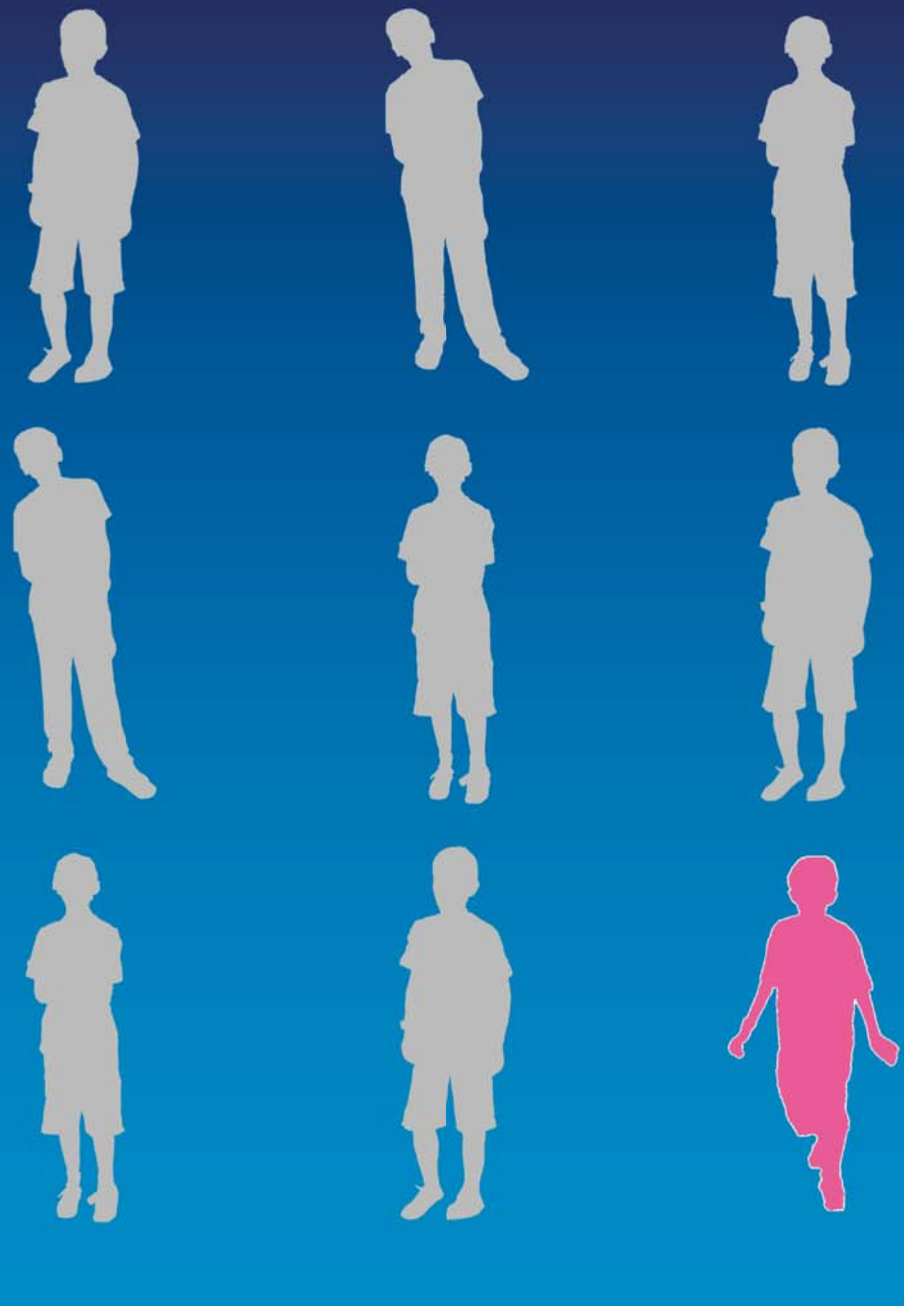
SCREENING TEST FOR GIFTED STUDENTS

Scientific Screening test `Huerta del Rey´ for gifted students,
Application of Raven Color (CPM)



Manual

Yolanda Benito
Jesús Moro
Juan A. Alonso
Susana Guerra

IDEAcción
LA REVISTA EN ESPAÑOL SOBRE SUPERDOTACION

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In our intent of developing to the maximum the TRAINING level of psychologists and university teachers (preferably from Teaching and Psychology faculties), we have extended the Agreement we had with the official College of Psychologists so that the IDEACCIÓN magazine keeps included in PSICODOC <http://www.psicodoc.org > bibliographic psychology database in Spanish, with the purpose of disseminating the magazine in Spain and Latin America in electronic format.

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Name: Screening Test for gifted students. Scientific Screening test 'Huerta del Rey' for gifted students, application of Raven Color (CPM).

Authors: Yolanda Benito, Ph.D. in Psychology; Jesús Moro, M.D.; Juan A. Alonso, Doctor in Education Sciences and Susana Guerra, Ph.D. candidate in Psychology.

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Application: individual and collective.

Application scope: ages 6, 7 and 8.

Duration: Variable, about 40 minutes according to the Raven Color Manual.

Purpose: detecting students with possible intellectual giftedness of ages 6, 7 and 8 in ethnic minorities, hearing-impaired children, with language difficulties, children with learning disability, children with impairment, low cultural class students, and those who are unfamiliar with the language of the country. There are no linguistic or cultural barriers.

Correction: According to the total amount of direct Raven Color scores and the cut-off point specified for each age in the Screening Test.

SCIENTIFIC SCREENING TEST FOR GIFTED STUDENTS

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INTRODUCTION

The Screening Test for early identification of gifted students of age 4, 5 and 6 was published in its first edition in 1997 by the Spanish Education Ministry and subsequently translated into six languages and validated in ten countries, through their respective ministries, agencies and universities.

This screening test has led to significant advances in the identification and education of students with intellectual giftedness and has had impact in the educational legislation of the countries.

The aim of this new screening test is to extend the chance of detection of intellectually gifted students of ages 6, 7 and 8 years, especially students with fewer chances of being identified: ethnic minorities, social and culturally disadvantaged classes, children with learning difficulties, hearing difficulties, motor difficulties, and those who don't know the language of the country.

The screening test that we expose below starts off the diagnosis and observation of gifted and non-gifted children for over 20 years. From the observation of the applied tests arose the possibility of developing a screening test for detecting students with intellectual giftedness.

The **scientific screening Test 'Huerta del Rey' for gifted students, application of Raven Color (CPM)** is intended for children ages 6, 7 and 8.

The criterion used for the prediction of intellectual giftedness in the field of the psychometric measure of intelligence was IQ (intelligence quotient) greater than or equal to 130 observed in a psychometric clinical test for intelligence measurement applied individually.

The scientific Screening Test for gifted students 'Huerta del Rey', application of Raven Color (CPM), offers the following **scientific criteria of diagnostic validity:**

- Sensitivity is 82'4% (Confidence interval 95%, located between the 72’52% and 92’28%). The Screening method allows identifying the 82’4% of children with intellectual giftedness.

- Specificity is 90% (Confidence interval 95%, located between 76’85% and 100%). Ability to detect children who really are gifted intellectually, as negative specificity is 90%.

It is a test free of cultural influences suitable for application on children of low social class, ethnic minorities, with hearing difficulties, learning difficulties, motor difficulties, language difficulties, or for those students who do not know the language of the country.

1. Definition of intellectual giftedness according to the different theoretical proposals

1.1 Current definitions of giftedness and talent

Definition of the National Association for gifted children (NAGC)

Gifted individuals are those who demonstrate extraordinary levels of aptitude (defined as an exceptional reasoning and learning capacity) or competence (performance or achievements documented in 10% or rarer) in one or more domains. These domains include any area of activity structured with its own symbol system of (e.g. math, music, language) and/or a set of sensor motor skills (for example, painting, dancing, sports).

Federal definition

This definition is taken from the Javits Act, which awards grants to educational programs oriented towards bright children of low-income families: "gifted and talented student means that children and youth show evidence of superior performance in such areas as intellectual, creative, artistic or leadership ability, or in specific academic fields which require services or activities not provided normally by schools, in order to fully develop these capabilities".

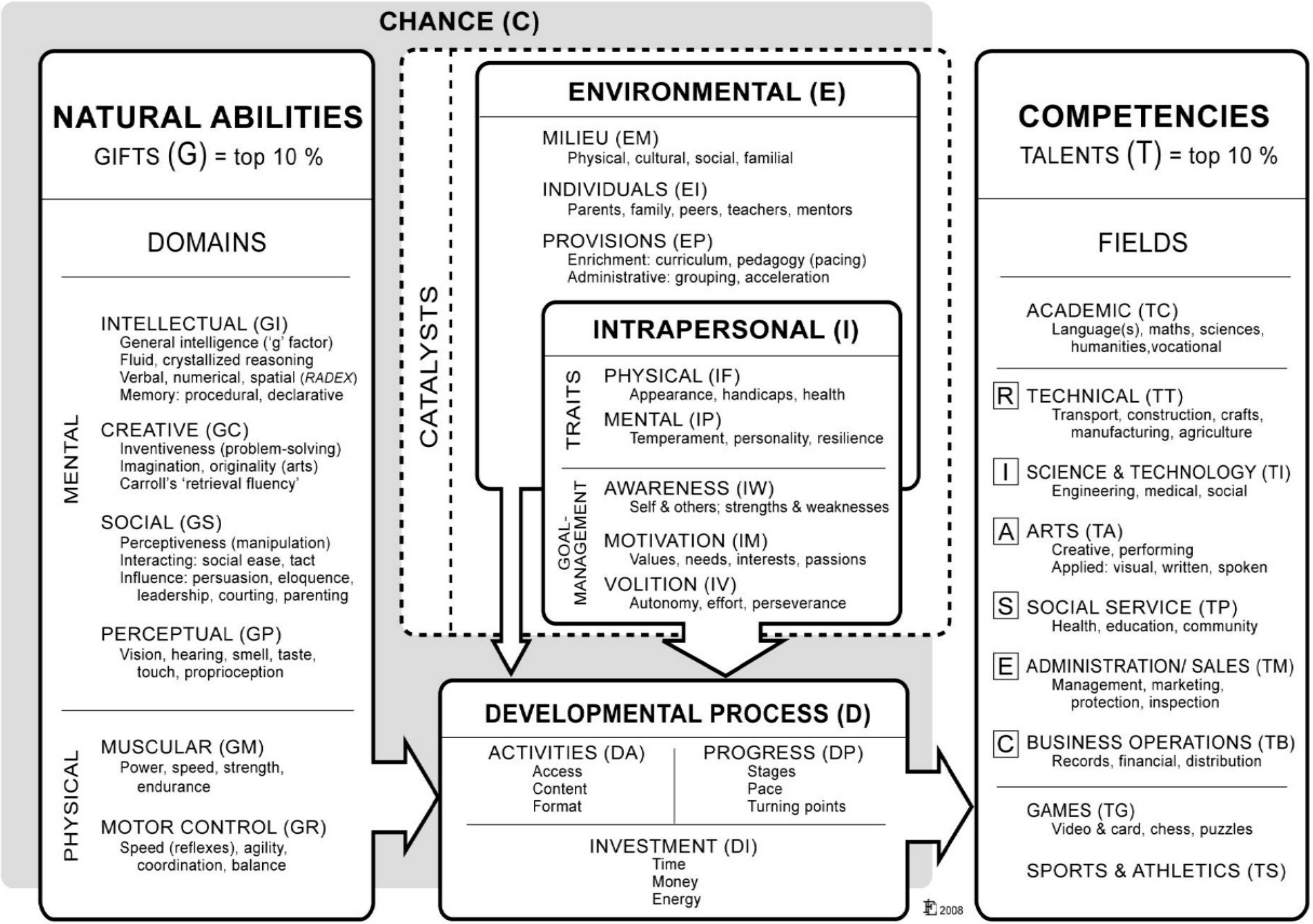
Columbus Group

"Giftedness is an asynchronous development in which advanced cognitive abilities and higher intensity combine to create inner experiences and knowledge that qualitatively differ from the norm. This asynchrony increases with higher intellectual capacity. The singularity of gifted children makes them especially vulnerable and requires changes from parents, teaching and counseling so that they can grow in an optimal manner"(Morelock, 1992).

Other definitions of Gagné and Renzulli are included in the NAGC website http://www.nagc.org/WhatisGiftedness.aspx

Gagné proposes a clear distinction between giftedness and talent. In his model, the term giftedness indicates possession and use of natural skills and expressed spontaneously (aptitudes or gifts) in the domain of at least one capacity (or skill) that places a child between 10% of the first age. Conversely, the term talent designates superior mastery of systematically developed skills (or competencies) and knowledge in at least one field of human activity that puts the achievements of the child within the top 10% of their children in a field. His model presents five aptitude domains: intellectual, creative, affective, sensor motor and other (e.g., extrasensorial perception). These natural abilities, which have a clear genetic substrate, can be observed in every task faced by children throughout their schooling (Gagné, 1985).

According to Gagné (1995-2010), the term giftedness seems appropriate in terms of possession of high, partially innate natural abilities, that can be understood as nature's 'gifts', and develop quite naturally through maturational processes, as well as through daily use or formal practice. According to this author, a student with low performance and an IQ above 130 will be reckoned as gifted, but not as academically talented (Figure 1).


CHANCE (C)
NATURAL ABILITIES
GIFTS (G) = top 10 %
DOMAINS
MENTAL
INTELLECTUAL (GI)
General intelligence ('g' factor)
Fluid, crystallized reasoning
Verbal, numerical, spatial (RADEX)
Memory: procedural, declarative
CREATIVE (GC)
Inventiveness (problem-solving)
Imagination, originality (arts)
Carroll's 'retrieval fluency'
SOCIAL (GS)
Perceptiveness (manipulation)
Interacting: social ease, tact
Influence: persuasion, eloquence, leadership, courting, parenting
PERCEPTUAL (GP)
Vision, hearing, smell, taste, touch, proprioception
PHYSICAL
MUSCULAR (GM)
Power, speed, strength, endurance
MOTOR CONTROL (GR)
Speed (reflexes), agility, coordination, balance
CATALYSTS
ENVIRONMENTAL (E)
MILIEU (EM)
Physical, cultural, social, familial
INDIVIDUALS (EI)
Parents, family, peers, teachers, mentors
PROVISIONS (EP)
Enrichment: curriculum, pedagogy (pacing)
Administrative: grouping, acceleration
INTRAPERSONAL (I)
TRAITS
PHYSICAL (IF)
Appearance, handicaps, health
MENTAL (IP)
Temperament, personality, resilience
GOAL-MANAGEMENT
AWARENESS (IW)
Self & others; strengths & weaknesses
MOTIVATION (IM)
Values, needs, interests, passions
VOLITION (IV)
Autonomy, effort, perseverance
DEVELOPMENTAL PROCESS (D)
ACTIVITIES (DA)
Access
Content
Format
PROGRESS (DP)
Stages
Pace
Turning points
INVESTMENT (DI)
Time
Money
Energy
FG 2008
COMPETENCIES
TALENTS (T) = top 10 %
FIELDS
ACADEMIC (TC)
Language(s), maths, sciences, humanities,vocational
R TECHNICAL (TT)
Transport, construction, crafts, manufacturing, agriculture
I SCIENCE & TECHNOLOGY (TI)
Engineering, medical, social
A ARTS (TA)
Creative, performing
Applied: visual, written, spoken
S SOCIAL SERVICE (TP)
Health, education, community
E ADMINISTRATION/ SALES (TM)
Management, marketing, protection, inspection
C BUSINESS OPERATIONS (TB)
Records, financial, distribution
GAMES (TG)
Video & card, chess, puzzles
SPORTS & ATHLETICS (TS)

According to **Renzulli,** gifted behavior occurs when there is an interaction between three basic groups of human traits: Above-average general abilities and/or specific skills, high levels of commitment in a task (motivation), and high levels of creativity. Gifted and talented children are those who possess or are able to develop this combination of traits and apply them to any potentially valuable area of human performance. As noted in the Schoolwide Enrichment Model, gifted-like behaviors can be take place "in some people (not everybody), on certain occasions (not always) and under certain circumstances (not all circumstances)".

According to Renzulli, *School Giftedness* can also be called lesson-learning or test-answering giftedness. It is the test that most easily measures IQ over other tests of cognitive skills, and it is therefore the type of test most used for student selection towards entering special programs. The skills that people show in IQ and aptitude tests are exactly the kinds of skills evaluated most often in situations of school learning. Research has shown that these lesson-learning or test-answering skills usually remain stable over the years. The results of this research should lead to some obvious conclusions about school giftedness: it exists in varying degrees, can be identified by means of standardized determination techniques, therefore , we should do try our best to achieve the appropriate changes aimed at students with the ability to cover regular curricular material with high degrees and levels of understanding. Compression or compaction of the curriculum, a procedure used to modify the curriculum content in order to adapt it to advanced learning, and other acceleration techniques, should represent an essential part of any school program that seeks to respect individual differences, differences that are clearly evident out of the scores established by tests of cognitive ability (Renzulli and Reis, 1992).

1.2. Definition of intellectual giftedness according to statistical distribution of intelligence

The results obtained from the new clinical tests of intelligence measurement are usually interpreted according to the method proposed by Flanagan and Kaufman (2006) in the book Essentials of WISC-IV Assessment. According to this method the IQ obtained by a student score corresponds to a particular category and according to this category sets a description of academic equivalency:

- IQ score: over 131. Category: higher end. Performance description: normative strong spot.
- IQ score: 116-130. Category: average high. Performance description: normative strong spot.
- IQ score: 85-115. Category: average. Performance description: within limits.
- IQ score: 70-84. Category: average low. Performance description: normative weak spot.
- IQ score: under 69. Category: bottom end. Performance description: normative weak spot.

It is also possible to use an alternative descriptive system of performance that defines the strong and weak spots of the child when compared with others of the same age.

Normative strong spot:

-a student at the upper end is one with an IQ 131 or above.

-a student of high average is one with an IQ between 116 and 130, meaning normative high average.

Average:

-an average student is one with an IQ from 85 to 115.

Normative weak spot:

-a student of low average is one with an IQ between 70 and 84, meaning normative low average.

-a student at the lower end, is one with an IQ of 69 or below.

1.3 Definition of intellectual giftedness according to clinical diagnosis

The change that has been taking place about the acceptance of the concept of "diagnosis" believe that it is due to the greater knowledge that exists today on the development of children and on childhood psychiatric disorders, based on advances, among others, of neurobiology.

Currently, the goal of education is to allow children to have opportunities to fully use the capabilities they possess and alleviate or correct, as soon as possible, the difficulties they may have. In this way we need to apply tests, in order to provide each child the education he needs.

Students located at the end of the curve are among students with psychopathology of cognitive functions: mental retardation and intellectual giftedness; characterized in the psychometric field by a significantly above-average general intellectual ability (IQ around 130 or higher) or significantly lower than the average (IQ around 70 or lower) approximately two typical deviations above or below the average.

What children with mental retardation and children with intellectual giftedness have in common is a score significantly different from the average in clinical psychometric tests of intelligence measurement, which involves an adapted educational intervention, since they learn differently and at a different rate than the rest of students.

Both in one group and another there are degrees, according to approximately two typical deviations above or below average and successive:

- Gifted (IQ 130-144), highly gifted (IQ 145-159), exceptionally gifted (IQ 160-174), and deeply gifted (IQ > 175) (Wasserman, 2003).

- Mild mental retardation (IQ between 50/55 and approximately 70), moderate mental retardation (IQ between 35/40-50/55), severe mental retardation (IQ between 20/25 and 35/40), and deep mental retardation (IQ < 20/25) (DSM-IV-TR, 2002).

Both on one end and the other, in the statistical field, prevalence is 2’2%. Most of these students are in the mild degree, 85% of students with mental retardation have an IQ between 70 and 56, and 85% of intellectually gifted ones have IQ 130-144.

These students may have associated disorders, namely, a child with mental retardation may have as an associated disorder attention deficit hyperactivity disorder. A child with intellectual giftedness may also have as an associated disorder attention deficit hyperactivity disorder. However, only some children with intellectual giftedness or mental retardation have associated disorders. Associated disorders such as ADHD are not intrinsic to mental retardation nor giftedness, they are not included in the definition; just some students with mental retardation and some intellectually gifted ones may have as an associated disorder, for example, ADHD.

It is known that the prevalence of psychiatric disorders in eminent adults is not greater than that occurring in the general population; psychological pathology among eminent population is 10%, approximately the same as in the general population (Yewchuck, 1995).

Sometimes the lack of awareness, on other occasions ignorance of these different degrees existing in the field of intellectual giftedness, and ignorance of the possibility that some gifted students may have an associated disorder, have resulted in rejection and lack of understanding and care of these gifted children, both by parents and teachers, because of them not matching the image of these children usually transmitted by the media.

Usually, the media tend to pick extremely intelligent children and/or with some talent in order to attract the public attention. These children most often belong to the exceptional or deeply gifted group.

According to Davis, only 0' 001% of the population have an IQ above 160, in other words, are exceptionally gifted (Marcelli and Ajuriaguerra, 2004). If we add to this that the student with mild giftedness (IQ 130-144) has any associated disorder, namely dyslexia, the acceptance of this child as a gifted student both by parents and by the teachers is even more unlikely.

For Gagné (1995) the term giftedness is often used in a *hyperbolic* way: it depicts a falsely exaggerated image of the typical behavior of gifted and talented individuals. Hyperbole can manifest itself in many ways, such as by our choice of examples. When Gardner illustrates their intelligences by means of association with a famous character (Einstein, Gandhi, Mozart), he fuels this hyperbolic trend. We all do the same thing whenever we play with the imagination of the general public showing the most outstanding cases within our population of gifted and talented. This hyperbolic trend can have harmful effects, among others:

- It reinforces the view of some teachers and principals that there are no gifted and talented students in their schools.
- It creates disproportionate expectations of those identified as gifted or talented. What will they be asked if the models we present are Nobel Prizes, internationally renowned musicians, or Olympic medalists?

1.4. Definition of intellectual giftedness according to empirical evidence

As stated by all of the above, and consistently with the latest models, we focus on the **definition** of **intellectual giftedness:** we define the intellectually gifted student as the one with superior skills related to academic abilities taking into account three criteria that were already collected in the screening test for early identification, issued by the Education Ministry (Benito and Moro1997):
the definition of intellectual giftedness of the **Center "Huerta del Rey"** is based on empirical evidence of development and learning, empirical evidence of neuropsychological evaluations of executive functions, current psychometric theories and the theories of cognitive processing.

Criterion **a.-** Intellectual giftedness is characterized by a significantly above-average *intellectual* functioning. General intellectual capacity is defined by the intelligence quotient (IQ or IQ equivalent) obtained by using one or more normalized intelligence tests administered individually, e.g., Wechsler and Stanford-Binet intelligence scale, form (L-M). A significantly higher than average capacity is defined as an IQ around 130 or higher (approximately two standard deviations above the average).

If standardized measures are not relevant to the case, as it might be for reasons of cultural diversity, clinical judgment must be applied. In this case, intellectual giftedness means performance superior to that reached by approximately 97% of the people in their reference group, in terms of age and cultural environment.

Criterion **b.**-Intellectual giftedness associates to greater maturity in the processing of information (Visual memory and Visual perception), early development of metacognitive capacity (approximately since age 6), insight in problem solving (executive functions), high motivation for learning, creativity, precociousness and talent.

Criterion **c.**-Intellectual giftedness must manifest itself during the development stage, which means it occurs since conception until the age of 18.

Theoretical foundation of the definition of intellectual giftedness of the Center "Huerta del Rey"

Reached this point, and in accordance with criteria (a) and (b) of our definition, we consider appropriate to expose some theories of intelligence.

The theory of multiple intelligences is now well known, according to Sternberg: "Howard Gardner (1983, 1993, 1999, 2006) does not consider intelligence as a unitary element. Moreover, instead of speaking of many different abilities that compose together the intelligence –like other authors have- Gardner proposed the theory of multiple intelligences, in which eight different intelligences operate more or less independently of each other and interact to produce an intelligent behavior: linguistic intelligence, logical-mathematical intelligence, spatial intelligence, musical intelligence, bodily-kinesthetic intelligence, interpersonal intelligence (dealing with other people), intrapersonal intelligence (deal with oneself), and naturalistic intelligence. Gardner (1999, 2006) also speculated about the possible existence of spiritual and existential intelligences. Each intelligence is an independent operating system that interacts occasionally with other intelligences to produce what we call intelligent behavior" (Sternberg and other, 2011).

In the epilogue of the book *Multiple Intelligences*, written by Gardner in 1993 (translated to Spanish in 1998), refers: "Having started this book with an imaginary journey to year 1900, I'd like to conclude making a speculative journey to year 2013. That year will mark the 30 anniversary of the publication of *Frames of Mind* and, coincidentally, the time for my retirement will be arrived" … "Undoubtedly, neurologists will have set stronger notions about the organization and development of the nervous system. After years observing the mental processes as it takes place in the living brain, they will be able to describe the neural structures involved in the realization of various intellectual activities; they will be able to show to what extent these activities are independent from each another"... "Until this moment, the concept of intelligence as IQ constituted the most important psychological contribution to the transformation of our society. Should there be in 2013 a wider acceptance of the idea that intelligence deserves to be pluralized, I will feel satisfied".

Gardner perspective of the mind of is modular. Advocates of the modularity theory believe that different capabilities, such as Gardner's intelligences, can be isolated as if they came from different parts of the brain. Thus, one of the main tasks in present and future lines of research consists in isolating areas of the brain, responsible for each of the intelligences. Gardner made speculations about some of these relevant areas. However, conclusive evidence of the existence of separate intelligences is yet to be obtained, as well as developing some kind of measure that can be used in a practical way (Sternberg et al., 2011).

This means that, 30 years after the creation of the theory of Gardner, according to Sternberg there is no conclusive evidence that supports said theory, neither development of some kind of measure of their intelligences has been achieved yet. Gardner did earn, 30 years after the creation of his theory, theoretical acceptance of a plural intelligence.

We do understand intelligence as a whole unit, many different abilities that comprise together the intelligence and we understand it based on the psychometric and cognitive models. The first attempts try to understand the structure of mental abilities that constitute the intelligence, and cognitive researchers seek to understand the processes of intelligence.

Considering like Sternberg that both models are complementary, the factors of intelligence can be understood in terms of the processes that are involved in them. Thus, for example, if a person has a verbal ability factor, it is legitimate to ask what processes are responsible for individual differences in verbal ability (Sternberg et al., 2011).

Cognitive and psychometric models have empirical support from the existence of a relationship between some neuropsychological evidence and intelligence tests, founded and based on psychometric and cognitive terms.

The frontal lobe is the purest expression of the high degree of mental development attained by mankind throughout the evolutionary process. Its main competence is executive functioning. The frontal lobe is a complex neuropsychological system which performs its activity by means of the reciprocal connections it establishes with other areas of the central nervous system such as the thalamus, basal ganglia, limbic system, reticular formation, and the associative areas from the rest of the cerebral cortex. The frontal lobe is divided in two distinct functional areas: the motor cortex and the prefrontal area.

The prefrontal area is the most important center of regulation of human cognitive processes, since it assumes responsibility for coordinating cognitive processes. Its main competence is executive functioning, which allows programming, developing, sequencing, executing and monitoring any plan of action aimed at achieving specific objectives and decision-making.

Table 1. **Strategies included in the Executive Functions to program behavior**

Ability to make decisions and plan behaviors aimed at goals.
Adequate selection of objectives.
Programming of sequences and activities required to achieve those objectives.
Selection of necessary strategies to start a specific plan of action and capacity to maintain said plan during its execution.
Inhibition of distraction, avoiding interference from irrelevant stimuli.
Monitoring of the action plan set-up to check its setting on the target and the strategies initially proposed.
Flexibility to correct errors and modify or incorporate new behaviors based on the contingencies that arise while the plan of action aimed at achieving a specific objective develops.
Ability to maintain an alternative thinking that allows a flexible change of strategies should the situation require it, to ensure the attainment of the goal.
Prospective ability, appraising which consequences will have our actions on the final outcome of our conduct.
Ability to adjust the intensity, energy cost, and time spent in the course of the action (timing).
Ability to evaluate the degree of success or failure in meeting the goals.

Executive functions make possible the implementation of all these strategies by means of a set of interdependent processes, among which we can highlight (Portellano and others, 2009): Prospective Memory, Operating Memory, Metacognition, Motivation, Verbal Fluency, Emotional Regulation, Empathy, Self-Awareness, Ethical Behavior, Social Interaction, Fluid Intelligence, Formation of New Concepts, Abstraction, Reasoning, Divergent Thinking, Creativity, Attention Regulation, Mental Flexibility, And Contextual Memory.

Executive functions are the core of mental activity, especially when it comes to solving new problems which require setting in motion reasoning processes, abstraction and use of symbolic codes.

Famous tennis player Rafael Nadal uses his intelligence as a unit, for example, in a match he uses it in order to measure space and time, logical-mathematical intelligence, attention, concentration, problem solving ability, creativity...

Nadal will use his capabilities altogether at all times. Depending on the moment he will use intelligence in a different, giving greater significance to some skills over others depending on the behavior to perform. The skills that make up intelligence are different in each person; however, this does not mean that different skills operate more or less independently.

Hagemann of the Kassel University (Germany), pioneer in the study of the brain mechanisms involved to make quick decisions in critical moments, has studied how athletes must act under temporal pressure, since an early recognition of the opponent's intentions allows reacting in a more accurate manner. Nadal will deal with spatial, three-dimensional, and appreciatory images as well as the memory needed to know how he smashed hits previously.

Executive function is related to development of the neurobiological maturation processes of the frontal lobe and its connections, thanks to the increase in myelination and synaptogenesis.

The efficiency of the executive system of an individual can increase throughout the life cycle. The myelination process of the brain's associative areas can continue throughout the life cycle, in direct proportion to the degree of stimulation that has been received.

The executive functions are a supramodal function that includes various sub-functions such as selective attention and operational memory, among others. In addition, scholar success or failure in childhood come up largely depending on the level of maturity reached in the development of executive functions, since the prefrontal area leads all remaining cognitive processes such as reasoning, language, memory, visoperception, reading, calculation, or writing. The prefrontal area is the activation center of the creativity processes and divergent thinking (Portellano et al., 2009).

Benton's Visual Retention Test (BVRT) is a classical neuropsychological test that assesses memory, visual perception and visoconstructive skills.

Significant correlation found between Mental Age at the SBL-M (Stanford-Binet, form L-M) and the Visual Memory in the TRVB is r = 0.83, this correlation indicates that the efficiency of the executive system has much to do with the intelligence measured by intelligence tests. The research sample was 25 children between ages 5 years, 0 months to 8 years, 9 months. The IQ ranged 123-175. The average IQ sample was IQ 137 (Guerra, 2002).

Similar research was undertaken by Dolores Valadez (2004) at the University of Guadalajara (Mexico), with a total of 60 children of ages 5 years, 6 months to 8 years, 4 months. IQ of the sample ranged IQ 79-155. The average sample IQ was IQ 109. The research found a correlation between the equivalent age of the WISC-R and the Visual Memory of r = 0.86.

These investigations reveal that the intelligence measured through the intelligence test, SBL-M (Stanford-Binet, form L-M) and the WISC-R relates to the development of the frontal lobe's neurobiological maturational processes.

Attention regulation is the sensor of the executive functions, since voluntary attention allows that all cognitive processes can be carried out. Attention is the gateway of cognition, the prefrontal area being the "end of the road" of attention processes initiated in the quadrigeminal reticular formation. The frontal lobe is responsible for processes of sustained and selective attention, being fundamental in the process of conscious attention control and avoiding distraction from irrelevant stimuli (Portellano et al., 2009).

The results of the research on neuropsychological assessment of attention capacity, concentration, and attention self-control displayed significant differences between attention abilities of non-gifted children with ADHD and gifted children with ADHD. Differences in the attention abilities between intellectually gifted children and intellectually gifted ones with ADHD were also observed.

The tests used in the research were the Brickenkamp D2 Test and the Conners' Continuous Performance Test II (CPT II V.5). The sample was 41 gifted students with ADHD, 17 gifted ones without ADHD, and 15 non-gifted students with ADHD. Ages ranged 4 to 20.

To consider a schoolchild as intellectually gifted, an IQ equal or higher than 130 in the Wechsler Intelligence scales and/or Stanford-Binet has been kept as a psychometric criterion. The system used for the diagnosis of ADHD was the DSM-IV-TR (American Psychiatric Association).

The results of the investigation made it clear that gifted students without ADHD show greater consistency in the response speed (the speed is the same along the entire test), higher speed in information processing, greater stability and consistency during work time, greater concentration, better balance between speed and accuracy and a more liberal response style than gifted students with ADHD.

The significant differences found between gifted ones with ADHD and non-gifted ones with ADHD in attention processes were the following: gifted students with ADHD make fewer mistakes, show greater stability and consistency in the performance and higher speed and precision in the answer (Benito, Moro and Alonso, 2007).

The executive function relates to the development of the frontal lobe's neurobiological maturation processes and this circumstance is directly related to intelligence.

It is possible that soon we will have neuropsychological means to measure intelligence, of great clinical usefulness.

We must emphasize in the field of cognitive theories that Spearman (1923) proposed three cognitive laws (which could also have been easily called cognitive processes) and to explain them took, as an example, the process of resolution of an analogy by an individual. In an analogy as "LAWYER" is to "CUSTOMER", as “DOCTOR” is to “______”, this apprehension of the experience would correspond to the codification process of the analogy's terms, in which the individual who solves the problem perceives each word and understands its meaning (Sternberg et al., 2011), which would agree with the first law.

Spearman (1904) believed that the ‘g’ factor, general intelligence, was the one that better represented and defined intelligence. This author felt that every intelligence test measured mostly a general factor ‘g’, which he likened to intelligence proper. Although intelligence varied from some individuals to others, it remained unchanged for a single individual regarding to the other correlated skills, and another specific ‘s’, much lesser than ‘g’, that was characteristic of the used test. The ‘s’ –or specific- factors are multiple of each individual and they vary not only from one individual to another but they also vary in a single subject for different skills. Somehow, ‘g’ would be involved in every intellectual activity, and therefore would appear on all items and all intelligence tests but in a variable proportion (Benito, Moro and Alonso, 2009).

Afterwards, Spearman also suggested an intermediate class of factors, not as specific as ‘s’ or as general as ‘g’. These are the group factors, which include dimensions such as arithmetic, mechanical, and language capabilities. Later it also included other factors at the level of ‘g’, like ‘p’ (preservation), ‘o’ (oscillation) and ‘w’ (will). However, these factors related reciprocally to the operation of ‘g’, which was considered to have an overwhelming importance to determine mental abilities (Buss and Poley, 1979).

Clinical evidence so far supports the existence of two components in any intelligent behavior. One factor linked to some extent to heredity that is essentially the ability to elaborate perceptions and conceptual activities; and a second factor, the experience that is the degree that reaches said elaboration.

In fact, one of the most precocious learning, empirically proved to be related to intellectual giftedness, is learning of the colors at age 18 months, regardless of culture and social class (Benito and Moro, 1999).

Abstraction capacity and depth in forming concepts is what sets the smartest children apart. Spearman (1927) mused about the formation of concepts or neogenesis as the most genuine of intelligent behaviors (Yuste, 2002; Benito, Moro and Alonso, 2009).

Empirical investigations are the ones that informed the intellectual giftedness definition of the Huerta del Rey Center that along with the psychometric models and cognitive models are the theoretical bases of the current screening test.

2. Stages in the evaluation and identification process

The identification process is usually divided in two phases: Screening or nomination, and Diagnosis and assessment.

Nominating and/or screening

This phase is intended to appreciate economically both in time and cost, who may be candidates for the diagnostic process.

Diagnosis - selection

It allows selecting which children require an adapted educational program. The individualized assessment is required. The goal is to plan the student's education.

2.1 Screening or shortlist: nomination

The objective of this phase is to find potentially gifted children that might require different or special educational intervention.

Considering that it is not possible to explore every child with appropriate instruments, since resources are limited, this phase is intended to appreciate, in an economical way both in time and cost, which ones may be candidates for the diagnostic process.

At this stage it is important to consider the following principles: multiple criteria, training of personnel, and use of tests and scales which are appropriate for screening, reliable and valid.

In the process of screening of students with possible intellectual giftedness, it is normal to select 10% of the population. At this stage, it is preferable to produce false positives among the selected subjects (subjects nominated as potentially gifted but are subsequently not confirmed as such in the diagnostic process), that leaving out unidentified children.

2.1.1 What is a screening test?

A screening (sifting or detection) test is a test performed to identify the presence of a disease or a risk factor for a disease, usually among asymptomatic people (those who have not developed symptoms of a disease).

In this way, some of the risk factors for a disease we can detect early, allowing early treatment or prevention.

Screening or detection tests are widely used in medicine as part of periodic health checkups, for example, within the public health mammography tests are taken to detect breast cancer in women, or tests like the PSA or its derivatives, to detect prostate cancer in men, questionnaires to identify persons with alcohol problems or the DGT (Directorate-General of Traffic) oral fluid test to detect the consumption of drugs in drivers.

2.1.2 Why are screening tests necessary?

Screening tests are necessary as checks of detection or sifting, because it would not be suitable, appropriate or possible, for example, carry out for all men a prostate biopsy to rule out or confirm prostate cancer. It would mean unnecessary inconvenience and hardly acceptable medical costs.

Tests for screening both in the field of medicine and in the educational field are the first stage of evaluation and are aimed to reach the entire population. Among disadvantaged classes, screening tests are what make possible the detection of these children.

Positives in the screening test among students in the case of education and among subjects in the case of medicine are subsequently subjected to other tests for definitive diagnosis.

2.1.3 Requirements a screening test must meet

The factors that determine the usefulness of a detection or screening test for use with students in a school setting or for any person in other areas is the accuracy of the test itself, especially its sensitivity and specificity. The requirements that a screening test must meet are:

- Diagnostic validity: sensitivity and specificity.
- Reproducibility.
- Efficiency: positive and negative predictive values (odds ratio).
- Security: not being harmful.

For example, the sensitivity of a rectal examination to detect prostate cancer is 56’56%. The ability to detect disease is 56’56%, i.e. 43’44% of actual cancer cases displayed a normal result. The test correctly identified 56’56% of prostate cancer cases. The validity of rectal examination as a screening test to detect prostate cancer is not very good due to its low sensitivity (56’56%), 43’44% of patients with a cancer registered as normal.This clearly indicates the need to use more sensitive markers, like the PSA (tumor markers, in this case for prostate cancer) or its derivatives (Pita and Pértegas, 2003).

Sensitivity and specificity values define the accuracy of the test. Obviously it would be ideal to work with high sensitivity and specificity screening tests, but this is not always possible.

The initial goal, for example, of the Directorate-General of Traffic in the screening test on control of drugs in oral fluid was set on obtaining a sensitivity and specificity above 80% for each of the 13 selected substances (DGT, 2011).

The requirements a screening test should meet are –as mentioned- diagnostic validity (sensitivity and specificity), and efficiency, which refers to the test’s chance of success: how likely are we to guess correctly by means of using this test?

The odds ratio offers the advantage of relating the sensitivity and specificity of the test in a single index. This allows it to be used as a comparison index between different screening tests of the same type.

Another requirement that a screening test must meet is the reproducibility, namely the test's ability to provide the same results when its application is repeated in similar circumstances.

It is convenient for the test to be easy to apply, accepted by the population in general and economically affordable.

2.1.4 Why is it important and necessary the application of the scientific Screening Test 'Huerta del Rey' for gifted students, application of Raven Color (CPM) for the detection of students with intellectual giftedness?

We can expose four points about the need for the present test:

Firstly, the identification of students means **equity in education** and thus makes it possible to consider article 29 of the Convention of the R**ights of the Children**: *1. "The States Parties agree that the education of the child shall be directed to:*

a) *The development of the child's personality, talents and mental and physical abilities to their fullest potential... "*.

Secondly, the stereotypes assumed by teachers when it comes to nominating students. According to the document edited by the Children's Commissioner of the Community of Madrid (2003), teachers worldwide correctly identified 50% of the gifted students. In Madrid, teachers identified 44% of these students. On the other hand, 97% of the students they identified as gifted actually were not.

Thirdly, the organic law for the Improvement of the Education Quality (LOMCE) states the following:

"...every and each student will be object of attention in the search for talent development, to make education become the main instrument of social mobility, helping to overcome economic and social barriers and generate aspirations and achievable ambitions for all...".

"It corresponds to the education authorities taking the necessary measures to identify their needs early...".

"It may be made flexible the duration of each stage of the educational system for the students, regardless of age, in accordance with the rules set for that purpose. This measure will mean anticipating the start of the stage or reducing the duration of the same".

Fourthly, there are various tests that are used and/or advertised as screening tests, but either are unknown or do not meet the validity criteria of a test screening, i.e. sensitivity and specificity criteria. Among these tests we can find the following:

SAGES-2. Screening Assessment for Gifted Elementary and Middle School Students.

BADyG.R. -E1-. Set of Differential and General Skills.

EDAC. Scale of Detection of subjects with high capacities.

NNAT. Nagliery Nonverbal Ability Test Score.

WNV. Non-Verbal scale of Intellectual Skills (Wechsler and Naglieri).

K-BIT: Kaufman's Brief Test of Intelligence.

The same can be said about some questionnaires for teachers, namely the "Protocol for detection of intellectual giftedness. Kindergarten" made by Aroca, Martinez and Regadera (Carreras et al., 2012); "Questionnaires for detection of children with High Capacities for ages 3-4 years, ages 4-8, and ages 9-14 " of Perez and Lopez (2007), or the protocols of the Junta de Castilla y León (Elices et al., 2003), which may be currently used as screenings but are unknown or do not meet the criteria of validity for a screening test.

It is the case of the –renovated- BADyG -E1- test that has been sometimes proposed or used as a test for screening and/or diagnosis of students with talents or intellectually gifted based on Gardner's theory of multiple intelligences, when his Manual states that the only theoretical trends that possibly cannot be found in the renovated BADyG are the more atomistic ones and those conceiving most radically non-interrelated factors, such as the lines of Thomson, Guilford and Gardner (Yuste, 2002).

Only two tests have been found to comply with the validity criteria for a screening test for detection of intellectually gifted students: the GATES Scales and the Screening Test with Empirical Basis for Early Identification of children aged 4, 5 and 6 with intellectual giftedness, being the latter the only one with a record of having been internationally validated. In the case of the GATES Scales data on the test's efficiency (Diagnostic Odds Ratio) is not provided.

3. Technical characteristics. Scientific Screening test 'Huerta del Rey' for gifted students, application of Raven Color (CPM)

3.1 Why was Raven Color chosen to be used as a screening test?

a) The Raven Color test is widely known and accepted in all countries. It is a free of cultural influences test, suitable to be applied to children of low social class, ethnic minorities, with hearing difficulties, learning difficulties, motor difficulties, language difficulties, or for those students who do not know the language of the country.

b) It is a classical test for the evaluation of the ‘g’ factor. This is a test of great tradition and used in more than 100 countries, and measures a key component of intelligence: educational capacity. It allows determining the possibilities or the learning potential of an individual, as well as obtaining an estimate of general intelligence or ‘g’ factor identified by Spearman (Raven, 2013).

c) Raven's Progressive Matrices is one of the non-verbal tests most researched worldwide. This test does not contain any exercise that can be solved exclusively by means of cultural knowledge, short- or long-term memory, nor motor skills either.

d) It must be highlighted that the concurrent validity found between the Raven Color and the WISC-IV is similar to the convergent validity found between Wechsler’s Non-Verbal Scale of Intellectual Aptitude (WNV) and the WISC-IV.

The correlation of Wechsler’s Non-Verbal Scale of Intellectual Aptitude (WNV) with the intelligence of the WISC-IV test is 0.76 (Wechsler and Naglieri, 2006).

The correlation of the Raven Color with the WISC-IV intelligence test **is** 0.708 (see Table 4 of this article).

e) Regarding the Deontological Regulations of the American Psychological Association (APA) accepted by the official College of Psychologists of Spain, Raven Color is a test classified in the "b" paragraph, so it can be applied by people with knowledge about the theory tests and statistical methods, approved by means of the pertinent academic qualification. This test does not require to be applied by graduates in Psychology or Psychiatry with professional experience in the clinical diagnosis.

3.2 Research sample

It was used for the research the whole available sample of children of ages 6, 7 and 8 evaluated from 2005 to January 2012. There were no exclusion criteria. The sample is made up by children from all the Spanish geography, of middle, average low, and medium high class.

The number of children selected for the creation of the test was 83 children. Gifted children included in this research (52 of the 83) imply a very important size taking into account the difficulty of finding samples of this entity, an illustrative example: in a sample between 100 and 300 subjects we would find only, with a score of two deviations above the average, between 2 and 6 subjects. In order to find 10 subjects above 132 of IQ, two standard deviations, would demand a representative sample of 438 subjects (Touron and others, 1998). Getting the sample in use is still more difficult since only children of ages 6-8 were selected.

The relevance and the specification of the characteristics of it are more significant if we consider the sample used in other current tests.

The sample used in the WNV (Wechsler and Naglieri, 2006) was of 41 subjects between ages 5 and 21 years, which had been previously been identified as subjects of high abilities. To be able to be part of the study, subjects must have achieved scores above 2 standard deviations in any standardized test of general intellectual learning. Neither the specific characteristics of the gifted group nor the specific characteristics of the control group are specified in the manual.

This difficulty to find a sample makes relevant the research undertaken for the creation of the screening test, and at the same time, to some extent, justifies the absence of scientific tests of screening for students with intellectual giftedness.

Table 2. **Sample - Distribution index value of General Intelligence (ICG) of the WISC-IV (non-gifted)**

ICG of the WISC-IV	TOTAL students
< 90	1
90-94	0
95-99	3
100-104	1
105-109	2
110-114	1
115-119	5
120-124	2
125-129	5
Non-gifted	20

Table 3. **Sample - Distribution index value of General Intelligence (ICG) of the WISC-IV (gifted)**

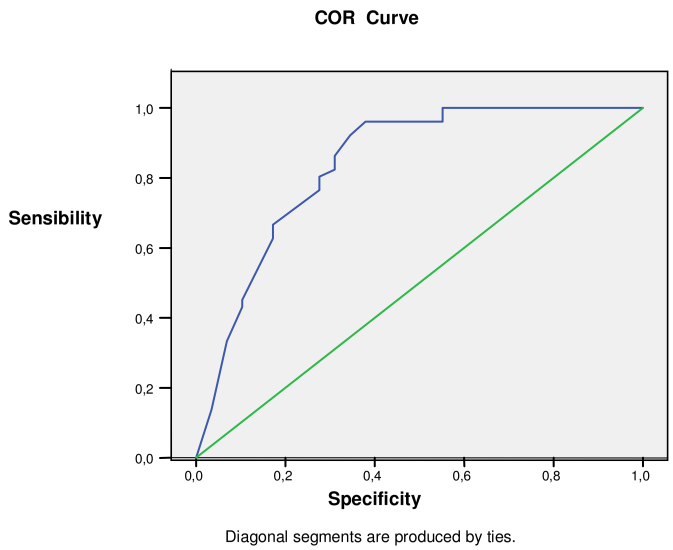
ICG of the WISC-IV	TOTAL students
130-134	14
135-139	12
140-144	14
145-149	9
150-153	8
Gifted	57

3.3 Research methodology

Statistical studies were conducted with different cut-off points, initially considering percentile scores, and subsequently, and in accordance with their significance, statistical studies were conducted with different cut-off points considering direct scores.

Among them those that offered greater validity (sensitivity, specificity and efficacy) were chosen. Highlight the COR curve between WISC-IV, Total IQ and the Raven Color (CPM).

Figure 2. **COR curve, between WISC-IV, Total IQ and RAVEN COLOR (CPM) ICG gifted cut-off at 130**



Area	Typ. Error (a)	Sig. asymptotic (b)	Asymptotic confidence interval at 95%	
			Upper limit	Lower limit
.840	.051	.000	.741	.939

3.4 Research results

The greatest correlation found was between the Raven Color (CPM) and the index of intelligence General (ICG) of the WISC-IV (index of General Intelligence equal to or greater than 130). This index on intelligence measure is the most accepted one to consider a student as intellectually gifted. In Flanagan and Kaufman's study (2006), and according to the recent information of the Psychological Corporation (Harcourt Assessment) it is suggested that, considering IGC –combination of RV (Verbal reasoning) and RP (perceptual reasoning-, the test's ability to identify gifted students is increased (Benito, Moro and Alonso, 2009).

Table 4. **Comparative study of different tests: Correlations**

** Correlation is significant at the 0.01 level (Bilateral)	IQ WISC-IV	ICG WISC-IV	IQ Stanford - Binet (form L-M)	Raven Color (CPM)
IQ WISC-IV - Pearson correlation	1	.926**	.788**	.708**
Sig. (bilateral)		.000	.000	.000
N	83	80	80	81
ICG WISC-IV - Pearson correlation	.926 **	1	.806**	.749**
Sig. (bilateral)	.000		.000	.000
N	80	80	78	78
IQ Stanford-Binet (Form L-M) – Pearson correlation	.788**	.866**	1	.695**
Sig. (bilateral)	.000	.000		.000
N	80	78	83	81
Raven Color (CPM) - Pearson correlation	.708**	.749**	.695**	1
Sig. (bilateral)	.000	.000	.000	
N	81	78	81	84

Subsequent studies were conducted with different cut-off points, considering this greater correlation found between the Raven Color and the ICG of the WISC-IV, and it was selected among them the one which offered greater validity (sensitivity, specificity and efficiency). As a criterion of prevalence in population 2’5 % was considered.

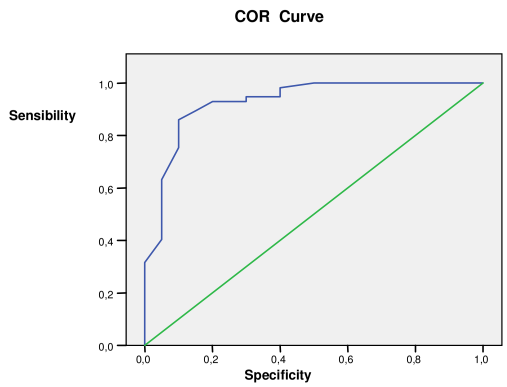
The "scientific Screening Test 'Huerta del Rey' for gifted students, application of Raven Color (CPM)", provides the following **validity criteria:**

- Sensitivity is 82’4% (Confidence interval 95%, located between 72’52% and 92’28%). The screening method allows identifying the 82’4% of children with intellectual giftedness.

- Specificity is 90% (Confidence interval 95%, is situated between 76’85% and 100%). The specificity or ability to detect negative intellectually non-gifted children is 90%.

- Diagnostic odds ratio (or Likelihood Ratio) is 8’24.

Figure 3. **COR Curve, between WISC-IV, ICG and RAVEN COLOR (CPM) ICG gifted cut-off at 130**



Diagonal segments are produced by ties.

Area under the curve
Variables result of contrast: Raven_1

Area	Error tip.(a)	Sig. asymptotic (b)	Asymptotic confidence interval at 95%	
			Upper limit	Lower limit
.929	.036	.000	.858	1.000

Besides being an economical and easy-to-apply method, the graph verifies the high profitability of screening (area 92’9). It visualizes the best cut-off point combining sensitivity and specificity (nearest point to the upper-left corner). The area under the curve is the probability for 2 students, being one of them gifted and another non-gifted, to be correctly sorted by the test. Possible values of the area under the curve range between 1 (perfect test) and 0’5 (useless test) (Garcia-Portilla et al., 2011).

The "scientific Screening Test 'Huerta del Rey' for gifted students, application of Raven Color (CPM)", **eliminates 88% of the sample**.

Only 12% of the students to whom the test was applied passed it. This means that only a small percentage of children go onto the second phase, therefore psychological evaluation is only necessary for that 12% of students.

For example, if the screening test was applied to 100 students, just 12 of them would give a positive to screening. After psychological evaluation two of them would be confirmed as intellectually gifted, and one would have been missed. Screening tests are not diagnostic tests.

The **diagnostic odds ratio** (or Likelihood Ratio) is 8’24; Per one incorrectly classified child chosen 8 times more will be correct.

Table 5. **Relationship between ICG (general intelligence index of the Wechsler scale (WISC-IV) and Raven Color (ICG - gifted ≥130).)**
Prognosis on a hypothetical sample of 100 children

	Gifted	Non-gifted	
Screening +	2	10	12
Screening-	1	87	88
TOTAL	3	97	100

4. Way of administration of the Scientific Screening test 'Huerta del Rey' for gifted students, application of Raven Color (CPM)

The presently provided screening method is extremely simple, objective and reliable. In addition, another advantage is minimal economic cost, given that except for the human resources, the only required materials are copies of the Raven Color Test (CPM).

Administration of the Raven Color test must be done according to the rules outlined regarding this in the Manual of progressive Matrixes Raven CPM-SPM-APM (Manuel Raven C1-C7). It would be advisable for children 6 years to be applied individually.

5. Correction standards of the scientific Screening Test 'Huerta del Rey' for gifted students, application of Raven Color (CPM)

For the correction of the test, the subject direct scores (number of correct answers) achieved in the Raven Color test will be taken on account.

A child would be considered as presumably gifted when satisfying the following condition, considering the child's age:

a) Student **age 6**, **cut-off point** (likelihood of intellectual giftedness) **direct score 27** Test Raven color.
   Sensitivity: 62'5% and specificity: 100%

b) Student **age 7, cut-off point** (likelihood of intellectual giftedness) **direct score 30** Test Raven color.
   Sensitivity: 86'8% and specificity: 91'6%

c) Student **age 8, cut-off point** (likelihood of intellectual giftedness) Raven Color Test **direct score 32**.
   Sensitivity: 81'8% and specificity: 80%

The screening test requires no special conditions of application. Profitability is very high as per incorrectly classified child we are right eight times. The positive value and the effectiveness of this method of screening can be considered good or very good, given the results of the research carried out.

6. Scientific Screening Test 'Huerta del Rey' for gifted students, application of Raven Color (CPM) as a screening tool

There are no cultural or language barriers, the " scientific Screening Test 'Huerta del Rey' for gifted students, application of Raven Color (CPM)" allows the detection of students with possible intellectual giftedness of ages 6, 7, and 8 among ethnic minorities, hearing impaired children, with language difficulties, children with learning disability, children with motor impairment, low cultural class students and those who are unfamiliar with the language of the country.

The selected criteria do not constitute by themselves a system of diagnosis of intellectual giftedness; they work as a tool of selection or election of children to subsequently perform an individualized diagnostic psychological evaluation that will do determine the final rating.

Setting the cut-off point from which due diagnosis is considered appropriate or not appropriate should not condition us to ignore evidence from other available sources.

If we build the instruments carefully enough we are enabling students with intellectual giftedness the child's right to receive the education they need. Unfortunately, this group of students, because of both prejudices of diverse nature and a misunderstood idea of equality, use to be one of the less attended school groups and, since these children are given in all social classes, those from most disfavored classes become harmed the hardest.

Establishing the validity and reliability of the instruments is a continuous process. We encourage practitioners and researchers to continue studying the screening test with different samples, statistical procedures and related measures. The sum of research will help to further clarify the validity of the screening test and will provide guidance for future revisions of the test.

The bigger scope of studies greater accumulated evidence of support, the greater confident we can be in choosing and using specific instruments, facilitating this way the identification of students with intellectual giftedness in different social and cultural populations.

Please share your research with us, so that your results can be included in subsequent editions.

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