

## The Psychometric Properties of the ACIE Test for the Identification of High Intellectual Abilities

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### Abstract

*High intellectual abilities reflect outstanding qualitative and quantitative performance. It involves aptitudes, talents, and skills that surpass common standards. The main objective was the construction and validation of the High Intellectual Abilities Execution Test (ACIE). The methodological process involved administering the test structured with 117 items distributed across 5 dimensions. The pilot study was conducted with 164 students from fourth to seventh grade in four schools in the capital of Ecuador. Psychometric qualities such as reliability, validity, difficulty, discrimination power, and differential analysis were identified, providing the technical conditions for the application and detection of high abilities.*

**Keywords:** *Aptitude, capacity, cognition, creativity, learning process.*

### Introduction

Over time, the perception of high intellectual abilities has undergone significant evolution, marking changes in its understanding and definition. Initially linked to high academic performance, it was considered that outstanding students possessed high abilities. However, this perspective has evolved, adopting three paradigms: giftedness, talent development, and differentiation based on needs (Dai & Chen, 2013; Nicholas et al., 2024). The predominant measure for assessing high abilities used to be the intelligence quotient, where a value above 130 indicated giftedness (Uribe et al., 2016). Despite its utility, this approach limited the assessment to quantitative aspects and did not reflect the complexity and diversity of cognitive abilities.

The identification of high intellectual abilities involves recognizing aptitudes, talents, and skills that surpass common standards, encompassing cognitive, creative, and commitment dimensions (De Oliveira et al., 2020). Although gifted children share some characteristics, their diversity is notable (Ferrando Prieto et al., 2023; Park & Steve Oliver, 2009). Therefore, detection should consider a wide range of aspects to address all the characteristics and multidimensionality of the individual being evaluated. It is essential not to limit oneself to the intelligence quotient, as it does not adequately reflect individual diversity.

High intellectual abilities encompass a series of cognitive skills such as memory, attention, problem-solving, creativity, and abstract reasoning, which enable the performance of high-level representation and processing operations (Almeida et al., 2010; Ziernwald et al., 2022). These capacities are defined by the presence of stable intellectual resources that manifest in efficient mechanisms for representing and processing information, with a solid brain and cognitive foundation.

Terms like gifted, high abilities, genius, prodigy, and exceptional, although not synonymous, have very marked relationships among them (Morán Borja et al., 2021). High intellectual capacity can be expressed as giftedness, talent, or genius, depending on the scores in different areas of intelligence (Laine et al., 2024). It is worth noting that stereotypes held by teachers can hinder the identification of students with high abilities, which in turn can lead to personality development disorders (Park & Steve Oliver, 2009). Therefore, it is

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crucial to understand and recognize the characteristics associated with giftedness and high intellectual abilities to provide an appropriate educational response.

The current notion of high abilities transcends academic measurements and intelligence quotient, embracing outstanding mental potential reflected in both qualitative and quantitative superior skills (Sandia Rondel & Guerra Vera, 2023). Adolescents with this potential often excel in their academic performance, highlighting the diversity of talents and abilities that can exceed normative expectations for their age or stage of development. This more holistic approach recognizes the complexity of human development and the importance of fostering an educational environment that nurtures and promotes these diverse and exceptional capacities.

High cognitive ability is characterized by outstanding performance in a specific area of talent, surpassing other individuals in that domain (Bennett, 1997; Infantes-Paniagua et al., 2023). This definition recognizes not only general cognitive potential but also specific talents that reflect creativity and excellence beyond conventional limits, encompassing diverse areas of expression. From a multidimensional perspective, high intellectual abilities represent elevated intellectual potential that develops and manifests over time, influenced by the environment and education (Datu et al., 2024).

The current understanding of high abilities encompasses overall performance in multiple academic areas and the demonstration of specific skills and creative talents. This expanded approach recognizes that intellectual excellence is not restricted to a single domain, including aspects such as creativity, originality, and commitment in specific tasks. Traits such as precocity, intelligence, and talent are incorporated, along with the traditional conceptualization of giftedness, as well as perseverance and adaptability (Datu et al., 2024). Additionally, this concept is grounded in aspects of neuroscience and cognitive development, promoting the development of skills necessary to face diverse social and cultural demands.

At a global level, policies have been established to identify high cognitive abilities early on. The aim is to implement both standard and exceptional measures in educational settings to provide appropriate and timely attention. This would allow maximizing the potential of these individuals, thereby expanding their opportunities for personal development and ultimately contributing to community progress. It is crucial to recognize the value these abilities offer and promote their full development to benefit society as a whole.

According to the World Health Organization (WHO), between 2 and 5% of students may have high cognitive abilities. However, during the 2020-2021 school year in Ecuador, only 40,916 students were identified with these abilities, representing less than 50% of what would be expected in a student population of approximately 4,998,169 students aged 3 to 17 years (Datos abiertos Ecuador, 2021). This discrepancy highlights the need to reflect on the obstacles to early detection of students with high intellectual abilities, who remain invisible and lack the necessary attention. This lack of identification leads to the waste of talents in a society that demands urgent technological and academic advancements.

The perception of high abilities has historically evolved, shifting from solely focusing on academic performance and intelligence quotient to a broader understanding that recognizes the diversity of skills and talents (Van de Vijver & Mathijssen, 2024). This analysis is further supported by other researchers (Infantes-Paniagua et al., 2023), who have noted that these individuals have greater potential to excel in different areas of talent beyond mere intelligence quotient. Their characteristics include not only intelligence but also aspects such as personality, creativity, and motivation, reflecting a more comprehensive view of high abilities.

High intellectual abilities encompass exceptional cognitive potential manifested in various areas such as logical reasoning, spatial skills, memorization of data, language proficiency, among other aspects. This potential is distinguished by outstanding academic performance, notable commitment to learning, appropriate adjustment to the educational environment, and often academic fatigue due to the need for significant intellectual challenges.

The perception of adolescents with high intellectual abilities as the most intelligent or diligent in the classroom reflects an evolution in the conceptualization of these capacities, enriching their definition. This transformation influences the design and evaluation of instruments such as the ACIE test, aimed at precise and comprehensive identification of those with high intellectual abilities. The central purpose was the construction and validation of the High Intellectual Abilities Execution Test (ACIE), based on an understanding of the characteristics of students with superior performance.

The ultimate purpose is to effectively address the specific educational needs associated with these capabilities. Failure to detect giftedness early on can lead to classroom demotivation and boredom. The examination focuses on motivation, interests, and task engagement, utilizing 19 specific criteria to analyze the characteristics of children with high abilities. The inclusion of a norm table and a workbook extends its scope, providing a comprehensive assessment framework. This study aims to significantly enhance the detection of high abilities in this age group, delving into the psychometric properties of the ACIE test to identify areas of strength and limitations. This will enable adjustments to enhance its effectiveness in the early and accurate detection of children with high intellectual abilities.

The central question of this research was: To what extent does the ACIE test, by focusing on motivation, interests, and task involvement, offer an accurate and comprehensive assessment of high intellectual abilities in this specific group of children? This formulation seeks clarity and conciseness by directly focusing on the ability of the ACIE test to effectively identify high abilities, considering the diversity of talents and skills that go beyond traditional metrics. By answering this question, the aim is to validate the usefulness of the test and provide valuable information to improve diagnostic practices and support for children with high abilities.

## Background

### *Exploring High Abilities in the Depth of Cognitive Aspects (Cognitive Style)*

The ability to solve complex problems and understand advanced concepts characterizes this profile. This profile is characterized by an accelerated learning pace, which implies early understanding and problem-solving, efficient use of strategies, effective social adaptation, and strong self-regulation (Quintero Rodríguez et al., 2021). Additionally, individuals with high cognitive abilities exhibit a variety of skills such as abstract thinking, logical reasoning, and working memory, along with a rapid ability to process information and be creative. These aspects also include cognitive flexibility, which drives them to maintain a high level of commitment and motivation toward their goals while demonstrating notable resistance to environmental interferences. This allows them to be creative producers and skilled in generating alternatives.

Cognitive aspects play a crucial role in the profile of high abilities, encompassing a wide variety of skills beyond simple academic performance. From abstract thinking to the ability to solve complex problems, individuals with high abilities exhibit a distinctive set of cognitive competencies. Students with high abilities often show a great curiosity about the world and tend to explore beyond the knowledge imparted in the educational system (Somolinos & García-Moya, 2019). This profile is reflected not only in an accelerated learning pace, which facilitates anticipation and problem-solving from an early age, but also in the application of advanced strategies and exceptional social adaptation that fosters effective resolution of complex.

Additionally, it's important to highlight the higher self-regulation and cognitive flexibility present in individuals with high abilities, allowing them to maintain remarkable commitment and motivation towards goals and objectives. This combination of cognitive attributes results in a notable capacity for creativity and competent generation of alternatives. Resistance to environmental interference adds an additional dimension to these skills, positioning these individuals not only as agile learners but also as creative and solution-oriented agents in various contexts.

The landscape of high intellectual abilities reveals an intriguing phenomenon: the accelerated development pace characterizing these exceptional individuals. Although their development is faster, over time, they reach levels of maturity comparable to those of individuals with a standardized pace. This phenomenon raises questions about the nature and evolution of high abilities, urging us to analyze the factors influencing this process (Guillén Ubico et al., 2022). Although they manifest a faster pace, it is essential to highlight that they reach levels of maturity similar to those of their peers. This underscores the importance of understanding diversity in developmental rhythms, recognizing that uniqueness in speed does not imply permanent differences in the level of maturity reached. There is an emphasis on the need for a more holistic consideration of developmental trajectories, promoting a comprehensive understanding of high abilities and their evolution over time.

On the other hand, cognitive style emerges as a fascinating trait that illuminates the uniqueness of the human mind. At the heart of this conceptualization, it is not only presented as an expression of intellectual abilities but also as a complex aspect of personality that shapes how we face challenges and organize our understanding of the world.

In this study, we delve into the conceptual richness of cognitive style, highlighting its crucial influence on personality. By exploring the interaction between cognitive strategies and mental organization, we seek to understand how this complex trait shapes the human experience, thereby expanding the understanding of the human mind by providing new perspectives on the relationship between cognition and personality (Montoya Londoño et al., 2021). Cognitive style, conceptualized as a key trait of personality, reflects how individuals approach problems and organize their perception of the world. This research aims to deepen our understanding of how these characteristics impact the way we perceive, remember, and think, thus providing a more comprehensive insight into the human mind.

### *Cognitive Characteristics*

Cognitive style is essential for characterizing the profile of high abilities, as it is based on intellectual skills such as reasoning, memorization, and comprehension, as well as responding to visual and auditory stimuli. Information processing strategies and qualitative organization are crucial in specific tasks. The cognitive process goes beyond perceiving objects, allowing for the identification, association, and inference of the meaning of environmental information (Lobo & Vuyk, 2023; Sternberg, 2024). Skills are required to process and abstract information, facilitating deep reflection, reasoning, and problem-solving, as well as the development of concepts, extrapolation of knowledge, and formulation of theories. These aspects are fundamental to understanding the complexity of the high ability profile and its impact on various cognitive areas.

The cognitive style assessed in the ACIE test to detect high intellectual abilities focuses on key skills. These include understanding complex and abstract instructions, making inferences, managing conceptual relationships, information processing (short-term memory, attention, and concentration), analyzing mathematical concepts, and classification and organizational skills. These skills allow for precise and effective evaluation of cognitive abilities. Although the cognitive factor is fundamental in detecting high abilities, it is not the only relevant aspect. However, understanding cognitive functioning and responses is essential, which, combined with other aspects, ensures reliable detection. This underscores the importance of considering multiple facets in the assessment of high intellectual abilities, contributing to more accurate and comprehensive results.

### *Motivations and Interests in High Abilities*

The study of high intellectual abilities in students goes beyond academic excellence, revealing exceptional intrinsic motivation and significant connection to learning. Students with high abilities display a wide range of cognitive interests, transcending conventional thematic limitations and enriching their educational experience (Torrente Verdeja et al., 2022). Additionally, they excel in extracurricular interests, such as a preference for news, suggesting mastery in language handling and a continuous curiosity to understand the world.

Motivation and interests are crucial in the development of high abilities. It is essential to stimulate intrinsic motivation and create an educational environment that promotes the particular interests of these students (Arboleda, 2023; Park & Steve Oliver, 2009). Teachers should be trained to identify and support these specific interests, thereby contributing to their overall development.

Motivation and interests are fundamental elements in the development of high abilities in students. By recognizing and nurturing these aspects, a more enriching and tailored educational environment is created, allowing students to reach their full potential.

### *Motivational Characteristics*

The process of detecting high intellectual abilities is influenced by task motivation, which encompasses traits such as perseverance, determination, and willpower (Infantes-Paniagua et al., 2023). This motivation acts as a catalyst for enhancing intellectual abilities, leading the individual to achieve exceptional results.

Commitment is another essential component in the superior cognitive profile, driving the individual to focus their energy and attention on solving problems and exploring areas of knowledge. This commitment can manifest as perfectionism, seeking excellence and precision in task execution, as identified by the ACIE test (Infantes-Paniagua et al., 2023).

Self-criticism, facilitating perfectionism, is a fundamental skill in the profile of high abilities, allowing for an objective evaluation of one's own performance and a constant desire to excel and produce (Rincón Montoya, 2022). Task motivation, commitment, perfectionism, and self-criticism are motivational characteristics that shape individuals with high intellectual abilities, influencing their academic performance and their constant pursuit of excellence.

### *Creativity in High Abilities*

Creativity in high intellectual abilities is a fascinating field that goes beyond artistic expression, becoming a relevant phenomenon that reveals originality of thought and the ability to generate new ideas (Fernández Díaz, 2019). This study reveals the complexity of the creative mind and its connection with exceptional intellectual potential (Mírez Tarrillo de Delgado & Moreno Muro, 2023).

Exploring the intersections between high cognitive ability and creativity helps us understand how these characteristics manifest together, generating a unique panorama of talent and originality in education (Pérez Pacheco & Castellanos-Simons, 2022). Creativity in individuals with high abilities manifests in various forms, highlighting the development of graphic creative potential and the presence of heterogeneous profiles of capabilities (Redó & Gutiérrez, 2022).

Harnessing the creative potential of these students to enrich teaching and learning activities, especially through approaches such as problem-based learning and collaborative projects, is crucial (Paredes-Martínez & Tirado-Lozada, 2022). These findings suggest a valuable opportunity to capitalize on the innate creative potential of students with high abilities, significantly enriching educational experiences.

### *Characteristics of Creativity and Originality*

Creativity and divergent thinking are distinctive traits of high intellectual abilities. However, they are not exclusive to exceptional individuals. According to Stemberg, "very high intellectual capacity can hinder the development of creativity, as the strong analytical abilities of intelligence can impede the creative process" (Lobo & Vuyk, 2023). This implies that people with high intellectual abilities may have variable levels of creativity, while creative individuals do not always possess high intellectual abilities.

To effectively identify these characteristics, one should not rely solely on independent traits but on their contrast to determine their representativeness (Oliveira & Ragni, 2022). It is essential to consider the characteristics that define creativity, such as curiosity and a desire to understand reality through unusual

activities for their age, like research and experimentation. These qualities enable individuals with high intellectual abilities to discover original and imaginative solutions to unforeseen situations.

### *Divergent Thinking*

Divergent thinking in individuals with high abilities is characterized by their ability to generate multiple responses, solutions, or ideas from a single problem or question (Pasarín-Lavín et al., 2024). In the context of giftedness, this type of thinking is linked to the ability to address novel situations and find creative solutions, being an essential component in the definition of high abilities, along with general intelligence and motivation. Additionally, those with high abilities who excel in divergent thinking often have significant correlations with factors such as leadership and motivation, highlighting its importance in their overall development.

Furthermore, divergent thinking in individuals with high abilities manifests in the capacity to generate multiple solutions to problems, explore diverse perspectives, and think unconventionally (Pasarín-Lavín et al., 2024). These individuals often have a notable ability to conceive creative, original, and unconventional ideas, facilitating them to find innovative and unique solutions. Their ability to establish unusual connections between ideas and their propensity to question the status quo are distinctive characteristics of this type of thinking (Grajzel et al., 2023).

Divergent thinking is essential in the development of creativity in individuals with high abilities, allowing them to generate a wide variety of responses without prejudging their feasibility (Organisciak et al., 2023). This type of thinking can be cultivated to enhance creativity in educational environments and in everyday problem-solving. Additionally, imagination, closely related to the execution of divergent thinking tests, can predict its performance and enhance the ability to find innovative and creative solutions.

### *Characteristics in Learning*

The characteristics of students with high intellectual abilities include a strong interest in connections between concepts, enabling them to understand and retain information more broadly and deeply. Additionally, they demonstrate maturity in judgment by making informed decisions and evaluating situations rationally. It is crucial for teachers not to underestimate these students, recognizing that their outstanding performance is not automatic.

These students also exhibit exceptional memory and an ability to intensely focus on specific tasks, allowing them to dedicate prolonged periods of attention (Peters & Mofield, 2024). Their distinctive way of being can influence how they approach learning and relate to others. According to Howard Gardner's theory of multiple intelligences, they show outstanding abilities in various areas and have a wide range of interests, reflecting their curiosity and motivation to explore diverse topics (Ferrero et al., 2021).

Specific characteristics include an interest in connections between concepts, sensitivity, independent thinking, leadership, speaking ability, non-verbal expression, excellent memory, divergent thinking, and high concentration ability, among others (Sternberg, 2024).

Common learning characteristics in students with high intellectual abilities encompass cognitive, concentration, memory, information processing, and personality aspects, influencing their way of learning and interacting in educational and social environments (Wulf, 2019). These students often exhibit a profound interest in specific knowledge areas, seeking challenges and depth in those fields.

When educational methods and curricula are rigid or do not adapt to individual needs, high-ability students may feel frustrated and demotivated, increasing the risk of dropout (Wulf, 2019). The lack of attention to their specific educational needs can alienate them from the learning process and affect their intellectual development.

To address this challenge, it is crucial to implement more flexible and personalized educational strategies that cater to the individual needs of all students, including those with high abilities. This will help provide them with the appropriate level of challenge and development opportunities, thereby reducing dropout rates and fostering their engagement and academic success.

### *Social Characteristics*

The social integration of students with high intellectual abilities is a common challenge, influenced by various factors. Differences in learning styles and more specific interests can generate a sense of misunderstanding among their peers (Van de Vijver & Mathijssen, 2024). Additionally, sometimes, students with high abilities may display attitudes of superiority, resulting from their perception of being intellectually different or more advanced (García Perales et al., 2020).

These social discrepancies can be as significant as differences in intellectual abilities, creating barriers to their social integration and emotional development (Sternberg, 2024). Studies have assessed the socio-emotional adjustment of gifted students, highlighting the importance of offering them specific attention and support to develop their social skills (Infantes-Paniagua et al., 2023). It is essential not only to focus on their intellectual abilities but also on their social and emotional development, providing support to enhance their social interaction skills and promoting an environment where they feel understood and accepted by their peers.

### *Emotional Development*

The analysis of emotional development in individuals with high abilities reveals a unique and challenging dimension of their experience. This group faces emotional peculiarities, such as notable emotional intensity, which is sometimes related to challenges in emotional regulation and forming healthy interpersonal relationships (Cabezas, 2017). Additionally, perfectionism and metacognitive regulation emerge as crucial aspects in their emotional development.

Emotional intensity can manifest in various ways, affecting perception, expression, and emotional management. If not addressed adequately, it can influence the quality of interpersonal relationships and emotional and social well-being (De Oliveira et al., 2020). Perfectionism can generate significant internal pressures, affecting self-assessment and self-esteem. Metacognitive regulation, key in managing one's own thoughts and emotions, is essential for effective emotional regulation. Addressing the socio-emotional needs of individuals with high abilities is fundamental for their overall well-being, complementing academic attention. It is crucial to promote an educational environment that nurtures the mind and promotes emotional health and positive relationships.

Emotional development in individuals with high abilities presents unique challenges, with increased emotional intensity and aspects such as perfectionism and metacognitive regulation influencing their emotional and social well-being. The high ability test focuses on motivation, interests, and task involvement, with 19 criteria breaking down specific characteristics and a workbook for diagnosing high abilities.

The exploration of emotional development in individuals with high abilities reveals a unique and challenging dimension of their experience. This group faces emotional peculiarities that include notable emotional intensity, which, at times, is associated with challenges in emotional regulation and establishing healthy interpersonal relationships. Additionally, perfectionism and metacognitive regulation emerge as crucial aspects in the complex panorama of emotional development in individuals with high abilities.

### *Ethical and Moral Characteristics*

The ACIE test addresses concerns regarding ethical values, supported by research by Hume (Duque, 2021), which indicates that gifted individuals excel above average in honesty, authenticity, responsibility, justice, sensitivity, independence, and originality. Therefore, it seeks to evaluate how the individuals being assessed approach situations that require ethical decisions, as individuals with high intellectual capacities tend to

deeply understand the context surrounding them and identify with the norms governing human relationships, nature, and the universe. They are aware of global issues such as pollution and inequality, and uphold moral principles that guide human behavior and the serious consequences of their violation.

### *Materials and Methods*

The test for detecting high intellectual capacities (ACIE) is based on the questionnaire developed by Martínez Olló. This questionnaire, originally completed by third parties, was adapted to a performance test format. Here, the evaluated individual verbally responds to a series of items, allowing for the assessment of specific strategic skills related to indicators of high intellectual capacities.

The test consists of 117 items distributed across 5 dimensions: cognitive style, motivation, interest and task involvement, creativity and divergent thinking, as well as learning and social characteristics. The first three dimensions use direct responses, while the last two employ a multiple-choice format.

An adaptation of the original questionnaire was performed to align the items with the objectives of the current research. Each dimension of the test was designed with the specific purpose of evaluating the development of strategic skills associated with high intellectual capacities. The structure was meticulously crafted to encompass a wide range of skills and cognitive aspects considered essential in the detection of these capacities. This methodological approach ensures thoroughness and precision in the evaluation of the participants.

### *Participants*

An intentional non-probabilistic sample, as shown in Table 1, was selected, allowing researchers to specifically choose the participating institutions in the pilot. Selection criteria included geographic distribution across various sectors of the city to ensure diverse representation.

Institutions with a larger number of students were prioritized to ensure sample diversity and representativeness. Four municipal institutions meeting these criteria and located in different areas of the city were chosen. Each institution had a significant number of students. The participants exhibited the following characteristics:

**Table 1** Frequency and percentage of students by elementary school grade

<b>GRADE LEVEL</b>	<b>Frequency</b>	<b>Percentage</b>	<b>Cumulative Percentage</b>
FOURTH	48	29,3	29,3
FIFTH	39	23,8	53,0
SIXTH	38	23,2	76,2
SEVENTH	39	23,8	100,0
Total	164	100,0	100,0

**Source:** Test application database

## **Results**

### *Psychometric Properties Identified*

#### *Reliability*

Reliability is defined as the consistency and accuracy with which the test measures what it intends to measure, in a specific population and under normal conditions of application (Aiken, 1996; Aliaga Tovar, 2007; Anastasi, 1986). In this study, the Rational Equivalence method with Cronbach's Alpha coefficient was used to assess reliability overall, by dimensions, and by items.



**Table 2** Reliability Index Total and by Dimensions

Measure Performed	Score	Equivalence
Overall Reliability	0,86	Good
Cognitive Style	0,693	Weak
Motivation, Interests, and Task Involvement	0,81	Good
Creativity and Divergent Thinking	0,53	Poor
Learning Characteristics	0,74	Acceptable
Social Characteristics	0,77	Acceptable

Source: Test Application Database

The above Table 2 shows that, overall, the reliability of the test is rated as "good" (0.86). This dimension exhibits a high level of reliability. The results are consistent and reliable for evaluating the overall variable.

At the dimension level, it is observed that "Cognitive Style" has a coefficient of (0.693), indicating relatively low reliability. This suggests that the results may be less consistent or reliable for measuring cognitive style compared to other dimensions. On the other hand, the dimension of "Motivation, Interests, and Task Involvement" scores (0.81), which corresponds to good reliability. The results are consistent and reliable for evaluating this dimension. In contrast, "Creativity and Divergent Thinking" display a coefficient of (0.53), indicating low reliability. The results may not be as reliable for measuring creativity and divergent thinking compared to other dimensions. Regarding "Learning Characteristics," the level is acceptable with a coefficient of (0.74), suggesting that the results are moderately reliable for evaluating these characteristics. Finally, in "Social Characteristics," the coefficient is (0.77), indicating an acceptable level of reliability for measuring these characteristics.

The dimensions of Creativity and Divergent Thinking show inadequate levels of reliability, while the other functions are at suitable levels. Twenty-five items with low reliability were identified in the test, suggesting that they may not adequately measure the same variable as the other items. The impact of removing these items on the overall reliability of the test was evaluated. The results indicated that removing these items would not significantly affect the overall reliability of the test, suggesting that these items do not contribute much to the measurement of the evaluated variable.

### Validity

Construct validity refers to the property of a test to measure what it intends to measure, in this case, whether the test items are suitable for detecting high cognitive abilities and not another variable. For the pilot study, construct validity was selected, which involves establishing the correlation between the components that make up the variables, that is, the relationship between the dimensions and the total test score and among the dimensions themselves. The results obtained are detailed in Table 3, which presents the correlations between the dimensions and the total test score, as well as among the dimensions themselves.

**Table 3** Correlations between Total and Dimensions

	Cognitive Style	Task Motivation	Creativity	Learning characteristics	Social characteristics
TOTAL	,758** ,000	,568** ,000	,658** ,000	,557** ,000	,617** ,000
Cognitive Style	1	,501** ,000	,333** ,000	,247** ,001	,179* ,002
Task Motivation			,102 ,195	-202** ,010	,369** ,000

Creativity				,520**	,280**
				,000	,000
Learning characteristics					,196*
					,012
Social characteristics					

\*\* La correlación es significativa en el nivel 0,01 (Bilateral).

\* La correlación es significativa en el nivel 0,05 (Bilateral).

Source: Test Application Database

All dimensions show positive and significant correlations at moderate to high levels. The Cognitive Style dimension exhibits the highest correlation with the total test score (0.758), while the Task Involvement (0.568) and Learning Characteristics (0.557) dimensions show lower correlations.

Cognitive Style has the highest correlations with other dimensions, all significant at a bilateral level (0.01) and of moderate to low magnitude. In contrast, Task Involvement shows the lowest correlation with other dimensions, especially with Creativity (0.102), and exhibits a low-level negative correlation with Learning Characteristics (-0.202).

#### *Level of Difficulty*

The level of difficulty addresses the ability of an exam to establish the difficulty of its questions, calculating an index of difficulty both overall and for each year of basic education, as shown in Table 4.

**Table 4** Overall and Grade-Level Difficulty Level

Calculated Aspect	Score	Equivalence
Total Test	0,54	Moderate
Fourth Grade	0,47	Moderate
Fifth Grade	0,47	Moderate
Sixth Grade	0,58	Moderate
Seventh Grade	0,62	Moderate

Source: Test Application Database

Both overall and by grade level, the difficulty level is considered moderate, suitable for the type of exam. However, when analyzing each item individually, it is observed that 26.5% are easy, 41% are of moderate difficulty, and 32.5% are difficult. Extremely easy or difficult items do not effectively contribute to the assessment.

The scores provided for the different educational levels (fourth, fifth, sixth, and seventh grades) indicate the difficulty level of the items in those specific exams. A score of 0.54 for the total test suggests a "moderate" difficulty, while the score of 0.62 for seventh grade indicates a slightly higher difficulty, but still classified as "moderate." These scores are compared with the population that took the exam, and a score of 0.5 is generally considered neutral in terms of difficulty. Table 5 shows the percentages of items according to difficulty levels.

Table 5 Percentage of Items by Difficulty Levels

LEVEL	F	%
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EASY	31	26,5
MODERATE	48	41,0
DIFFICUL	38	32,5
Valid	117	100

**Source:** Test Application Database

### *Discrimination Power*

The "discrimination power" is a crucial property in educational assessment that allows distinguishing between test-takers with higher scores and those with lower scores, determining whether the responses reflect knowledge or chance. In this context, it refers to the ability of a test to differentiate between individuals with different levels of ability, knowledge, or competence. The Table 6 below demonstrates the total discrimination power and by years of Basic Education.

**Table 6** Total and Grade-Level Discrimination Power

Calculated Aspect	Score	Equivalence
Total test	0,40	Excellent
Fourth Grade	0,25	Regular
Fifth Grade	0,25	Regular
Sixth Grade	0,17	Poor
Seventh Grade	0,17	Poor

**Source:** Test Application Database

The mentioned results appear to be linked to the discrimination power of various exams or assessments conducted at different educational levels (fourth, fifth, sixth, and seventh grades of basic education). These results are presented in the form of scores and are classified as "excellent," "regular," or "poor" based on the discrimination power of each test.

The "total test" achieves a score of 0.40, indicating excellent discrimination power, suggesting a high effectiveness in distinguishing between those with a solid knowledge of the evaluated topic and those without it.

The "Fourth Grade" and "Fifth Grade" exams both obtain a score of 0.25, classifying them as having regular discrimination power. Although they can still differentiate between levels of knowledge, they do not do so with the same precision as the "total test."

In contrast, the "Sixth Grade" and "Seventh Grade" exams both obtain a score of 0.17, indicating poor discrimination power. This suggests difficulties in distinguishing between those with solid knowledge and those responding randomly or having limited knowledge compared to the previous exams.

### *Differential Analysis*

Taking into account the age and instructional level of the participants, differences between the grades in which the test was administered were calculated, as shown in Table 7.

**Table 7** Differences in Means between Grade Levels

Grade	Means	N	Standard Deviation	T	t
Fourth Grade	55,7	48	11,6	0,67	
Fifth Grade	57,5	39	13,0	p=4,99	-4,2
Sixth Grade	68,0	38	8,6	-2,02	p=0,000
Seventh Grade	72,1	39	8,8	p=4,96	

Source: Test Application Database

The fourth grade has a mean of 55.7 with a standard deviation of 11.6; the fifth grade has a mean of 57.5 with a deviation of 13; the sixth grade shows a mean of 68 and a deviation of 8.6; finally, the seventh grade has a mean of 72.1 and a deviation of 8.8.

An increase in the mean is observed as the school year progresses, and it is noted that in the fourth and fifth grades, the group is more heterogeneous, while in the higher grades, sixth and seventh, the standard deviation is lower, indicating greater homogeneity.

To further specify the differences between the means of each grade level, the Student's t-test for independent samples was calculated. It was determined that there is no statistically significant difference between fourth and fifth grades ( $t = 0.67$ ,  $p = 4.99$ ), whereas there is a significant difference between sixth and seventh grades ( $t = 2.02$ ,  $p = 4.96$ ). Additionally, the difference between lower and upper grades is significantly greater ( $t = -4.2$ ,  $p = 0.000$ ).

## Discussion

Despite their utility, several approaches limit assessment to quantitative aspects and fail to reflect the complexity and diversity of cognitive abilities, as mentioned by Uribe et al. (2016). According to the Datos abiertos Ecuador (2021), between 2 and 5% of students may have high cognitive abilities. However, during the 2020-2021 school year in Ecuador, only 40,916 students with these capacities were identified, representing less than 50% of what is expected in a student population of approximately 4,998,169 students aged 3 to 17 years. This discrepancy underscores the need to reflect on the obstacles in the early detection of students with high intellectual abilities, who remain invisible and lack necessary attention. This lack of identification leads to the waste of talents in a society that demands urgent technological and academic advancements. It is essential not to limit oneself to the intelligence quotient, as it does not adequately reflect individual diversity.

Over time, the conception of high abilities has evolved from a perspective focused on academic achievement to a more holistic understanding that recognizes the diversity of skills and talents (Dai & Chen, 2013; Nicholas et al., 2024). Detecting high abilities should consider a wide range of aspects to address all the characteristics and multidimensionality of the individual being evaluated (Ferrero et al., 2021; Park & Steve Oliver, 2009). These include a variety of cognitive skills that go beyond the intelligence quotient, such as creativity, engagement, and excellence in different areas (Datu et al., 2024; Sandia Rondel & Guerra Vera, 2023). The assessment should be dynamic and systematic, considering cognitive, emotional, and social aspects, and using standardized instruments that allow for a comparative evaluation of the individual (Van de Vijver & Mathijssen 2024). The evolution in the perception of high intellectual abilities has led to a more comprehensive and multidimensional approach, which recognizes the diversity of skills and talents and seeks to identify these abilities early on to provide appropriate attention and maximize individuals' potential.

The assessment of high intellectual abilities represents a complex and multifaceted challenge that requires consideration of various factors, from the definition of these abilities to their reliable and valid measurement. According to Dai and Chen (2013) and Nicholas et al. (2024), advances in understanding high abilities have expanded our perception beyond IQ and academic performance, but significant challenges persist in their identification and assessment. The study highlights that the test demonstrates an

overall level of "good" reliability, indicating acceptable consistency and precision in measuring the general variable of high abilities (Uribe et al., 2016). However, the dimension of "Creativity and Divergent Thinking" emerges as the least reliable, consistent with observations by Ferrero et al. (2021) and Park and Steve Oliver (2009), who have noted challenges in reliably measuring creativity due to its subjective and multifaceted nature. Regarding construct validity, it is found that the test items show significant correlations with the total test score, supporting the effectiveness of the test in measuring high cognitive abilities (Almeida et al., 2010). However, a weaker correlation is observed with the "Task Motivation" dimension, suggesting the need to review the formulation of items related to this dimension to improve their measurement capability. In terms of test difficulty level, it is determined that overall, and for each year of basic education, the difficulty level is considered "moderate." However, it is noted that a considerable proportion of items are of extreme difficulty, raising questions about the distribution of item difficulty and the overall effectiveness of the assessment (Almeida et al., 2010). This observation underscores the importance of reviewing and adjusting the distribution of item difficulty to enhance the accuracy and fairness of the assessment.

The correlation analysis revealed significant findings that enhance the understanding of interactions among dimensions: cognitive style, motivation-interest and task engagement, creativity and divergent thinking, learning characteristics, and social characteristics, as suggested by De Oliveira et al. (2020). Thus, the total test score showed significant bilateral correlations (0.000) with all dimensions comprising the test. It was found as a result that significant correlations exist at high and moderate levels, meaning that the majority of assessed individuals who scored high on the total test also obtained high scores in each of the dimensions. Therefore, individuals with low scores on the total test also reflected low scores in each dimension. Among each of the dimensions comprising the test, different results are presented. The Cognitive Style dimension is most strongly related to other dimensions, especially with the motivation-interest and task engagement dimension, as suggested by Lobo & Vuyk (2023), and (Sternberg (2024), because cognitive style goes beyond the perception of objects, allowing for the identification, association, and inference of the meaning of environmental information, and it relates to motivation-interest and task engagement, as indicated by (Arboleda, 2023) and Park & Steve Oliver (2009), as it involves the speed of thought, mental activity, persistence in seeking solutions, and interest in transcendent topics. The creativity dimension shows a high level of correlation with learning characteristics (0.52), as mentioned by Fernández Díaz (2019), as it allows for establishing relationships between ideas, images, and experiences with elements from other contexts, involving the ability to respond fluently and originally to different problems in everyday and school environments. This situation is reflected in the characteristics that students present in their vocabulary developed for their age, in the high semantic precision, high reading level, quick resolution of calculation and mathematical problems, revealing the complexity of the creative mind, as mentioned by (Mírez Tarrillo de Delgado and Moreno Muro (2023).

## Conclusions

The pilot test for high cognitive abilities provided an invaluable opportunity to assess the performance of the instrument in real-world settings, addressing various aspects such as test duration, clarity, and relevance of the items formulated to achieve the main objective of the study: detecting high abilities.

The execution test for the detection of high cognitive abilities exhibits favorable psychometric properties, including acceptable reliability in all dimensions, construct validity with moderate positive correlations, a medium level of difficulty, and excellent discrimination capacity at the global level. However, it is important to note that there are still areas for improvement both at the level of individual dimensions and some specific indicators.

Statistically significant differences were observed in the average obtained between lower basic education years (fourth and fifth) and higher years (sixth and seventh). This implies the need to classify items for two different tests, adapted to the needs and abilities of each group of students, and the corresponding differentiation in the scale.

Comparative values provide insight into the relative difficulty of the items in relation to the evaluated population. A score of 0.5 is considered the medium or neutral level in terms of difficulty. These data are essential for understanding the perceived challenge by students at each educational level, shedding light on the complexity of exams and respective educational content.

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