to the tasks presented in these instruments. This latter approach is not limited to considering whether the subject's answer is correct but aims to identify the elementary processes by which the examinee arrives at it. This analysis will likely contribute

significantly to the use of diagnostic instruments and the development of training programs that meet the needs of the individual (Anastasi & Urbina, 1998).

"Concurrent and predictive validation. Criterion-predictive validation procedures indicate the test's predictivity in predicting individual performance in specific activities. The criterion measure against which the results of the instrument are validated can be obtained at approximately the same time as the test results or after a set interval. […] The term prediction is used in a broad sense to refer to the assumption that the test can make about the test of any situation, or in the more restricted sense of anticipation of an interval" (Anastasi & Urbina, 1998)

Final considerations on IQ assessment

It is recommended that the following argument be paused for reflection:

"The most characteristic feature of the gifted is a high degree of intelligence. However, high intelligence is insufficient to determine giftedness since other elements, such as creativity, also come together in this construct. In subjects with a specific talent - such as musical, mathematical or artistic - this is always linked to a degree of intelligence that is at least above average" (Peña del Agua, 2004).

Regarding the subject of this study, which focuses on children with attention deficit disorder rather than outstanding abilities, it can be understood that intelligence or intellectual level is unfortunately related to an inevitable inequality of the hegemonic system, especially if we place below-average children in an antagonistic concept to "gifted."

It will be emphasized that generalizing psychological constructs entails standardizing the instruments used for their measurement beyond specific cultures or languages. This is because IQ as a concept and/or intelligence tests as a procedure were developed in a specific sociocultural context in the United States from 1900-1930. This context included mass immigration, which led to great ethnic and racial diversity and social and urban complexity in adaptation. The latter includes expanding school facilities and educational purposes, as well as the growing influence of science and technical expertise in all areas of social life. This is why IQ seemed to provide a form of social order and a meritocratic evaluation (Fass, 1980).

At that time, IQ helped to organize an educational system that became more ambitious and "idealistic" due to authors such as John Dewey and his challenging educational philosophy. This is why admission tests were included in public schools, even though some immigrants and racial groups made it significantly more difficult than others. It is currently a selection process that persists for admission to basic secondary, upper secondary, and higher education institutions.

Andrés Pueyo and Colom (1999) mentioned that a high level of intelligence presupposes an advantage in everyday life, given that most daily activities require reasoning and decision-making. On the contrary, a low level is a disadvantage, especially in disorganized environments. However, a high IQ does not guarantee success in life, just as a low IQ does not guarantee failure (Andrés-Pueyo & Colom, 1999).

Other intelligence models

The lack of well-founded and generalizable conclusions about intelligence led to the investigation of new explanatory models that would make dealing with the phenomenon's complexity possible. For example, due to their importance and influence in educational and professional practice, there is Howard Gardner's multiple intelligences model and Robert J. Sternberg's triarchic theory of intelligence Sternberg, precursors of the notion of emotional intelligence (Mora Mérida & Martín Jorge, 2007)

Gardner's theory of multiple intelligences (1983) provides another perspective on how information-processing skills underlie intelligent behavior and broadens the conceptualization of intelligence by including seven separate areas of knowledge such as linguistic, logical-mathematical, musical, spatial, bodily-kinesthetic, interpersonal, and intrapersonal, which function relatively independently, but which interact at other levels when the subject is engaged in problem-solving; the author considers that intelligence should be defined in terms of the different series of processing operations that enable individuals to solve problems, create products and discover new knowledge in various series of culturally valued activities (Peña del Agua, 2004).

Something similar happens with Sternberg's (1985) triarchic theory of intelligence, which states that in human beings, there is an interaction between three basic types of sub-theories that interact and determine intelligent behavior. These are as follows: the componential theory comprises the skills of processing the information that underlies intelligent behavior; the experiential theory states that knowledgeable individuals, compared to others who are less intelligent, process information better and carry out new tasks more quickly and internalize and automate what they have learned; contextual proposes that intelligent people have an excellent facility for processing information according to their desires and about daily life (Peña del Agua, 2004).

For all the above reasons, "non-cognitive" aspects or traits must be included in the evaluation and description of intelligence, such as discipline, enthusiasm, sociability, linguistic competence, self-confidence, social sensitivity, openness to experience, and self-esteem (Fernández, 2007).

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Cognitive Processes

The development of the individual is mediated by their genetically determined capacities, which guarantee their survival by solving the problems derived from the demands of the environment (Najul & Witzke, 2008). Nowadays, the concept of leaves aside old dichotomies such as "nature and nurture" (innate or acquired), currently responds to an integrated model in which ontogeny is understood as a successive and orderly emerging hierarchical organization, bidirectionally related between biological complexity and psychological organization, without neglecting genetic and neurological activity, experience and the environment (Sastre-Riba, 2006).

Transformations are generated at a social level related to the learning and performance of different roles that shape an identity as a social subject and others at a psychological level, where the passage of time produces changes in emotions, personality, cognition, and affectivity, thus modifying capacities and functions and their performance (Urbano & Yuni, 2005). There is no doubt that neural structure influences psychological functions and learning, and these, in turn, influence neural structure (Sastre-Riba, 2006).

In this respect, cognitive processes are mental structures or mechanisms (Banyard 1995: 14, cited in Fuenmayor & Villasmil, 2008) set in motion when humans observe, read, listen, etc. These processes are perception, attention, thought, memory, and language. Such cognitive processes play a fundamental role in daily life since human beings constantly perceive, attend, think, and use memory and language (Fuenmayor & Villasmil, 2008).

For this reason, the current understanding of cognitive development calls for interdisciplinary and neuropsychological research into the relationship between brain architecture and the functioning of cognitive processes (Sastre-Riba, 2006).

Attention

For many years now, the process of attention has been considered an independent function and even a superior psychological function. Previously, separating it from other functions, especially perceptions (Rebollo & Montiel, 2006), was not easy. Traditionally, attention is closely related to perception and working memory, and although they are often evaluated together in practice, they are not the same (Servera & Llabres, 2004). According to Otero (1999), perception is only the process of reducing information, in which a set of sensations is reduced to a simpler and more organized form.

However, attention for some authors, such as García Sevilla (1997), point out that it is not a cognitive process (Ruiz-Vargas and Botella, 1987, p. 95, cited in Servera & Llabres, 2004) but rather, "the mechanism directly involved in the activation and functioning of the processes and/or operations of selection, distribution, and maintenance of psychological activity" (García Sevilla, 1997, p.14).

For other scholars of the subject, such as Santiago, Tornay, Gómez & Elosúa (2008), it is "the organizer of the mind," which, relying on perception and memory and response systems, selects the information that arrives from the outside to construct a psychological experience and, according to this, carries out an action. For Aleksandr Luria (1986), attention is the selective process of necessary information, the consolidation of eligible action programs, and the maintenance of permanent control over their course" (Luria, 1986, p.7).

Attention will be directed to those events in the environment that imply a more significant emotional intensity, ignoring irrelevant surrounding stimuli. This is precisely selective attention (González Garrido & Ramos Loyo, 2006).

Definition of attention

For the purposes of this paper, attention will be defined as a basic psychological process and a fundamental and indispensable neuropsychological function that allows the senses to focus on information relevant to the performance of an activity while inhibiting other stimuli irrelevant to the context (Londoño, 2009). In this position, far removed from traditional models that assign attention to the sole function of information input, it is a vertical functioning, articulating and controlling all higher cognitive activity. Therefore, it is a necessary but not sufficient condition to guarantee executive processing (Servera & Llabres, 2004).

Despite its automatic functioning, we are not fully aware of it. The attentional process is very complex and is always interrelated with other essential and higher processes; it also acts as a kind of information filter (Gómez A. I., 2012). Among these are neurophysiological factors (the biological basis of attention) and cognitive factors (learned attentional skills and strategies), to the point where it is tough to establish the differences. It should be borne in mind that attention (and its different characteristics) is one of the neurocognitive elements most susceptible to maturation. Probably until the age of 16 or even older, the function of the attentional mechanism is not fully consolidated in human beings (Servera & Llabres, 2004).

Distinction between attention deficit and inattentive behavior

Following the understanding of attention and the processes with which it is interrelated, it is possible to point out that the presence of an attention deficit in a person must imply a generalized dysfunction in one or more of the mechanisms of amplitude, intensity, oscillation and/or control proper to the activity of attention, which

derives from neurological and cognitive factors, often undifferentiated, as we have already mentioned (Duñó Ambrós, 2015). It is worth mentioning that the severity of the deficit depends on the number of mechanisms affected and the degree of affectation of each mechanism. The deficit is somewhat chronic since although it can be mitigated by manipulating specific evolutionary, neurobiological (genetic, physiological, neurological, biochemical variables, etc.), or environmental factors, it tends to be present when performing tasks that clearly require the affected attentional mechanism or mechanisms (Servera & Llabres, 2004).

On the other hand, inattentive behavior, although in its motor appearance and the results it causes it may be similar to that of attention deficit, is not strictly a neurocognitive cause; instead, it has an evolutionary-intellectual nature (e.g., the task or situation is too complex for the person's level of development), neurobiological (e.g., sensory deficits, illnesses, motivational factors, temperamental characteristics, transitory factors, etc.) and/or environmental factors (physical characteristics of the stimuli, the task, the situation, distractors, etc.). Inattentive behavior is more global, transitory, and variable and is not so clearly reflected in specific tasks measuring attention (Servera & Llabres, 2004).

The aim of the above is to summarize and provide the reader with a characterization of Attention Deficit Disorder, explain the determining factors of attention, and emphasize that attention is directly involved in school learning.

Memory

The differences that tend to appear in specialized literature between models of memory (structural, procedural, modular, or more integrative models), depend on the importance that each author, at each moment, has given to the invariable components of memory and to the operations that these components carry out; or, to the interactions between the components and the processes that they carry out (Atkinson and Shif-frin, 1968; Baddeley and Hitch, 1974; Cowan, 1988; Craik and Lockhart, 1972, cited in Ruiz, Guinea, & González-Marqués, 2006).

Therefore, the ideas of encoding, storing, and retrieving information appear intertwined in these models. Therefore, in this study, in order to try to establish a slightly more integrative conception (but without going into operational processes in depth), we will say that memory is the ability to retain and evoke past events through neurobiological processes of information storage and retrieval, which is essential to learning and thinking (Etchepareborda & Abad-Mas, 2005). "The capacity to retain and evoke information of a perceptual or conceptual nature" (Viramonte, 2000: 31, cited in Fuenmayor & Villasmil, 2008), by which the knowledge one has about something and the interpretations one makes of it are stored.

The memory system comprises three basic processes: – Encoding of information is the process where information is prepared to be stored. Information can be encoded as images, sounds, experiences, events, or significant ideas. The circumstances surrounding this moment are fundamental to the success or failure of the memory, as attention, concentration, and the subject's emotional state are important in this initial process. – Information storage is characterized by the ordering, categorizing, or titling of information while the ongoing process occurs. Intellectual structures are required to support the person in classifying the data because storage is a complex and dynamic system that changes with the experiences to which the subject is exposed. – Information retrieval is the process of retrieving information. As with a computer, if properly stored and classified, it will be easier to locate and use when needed (Etchepareborda & Abad-Mas, 2005).

Therefore, there is a relationship between memory and attention. A particular event may or may not be analyzed or processed in more detail, depending on whether or not it is attended to. This is why many so-called memory problems are the result of inattention (Fuenmayor & Villasmil, 2008).

Temporal levels of memory

Memory develops through a temporal variable. This situation has allowed it to be divided into stages or temporal levels according to the moment it is found. Thus, three types of memory levels are recognized: immediate, short-term, and long-term:

Immediate memory (IM) is related to sensory registration. It is linked to information that has not been processed and that comes from the senses. This information enters, remains for a period of time, and is then processed or lost.

Mediata memory: Short-term memory or working memory (MT) is the one that stores and processes information coming from the sensory registers for a short period. Richardson et al. (1996) define it as a complex system responsible for temporarily storing and processing information. According to Baddeley (1983), when attended to and perceived, the stimulus is transferred to working memory. This memory enables us to remember information but is limited and susceptible to interference. This weakness of the process gives it a character of great flexibility, which allows the subject to be always open to the reception of new information. Baddeley (1983) describes WM as a temporary storage mechanism that allows us to retain some pieces of information simultaneously, compare, contrast, or, where appropriate, relate them to each other.

Long-term memory: Deferred or long-term memory (LTM) stores knowledge in verbal and visual form, each

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independent although interconnected (Tulving, 1972). It corresponds to everything we know or have learned throughout our lives. LTM has a large capacity but limitations regarding information access and retrieval. It contains different types of basic associations between stimuli and learned reactions. The links between conditioned stimuli, conditioned reactions, and signs and behaviors (Etchepareborda & Abad-Mas, 2005).

Working memory

The "construct working memory" is inspired by the structural models of memory in which, as already mentioned, the MCP and the MLP were distinguished. This model includes working memory span (WMS), which is the amount of material (verbal, numerical, or figurative) that an individual can immediately recall in the order in which it was presented (Colom & Flores-Mendoza, 2001). Working memory (WM) is a cognitive capacity relevant to intellectual performance (Burgaleta Díaz, 2011).

Working memory has the capacity to process information quickly and remains connected to long-term memory, which allows it to access the subject's past knowledge and experiences. This information contributes to its operation with greater precision in resolving the problems posed.

Within the TM approach, it is assumed that performance in memory tasks depends on the individual's ability to manipulate small units of information (executive function). It is necessary to maintain objectives in problem-solving. Different TM capacities lead to differences in problem-solving. Interference in TM results in poor performance in reasoning tasks. It is also necessary for language comprehension (it stores information about a text being spoken or read while the rest is encoded). Comprehension processes work on information stored briefly to produce a coherent meaning for the complete text. MT is necessary for sentence comprehension and subsequent storage in LTM (Etchepareborda & Abad-Mas, 2005).

Verbal Comprehension

Within this framework, it must be considered that the process occurs from the association between phonological, visual, and semantic processes, allowing the inseparable work of two forms of processing to begin: the decoding of the word and the comprehension and interpretation of the messages that they read or listen to. Verbal comprehension is an essential skill for learning and corresponding academic success.

In functional terms of verbal comprehension, language implies syntactic and semantic development (Mejía-Quintero & Escobar-Melo, 2012). Syntax studies how words are combined to form correct or acceptable phrases or statements, and semantics refers to the meaning of constructed words or sentences (Santrock, 2001). Regarding syntax (word order in phrases or sentences), children quickly master the basics of word order but need more time to master more complex forms such as articles, adjectives, and conjunctions. On the other hand, in terms of semantic development (meaning of words and sentences), he states that between the ages of two and six, the average child learns six to ten words per day, which means that by the age of six, they have a lexicon of 8000 to 14 000 words (Woolfolk, 1999). Therefore, establishing relationships between words and concepts can be difficult because of a certain amount of information being dealt with or a certain level of complexity in these relationships (Monfort & Monfort, 2013).

Research by Sellés (2006) indicates that one of the main facilitators of the reading-learning process is having adequate oral language and having developed specific basic cognitive processes. The importance of the perceptual and attentional process is worth mentioning, as its intervention in the reading process is straightforward. Children must understand what they are saying or what is being said to them to subsequently acquire the ability to give meaning to the words they read. Difficulties in reading are often associated with the disorder. They are related to failures in executive functions, and it is possible that there is also a relationship between the latter and poor performance in phonological awareness tasks (Pérez Mariño, 2015).

MT is another important basic cognitive process in the development of these, as the ability to retain verbal information in working memory is essential for learning, specifically for learning to read, repeat, and memorize verbal information (Sellés Nohales, 2006).

Let us remember that reading is a process through which children have access to the most advanced level of mediation of psychological processes since, through it, the capacity is generated to become aware of the phenomena and implications that language has in their development (Bohórquez Montoya, Cabal Álvarez, & Quijano Martínez, 2014).

Children with a significant vocabulary deficit tend to have difficulties acquiring knowledge that is transmitted culturally and not based on their own experience; this is likely to affect their reading comprehension more, as well as their comprehension of complex oral information, such as the news, a documentary in biology class, or the teacher's explanations in class (Monfort & Monfort, 2013).

Perceptual reasoning

Perceptual reasoning is the ability to analyze, compare, evaluate, order, classify, make inferences, make judgments, apply knowledge appropriately, transcend the information received, generate new ideas, and solve problems (Mejía-Quintero & Escobar-Melo, 2012). In other words, the organization of information is presented

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to the individual perceptually through abstract reasoning.

"Thinking means manipulating and transforming information in memory. This is often done to form concepts, reason, think critically, and solve problems" (Santrock, 2006, p.75). What must be clearly taken into account is that if the individual is unable to organize information on the properties of structure, pattern, or shape at a perceptual level, it is understood that it will be difficult for them to integrate it since they will not be able to discriminate the information presented to them.

The previous term for evaluating this cognitive process (WISC-III) was the Perceptual Organization Index (POI). According to the American Psychological Association (2010), the POI is a process that allows properties such as structure, pattern, and form to impose themselves on the senses to offer a perceptual organization. Although the term POI is no longer used, what is intended to be measured in the WISC IV PRI remains.

Processing speed

From the perspective of individual differences, and like the other cognitive elements, the main interest in information processing lies in the attempt to break down the mental processes presumably involved in solving complex problems as a way of advancing the understanding of cognitive capacity (Burgaleta Díaz, 2011).

Meanwhile, processing speed (PS) can be defined as the time it takes a person to carry out a mental process. The VP is usually understood as the time needed to process information of different types and degrees of complexity (Jensen, 2006). It has to do with the speed at which a person captures and reacts to the information they receive, whether visually (letters and numbers), audibly (language), or through movement.

The study of PV initially emerged after significant correlations were found between IQ and certain parameters of evoked potentials; that is, subjects with high IQ had shorter latencies than subjects with low IQ, which was interpreted as evidence that individual differences in intelligence behavior had a biological substrate in the speed of information processing in the brain (Cosculluela, Andrés, & Tous, 1992).

Information processing models assume that mental processes take place at a given time. It is measured by the increase in reaction time (RT) about the size of the information to be tracked or a series of stimuli that require a particular response, choice, or decision (Burgaleta Díaz, 2011). This provides a value for mental processing speed since the decision and reaction time components remain constant (Junqué & Jódar, 1990). PS implies the ability to perform efficiently or already learned tasks fluently and process information automatically and, therefore, quickly.

However, slow PS does not mean that they are less intelligent subjects, but that they will go slower doing certain tasks such as reading, doing mathematical calculations, listening and taking notes, or holding conversations. It can also interfere with executive skills, so it will take a person with slow PV longer to plan, set goals, make decisions, start tasks, and maintain attention (Ríos Lago, Lubrini, Periáñez Morales, Viejo Sobera, & Tirapu Ustárroz, 2012).

In short, the speed or rapidity of cognitive processing is the time that elapses from receiving the information until you assimilate it and begin to respond.

Wechsler Intelligence Scale for Children

David Wechsler (1896-1981) is the author of several scales or tests to measure intelligence or determine a person's IQ, generally known as Wechsler Scales. David Wechsler (1975) mentioned that:

"What we measure with tests is not what the tests measure, not information, spatial perception, or reasoning ability. They are only means to an end. What intelligence tests measure is something much more important: an individual's ability to understand the world around them and their ingenuity in facing the challenges that arise" (Wechsler, Intelligence defined and undefined: A relativistic appraisal, 1975).

Any intelligence assessment should have an integrative vision of understanding and support.

In a previous section, it was pointed out that 45 years ago, Wechsler (1971) published that "intelligence is one of the psychological phenomena we know best and about which we have the most information when compared to many other psychological phenomena" (Wechsler, 1971). Perhaps because the intelligence scales prepared by David Wechsler include three successive variations of the individual application, one for adults, one for school children, and another for preschoolers (WAIS, WISC, and WIPPSI). The Wechsler Adult Intelligence Scale, for example, is the test most frequently used in the evaluation of intelligence in a wide variety of scenarios or contexts, including clinical practice (Úbeda Cano, Fuentes Durá, & Dasí Vivó, 2016). In addition to their use as measures of general intelligence, their possible use as an aid in psychiatric diagnosis has been investigated based on the observation that brain damage, psychotic deterioration, and emotional problems can affect some intellectual functions more than others (Anastasi & Urbina, 1998).

The interest generated by these scales and the degree of use by thousands of publications that have appeared about them. In addition to the usual reviews published in the Anuario de Medición Mental, research related to the Wechsler scales is periodically reviewed in the specialized literature (Soto Vidal, Marques de Figueiredo, & do Nascimento, 2011, Molinero Caparrós, Mata Sierra, Calero García, García Martín, & Araque Cuenca, 2015, Úbeda Cano, Fuentes Durá, & Dasí Vivó, 2016).

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Evolution of the Wechsler Intelligence Scale

1939, the first Wechsler Scale, known as the Wechsler-Bellevue Intelligence Scale, was published. It was intended to be an intelligence test suitable for adults. Wechsler, in 1939, pointed out that previous tests had been designed primarily for schoolchildren and that they had subsequently been adapted for use with adults by simply adding more difficult items of the same kind so that their content tended to be of little interest to them (Anastasi & Urbina, 1998).

The excessive emphasis on speed in most tests tends to disadvantage older people (Anastasi & Urbina, 1998). Similarly, Wechsler believed that the relatively routine manipulation of words was given excessive weight in traditional intelligence tests. He also noted that mental age norms do not apply to adults and pointed out that very few adults were included in the standardization samples of individual intelligence tests (Anastasi & Urbina, 1998).

The original Wechsler-Bellevue test was intended to respond to these objections. In form and content, the scale established the basic pattern for subsequent Wechsler intelligence scales, each adding specific improvements to its predecessor (Anastasi & Urbina, 1998).

In 1949, the Wechsler Intelligence Scale for Children (WISC) was prepared as a descending extension of the Wechsler-Bellevue (Seashore, Wesman, and Doppelt, 1950, cited in Anastasi & Urbina, 1998).

In 1955, the Wechsler-Bellevue itself was replaced by the Wechsler Adult Intelligence Scale (WAIS), which corrected some technical deficiencies of the previous scale about the size and representativeness of the normative sample and the reliability of the subtests (Anastasi & Urbina, 1998).

The smallest of the Wechsler series, published in 1967, is the Wechsler Preschool and Primary Scale of Intelligence (WPPSI), initially designed for ages 4 to 6½ as a descending extension of the WISC, which in turn was designed for ages 5 to 15 (Anastasi & Urbina, 1998).

The first edition of the WISC was criticized because its content was not sufficiently child-oriented. In the revised edition (WISC-R), published in 1974 and designed for children aged 6 to 16, special efforts were made to replace or modify those items oriented to adults so that their content would be closer to everyday childhood experiences. […] Other changes included eliminating items that could be differentially similar for particular groups of children and including more women and black people in the pictorial content of the subtests. Some subtests were lengthened to increase their reliability, and improvements were made to the administration and scoring procedures (Anastasi & Urbina, 1998).

The WAIS-R, the WISC-III, and the WPPSI-R share many characteristics, including their essential organization into verbal and performance scales, each consisting of a minimum of five subtests and providing a Total IQ, which helps establish a good rapport. Efforts have been made to avoid specialized knowledge. The first items are simple enough to be answered correctly by the vast majority of examinees unless they are mentally disabled or have problems with reality orientation, in which case the administrator can decide to discontinue the test (Anastasi & Urbina, 1998).

Since the publication of the original Wechsler-Bellevue test, a large number of abbreviated scales or short forms of the Wechsler scales have been formulated to substantially reduce the application time and make an estimate of the full-scale IQ that can be evaluated in terms of published norms. [...] its use and development for rapid identification purposes have been stimulated by various subtest combinations showing a correlation greater than .90 with full-scale IQ. Extensive research has been conducted to identify the combinations of two, three, four, and five subtests that most effectively predict the scores obtained from the verbal part, execution, and full-scale IQs. (Matarazzo, 1972; McCusker, 1994; Sattler, 1988, 1992 cited by Anastasi & Urbina, 1998).

The Wechsler Intelligence Scale for Children-Fourth Edition

The Wechsler Intelligence Scale for Children Edition is a clinical instrument for individual use in assessing the cognitive ability of children aged between 6 years 0 months and 16 years 11 months. The WISC-IV is an adaptation of previous Wechsler scales (Wechsler, 2003). This version of the scale [...] provides subtests and composite scores representing intellectual functioning in specific cognitive domains and a composite score representing general intellectual ability and the total IQ (Wechsler, 2007).

It is a new clinical instrument for an individual application that allows the evaluation of general cognitive functioning that would help to assess a population effectively:

- Language and/or speech disorders
- Hearing disorders or deafness
- Developmental disorder
- Moderate mental retardation
- High abilities in Autism Spectrum Disorder
- Selective mutism
- Those who come from different cultural or linguistic backgrounds to our own (Cantero Caja, 2011).

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It is important to point out that the interest in doing the fourth revision of the WISC was aimed at updating the theoretical foundations of the instrument, including fluid reasoning, working memory, and processing speed (Jiménez, 2007). Among the new features of the WISC-IV compared to previous versions of the test are (a) Improved psychometric properties, (b) more excellent knowledge of the characteristics of cognitive and intellectual development, (c) modifications to the instructions to make them more comprehensible, (d) increase in the number of teaching, sample and practice items; and (e) updating of the stimulus booklet designs to make them more striking, attractive and engaging for children (Jiménez, 2007)

The WISC-IV can be used as a psycho-educational tool to obtain a complete evaluation of general cognitive functioning (Wechsler, 2007). It can also be used as part of an evaluation to identify outstanding intelligence, mental retardation, and cognitive strengths and weaknesses (Wechsler, 2007). The results can serve as a guide for treatment planning and placement decisions in clinical and educational settings. They can provide invaluable clinical information in neuropsychological assessment and for research purposes (Wechsler, WISC-IV Wechsler Intelligence Scale for Children-IV. Technical Manual, 2007).

The WISC-IV test is an excellent test for exploring cognitive abilities. It is the world's most widely used intelligence test (General Council of Official Colleges of Psychologists of Spain, 2005).

This test consists of 15 subtests: 10 retained from the WISC-III and five new subtests [...], concepts with drawings, sequences of numbers and letters, matrices, records, and reasoning with clues (Wechsler, 2007). Other mazes, puzzles, and cartoons were eliminated in previous versions (Jiménez, 2007).

With the WISC-IV, five composite scores can be obtained; it provides a TCI to represent the child's general cognitive ability. Four additional scores represent the child's functioning in domains more independent of cognitive functioning: the Verbal Comprehension Index, the Perceptual Reasoning Index (formerly called the Perceptual Organization Index, POI), the Working Memory Index (formerly called the Freedom from Distractibility Index, FDI), and the Processing Speed Index (Wechsler, 2007

Puntuación Compuesta	***Abreviatura***
Índice de Comprensión verbal	ICV
Índice de Razonamiento perceptual	IRP
Índice de Memoria de Trabajo	IMT
Índice de Velocidad de Procesamiento	IVP
Coeficiente intelectual total	CIT

Figure 1. Abbreviations of the scores on the Wechsler Intelligence Scale for Children-IV

Índices del WISC-IV	***Test***
Comprensión verbal (ICV)	Semejanzas
	Vocabulario
	Comprensión
	Información
	Adivinanzas
Razonamiento perceptivo (IRP)	Cubos
	Conceptos
	Matrices
	Figuras incompletas
Memoria de trabajo (IMT)	Dígitos
	Letras y números
	Aritmética
Velocidad de procesamiento (IVP)	Claves
	Búsqueda de símbolos
	Animales

Figure 2. Wechsler Intelligence Scale for Children Test, Fourth Edition, grouped by indices (adapted from Wechsler, 2007)

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Verbal Comprehension Index (VCI). This evaluates verbal reasoning and comprehension skills. It comprises five subtests, three of which are compulsory (Similarities, Vocabulary, and Comprehension) and two optional (Information and Riddles). The only subtest in this index not in the WISC-R is the Riddles subtest, which consists of 24 items that measure general analogical reasoning, knowledge, and alternative thinking (Wechsler, 2007). This is very similar to the riddles subtest of the K-ABC test (Kaufman & Kaufman, 1997).

Perceptual Reasoning Index (PRI). This new index partly overlaps with the Manipulative Intellectual Quotient (MIQ) of the WISC-R. It assesses fluid reasoning, a form of reasoning that involves being able to handle abstract concepts, rules, generalizations, and logical relationships (Sternberg, 1995; Carroll, 1997). It comprises four subtests: Cubes, Concepts, Matrices, and Incomplete Figures. The first three are compulsory for calculating the score for this index, while Incomplete Figures are optional (Wechsler, WISC-IV Wechsler Intelligence Scale for Children-IV. Technical Manual, 2007). The Concepts and Matrices subtests are new to the WISC-R.

The Matrix subtest consists of 28 items that assess visual completion, classification, analogical reasoning, and serial reasoning. It assesses fluid reasoning and general intelligence (Raven, Raven, & Court, 1998). It is also a culture-free test. The Concepts subtest also consists of 28 items assessing abstract and fluid reasoning. The test sequence reflects the increase in reasoning skills (Flavell, 1985). The most straightforward items are solved by concrete representations (basic categories), and the most complex by abstract representations (functionality of objects) (Wechsler, WISC-IV Wechsler Intelligence Scale for Children-IV. Technical Manual, 2007). It is a test similar to the Wechsler Picture Concept Scale for Children under 6 years of age (WPPSI-III).

Working Memory Test (WMT). It assesses the ability to keep information active in the mind, perform operations, and give a response (Swanson & Berninger, 1996; Unsworth & Engle, 2007). It comprises the Digits (direct and inverse), Letters and Numbers, and Arithmetic subtests. The first two are compulsory for calculating the index score, while the third is optional (Wechsler, Wechsler Intelligence Scale for Children. Application Manual, 2007). Digits and Arithmetic were already part of the WISC-R, while the subtest "Letters and Numbers" is new. The Letters and Numbers task consists of reading a list of numbers and letters to the subject in random order. He has to repeat the numbers in ascending order and the letters alphabetically. It consists of 10 items with three attempts each. This test measures skills in sequence formation, mental information management, attention, short-term auditory memory, visual-spatial imagination, and processing speed (Crowe, 2000; Sattler, 2001).

Processing Speed Index (PSI). This evaluates the speed with which the subject processes information. It is considered to be closely related to reading (Kail & Hall, 1994) and working memory (Kail, 2000). It comprises the subtests Symbol Search, Coding, and Animals. The first two subtests are compulsory for calculating the index, while the Animals subtest is optional (Wechsler, 2007). The Clues subtest was already part of the WISC-R, while the other two are new. Symbol Search requires processing speed, short-term visual memory, visual-motor coordination, cognitive flexibility, visual discrimination, and concentration (Kaufman, 1994; Sattler, 2001). Two forms of search (A and B) are adapted to different ages.

Índices del WISC-IV	*Capacidades cognitivas evaluadas*
Comprensión verbal (ICV)	– Aptitudes verbales – Formación de conceptos verbales. – Establecimiento de relaciones entre conceptos. – Comprensión auditiva. – Comprensión social. – Conocimientos adquiridos.
Razonamiento perceptual (IRP)	– Razonamiento perceptivo – Organización perceptiva – Habilidad viso-constructiva – Análisis visual – Formación de conceptos no verbales
Memoria de trabajo (IMT)	– Capacidad para retener en la memoria determinada información con el objetivo de manipularla (manipulación mental), para llegar a una solución concreta – Atención Concentración – Memoria de trabajo
Velocidad de procesamiento (IVP)	– Capacidad para focalizar la atención e informar del tiempo que se tarda en completar una actividad concreta. – Velocidad de procesamiento mental – Velocidad de procesamiento grafo-motriz

Figure 3. Cognitive abilities evaluated by each index of the WISC-VI (adapted from Wechsler, 2007)

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The animal subtest is optional. The task consists of the subject observing a group of different drawings, some ordered and others spatially disordered, and having to search for and mark the drawings indicated to them within a specific time (Flanagan & Kaufman, 2012).

Below, as shown in figure 3, the cognitive abilities evaluated by each of the four indexes with their corresponding abbreviations are shown on the left side.

Figura 4 below shows the cognitive abilities assessed by each of the fifteen subtests, with their corresponding abbreviations on the left:

Subte	*Capacidades cognitivas evaluadas*
Adivinanzas (Ad)	– Razonamiento – Abstracción verbal – Habilidad para relacionar diferentes tipos – de información y crear conceptos – alternativos
Animales (An)	– Velocidad de procesamiento – Habilidades de rastreo visual como – estrategia de búsqueda
Aritmética (A)	– Atención – Memoria a corto plazo – Memoria de trabajo – Representación mental
Búsqueda de símbolos (BS)	– Velocidad de procesamiento – Atención selectiva – Coordinación visomotora
Claves (Cl)	– Velocidad de procesamiento – Memoria a corto plazo – Atención. – Coordinación motriz
Comprensión (C)	– Razonamiento – Fluidez verbal – Capacidad para resolver situaciones – sociales (juicio social)
Conceptos (Co)	– Razonamiento no verbal – Formación de categorías
Cubos (CC)	– Percepción visual – Establecimiento de relaciones espaciales – Coordinación visomotriz
Dígitos (D)	– En orden directo: amplitud atencional y codificación. – En orden inverso: control atencional y memoria de trabajo
Figuras incompletas (FI)	– Organización perceptiva – Concentración
Información (I)	– Adquisición y recuperación de – conocimientos relacionados con hechos – generales (memoria semántica) – Fluidez verbal
Letras y números (LN)	– Fundamentalmente memoria de trabajo
Matrices (M)	– Fundamentalmente razonamiento – abstracto
Semejanzas (S)	– Capacidad de abstracción – Formación de conceptos verbales – Memoria semántica – Expresión verbal
Vocabulario (V)	– Memoria semántica – Fluidez verbal

Figure 4. Cognitive abilities evaluated by each subtest of the WISC-VI (adapted from Wechsler, 2003)

In summary, we can assert that the WISC-IV test offers extensive benefits for assessing intelligence in children and adolescents. However, it is only a tool that allows us to approximate the cognitive and intellectual functioning of the individual. Therefore, no psychological test, and even less an intelligence test, is absolute enough to offer a complete interpretation of this measurement; it is always necessary to resort to other sources

of information to conclude an individual (Jiménez, 2007). The WISC-IV is important in identifying children with different disorders (Osuna, 2017).

Clinical evaluations with WISC-IV

Below are some findings on applying the WISC-IV in populations with particular clinical circumstances.

It has been observed that children with mild mental retardation obtain significantly lower scores in all indexes than children without mental retardation (Osuna, 2017). Children with moderate mental retardation obtain lower scores in all indexes compared to children with mild mental retardation. It should be noted that children with mild and moderate mental retardation obtain lower scores than those obtained by the control group (Wechsler, 2003).

For children with learning disabilities, studies have shown that children with reading disorders obtain lower scores on all indices compared to children without reading disorders (Osuna, 2017). They have also shown that in children with reading and written expression disorders, the differences in means of all indices, except for the PRI, were significant (Wechsler, 2003). On the other hand, in children with calculation disorders, the mean scores of all indices are also significantly lower, except the PSI (Osuna, 2017). In children with reading, written expression, and calculation disorders, the scores in all indexes are lower than those obtained by the control group (Wechsler, 2003).

In the case that concerns us, in children with attention deficit hyperactivity disorder, a moderate increase in the PVI and a lesser effect on the CVI, TMI, and CIT indices have been observed (Wechsler, 2003; Osuna, 2017)

CONCLUSIONS

Intelligence has been a widely studied and debated concept within psychology and other disciplines, evolving throughout history in its definition, measurement, and application. From the first attempts to quantify individual differences in cognitive ability through the psychometric models of the intelligence quotient (IQ) to the emergence of more integrative theories, such as Gardner's multiple intelligences or Sternberg's triarchic theory, the understanding of intelligence has followed a path of constant reformulation.

One key finding in measuring intelligence is that IQ, although useful as an indicator of specific general cognitive abilities, should not be considered the only measure of human intelligence. Studies have shown that sociocultural context, access to education, and environmental stimulation significantly influence intellectual development. Furthermore, contemporary models suggest that intelligence is not a unitary capacity but a set of interactional differentiated skills.

The evolution of intelligence measurement instruments, from the Binet-Simon scales to the modern Wechsler Intelligence Scale for Children (WISC-IV), reflects the need to adapt assessment approaches to theoretical advances and the population's cognitive diversity. These tools have made it possible to identify mental strengths and weaknesses and provide valuable information for diagnosis and support in educational and clinical contexts.

On the other hand, the study of cognitive processes has shown that intelligence is a dynamic and malleable capacity. Factors such as working memory, processing speed, and verbal comprehension play a fundamental role in intellectual performance and adaptation to different learning environments. Likewise, attention and perceptual reasoning are essential for cognitive development, highlighting the importance of educational strategies that enhance these skills.

In conclusion, intelligence must be understood as a multifaceted characteristic influenced by various biological, psychological, and environmental factors. Its measurement and evaluation must be carried out responsibly and ethically, avoiding reductionism or determinism that limits people's potential. The future of research in this field will continue to explore new ways of understanding intelligence, integrating advances in neuroscience and cognitive psychology to develop more inclusive assessment methods more representative of the complexity of the human intellect.

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FINANCING

None.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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