Revista Iberoamericana para la Investigación y el Desarrollo Educativo

https://doi.org/10.23913/ride.v16i32.2897

Scientific articles

Análisis Cognitivo y Evaluación de Habilidades Académicas y Psicosociales después de la Intervención Peraj: CASO UPT

Cognitive Analysis and Evaluation of Academic and Psychosocial Skills After the PERAj Intervention: The UPT Case Study

Análise cognitiva e avaliação das habilidades acadêmicas e psicossociais após a intervenção Peraj: estudo de caso da UPT

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Resumen

El programa Peraj se establece como una intervención de orientación cuyo objetivo es promover el acompañamiento académico y el apoyo emocional a estudiantes de quinto y sexto grado de educación primaria, mediante la participación de alumnos de la Universidad Politécnica de Tulancingo. Este programa forma parte de una iniciativa de alcance nacional enfocada en fortalecer el desarrollo integral de niños en situación de vulnerabilidad a través del vínculo mentor–estudiante, implementada en diversas instituciones de educación superior en México. No obstante, es importante precisar su contexto institucional específico para comprender con mayor claridad su aplicación y alcances dentro de la universidad.

Este modelo busca generar un impacto positivo en la trayectoria educativa de los estudiantes, cuyo objetivo fue evaluar el perfil de desarrollo cognitivo y el nivel de habilidades académicas en un grupo de niños y niñas que permanecieron en el programa durante el ciclo escolar 2024-2025.

Se empleó un diseño cuantitativo, transversal y descriptivo. La muestra estuvo conformada por 11 estudiantes cuyas edades oscilaban entre 10 y 12 años. Para esta investigación se aplicó la Escala de Inteligencia de Reynolds (RIAS), mediante la cual se obtuvieron los índices de Inteligencia General (IG), mostrando que los resultados descriptivos de los participantes se ubicaron en el rango normativo (IG media = 103.4, DE = 6.94), de acuerdo con los criterios estandarizados del instrumento, lo que sugiere un nivel de desarrollo cognitivo acorde con su grupo de edad.

Además, se utilizó la escala para medir aptitudes lógico-matemáticas, obteniéndose una puntuación media de 11.27/20 (DE = 3.79). Se encontró una correlación positiva y fuerte entre la IG y las aptitudes lógico-matemáticas ($r = .75$, $p < .008$). Los resultados indican que el modelo de acompañamiento Peraj se asocia con el desarrollo de habilidades cognitivo-académicas en los estudiantes, lo que podría reflejarse en un mejor rendimiento académico; sin embargo, el diseño transversal no permite establecer causalidad

Palabras clave: aptitudes matemáticas, desarrollo psicosocial, inteligencia general, mentoría, Peraj.

Abstract

The Peraj program is established as a guidance-based intervention aimed at promoting academic support and emotional assistance for fifth- and sixth-grade elementary school students, through the participation of students from the Universidad Politécnica de Tulancingo. This program is part of a national initiative focused on strengthening the comprehensive development of children in vulnerable situations through the mentor–mentee relationship, implemented across various higher education institutions in Mexico. However, it is important to specify its institutional context in order to better understand its application and scope within the university.

This model seeks to generate a positive impact on students' educational trajectories, and its objective was to evaluate the cognitive development profile and the level of academic skills in a group of children who remained in the program during the 2024–2025 school year.

A quantitative, cross-sectional, and descriptive design was employed. The sample consisted of 11 students aged between 10 and 12 years. For this study, the Reynolds Intellectual Assessment Scales (RIAS) was administered, from which the General Intelligence Index (GI) was obtained. The descriptive results showed that participants' scores fell within the normative range (GI mean = 103.4, SD = 6.94), according to the standardized criteria of the instrument, suggesting a level of cognitive development consistent with their age group.

Additionally, the scale was used to assess logical-mathematical aptitude, yielding a mean score of 11.27/20 (SD = 3.79). A strong positive correlation was found between GI and logical-mathematical aptitude ($r = .75$, $p < .008$). The results indicate that the Peraj mentoring model is associated with the development of cognitive-academic skills in students, which may be reflected in improved academic performance; however, the cross-sectional design does not allow for establishing causality.

Keywords: mathematical aptitude, psychosocial development, general intelligence, mentoring, Peraj.

Resumo

O programa Peraj estabelece-se como uma intervenção de orientação cujo objetivo é promover o acompanhamento acadêmico e o apoio emocional a estudantes do quinto e sexto ano do ensino fundamental, por meio da participação de alunos da Universidad Politécnica de Tulancingo. Este programa faz parte de uma iniciativa de alcance nacional voltada ao fortalecimento do desenvolvimento integral de crianças em situação de vulnerabilidade, por meio do vínculo mentor–aluno, sendo implementado em diversas instituições de ensino superior no México. No entanto, é importante especificar seu contexto institucional para compreender com maior clareza sua aplicação e alcance dentro da universidade.

Este modelo busca gerar um impacto positivo na trajetória educacional dos estudantes, tendo como objetivo avaliar o perfil de desenvolvimento cognitivo e o nível de habilidades acadêmicas em um grupo de crianças que permaneceram no programa durante o ano letivo de 2024–2025.

Foi empregado um delineamento quantitativo, transversal e descritivo. A amostra foi composta por 11 estudantes com idades entre 10 e 12 anos. Para esta pesquisa, foi aplicada a Escala de Inteligência de Reynolds (RIAS), por meio da qual foram obtidos os índices de Inteligência Geral (IG). Os resultados descritivos indicaram que as pontuações dos participantes situaram-se dentro do intervalo normativo (IG média = 103,4; DP = 6,94), de acordo com os critérios padronizados do instrumento, sugerindo um nível de desenvolvimento cognitivo compatível com sua faixa etária.

Além disso, a escala foi utilizada para avaliar aptidões lógico-matemáticas, obtendo-se uma pontuação média de 11,27/20 (DP = 3,79). Foi encontrada uma correlação positiva e forte entre a IG e as aptidões lógico-matemáticas ($r = .75$, $p < .008$). Os resultados indicam que o modelo de acompanhamento Peraj está associado ao desenvolvimento de habilidades cognitivo-acadêmicas nos estudantes, o que pode refletir-se em um melhor desempenho acadêmico; no entanto, o delineamento transversal não permite estabelecer causalidade.

Palavras-chave: aptidão matemática, desenvolvimento psicossocial, inteligência geral, mentoria, Peraj.

Date Received: June 2025 **Date Accepted:** February 2026

Introduction

Cognitive development during primary education is a fundamental pillar for academic success and social adaptation (Vygotsky , 1978; Castillo, 2024). During this period, skills such as thinking, logical reasoning, and problem-solving are consolidated, forming the basis for more complex learning.

In this context, mathematical skills acquire special relevance within the educational process, since they not only involve the handling of numerical concepts, but also foster the development of logical thinking and problem-solving in diverse areas; furthermore, they act as an indicator of intelligence and analytical skills (Nistal et al., 2018). Therefore, the purpose of this study is to improve students' academic performance and strengthen their specific competencies from a holistic perspective.

In this context, the Peraj program is a high social impact initiative based on the mentoring of university students, who support primary school children through a structured and continuous process aimed at academic and socio-emotional strengthening (Peraj , 2020; Ortiz et al., 2023).

The model is based on personalized mentoring, which promotes the development of self-esteem, intrinsic motivation, and the necessary tools for self-directed learning. The Polytechnic University of Tulancingo (UPT) is an active member of this network of institutions, implementing the program as a collaborative strategy aimed at reducing school dropout rates and fostering social interaction.

The literature reports the effectiveness of mentoring programs; however, a precise quantification of the benefits in specific populations and under concrete intervention models, such as the UPT program, is needed. This study seeks to advance in this direction, employing an empirical approach. The purpose is not to validate an instrument, but rather to quantify and describe the profile of cognitive and academic skills of children who have benefited from the program's intervention.

By knowing the current level of their general intelligence (GI) through the application of the indices and subtests of the RIAS scale, as well as their performance in mathematical aptitudes, it is possible to evaluate the impact that the Peraj program has had on the consolidation of their fundamental skills (Reynolds & Kamphaus , 2003; Tabiani Nian et al., 2024).

According to the above, the objective of this research is: 1) to establish the cognitive profile (GI) of the primary school students participating in the Peraj program at the

Polytechnic University of Tulancingo; and 2) to determine the level of mathematical aptitudes of the population, analyzing the relationship between cognitive variables and academic performance.

Theoretical Framework

Students aged 10 to 12 are in a critical period of cognitive development, associated with the transition to formal operations according to Piaget's theory (Piaget, 1964). However, it is important to consider that this process does not occur uniformly in all students. During this stage, skills such as abstract thinking, hypothetical-deductive reasoning, and information processing are strengthened, all of which influence academic performance.

In particular, mathematical skills become more complex, requiring not only the memorization of procedures but also the use of logic, quantitative reasoning, and the ability to abstract in problem-solving (Montañez Romero & Beltrán de la Rosa, 2022). Cognitive development is the necessary foundation for acquiring academic skills, providing the mental processes that allow students to effectively understand and construct new learning. In this sense, intervention programs like Peraj can contribute to strengthening these skills through mentoring strategies that promote the student's holistic development.

The study of intelligence, understood as the general capacity to learn, reason, and adapt to new situations (Romero & De la Rosa, 2022), is fundamental for evaluating a student's learning potential. The RIAS scale is a psychometric tool designed using factorial models that allows for the rapid and accurate assessment of general intelligence (GI) in children, adolescents, and adults (Reynolds & Kamphaus , 2003). The use of RIAS in this study allows us to establish a cognitive profile of the participants in Peraj , based on the measurement of their intellectual abilities.

The development of academic skills is influenced by various psychosocial factors that can be addressed through mentoring models (General Directorate of Educational Guidance and Support, 2010). In this sense, the university mentor not only provides support in academic activities but also acts as a role model, strengthening the child's confidence in their abilities and promoting a positive attitude toward education. Several studies indicate that structured mentoring interventions are associated with improvements in cognitive skills, as well as with a decrease in anxiety about academic performance and a greater commitment to learning (Balsamo et al., 2019). Therefore, the Peraj program is recognized

as a school enrichment factor that can influence the cognitive and academic development of its participants.

Methodology

This research employs a quantitative approach, with a non-experimental, cross-sectional design, and a descriptive-correlational scope. Data collection was conducted at a single point in time. The study aims to characterize the cognitive and academic skills profile of the population and to analyze the relationship between general intelligence (GI) and performance in mathematical aptitudes.

A convenience sampling method was used, due to the accessibility of the population participating in the Peraj program . Students were selected who met the following criteria: 1) being a regular fifth or sixth grade elementary school student; 2) being enrolled and having participated in the Peraj program of the Polytechnic University of Tulancingo for a minimum period of one year, considering as participation the fulfillment of the activities established within the program; and 3) having written informed consent, signed by their parents or guardians, in accordance with the institutional guidelines for participation in the evaluation.

The final sample consisted of 11 students (n = 11) from a public school in the state of Hidalgo. The ages of the participants ranged from 10 to 12 years (M = 10.5; SD = 0.73). Two instruments were used for data collection. First, the RIAS scale (Reynolds & Kamphaus , 2003), a standardized test for assessing general intelligence and memory in children, adolescents, and adults. In this study, specific subtests were administered to obtain the general intelligence quotient (GI), a composite score representing an individual's overall intellectual ability. This selection was based on the study's objectives and the feasibility of its application. The instrument was chosen for its brevity and the reliability reported in various studies.

Secondly, a mathematical aptitude test designed to assess the skills required in the fifth and sixth grade elementary school curriculum was used. This instrument was developed based on the corresponding school content; therefore, it is recommended to consider evidence of validity and reliability for its proper interpretation.

The test consisted of 20 items covering the areas of basic operations (addition, subtraction, multiplication, and division), numerical reasoning, word problem solving, number sequences, and understanding fractions and percentages. The total score is used as

an indicator of the participants' level of mathematical aptitude, with a maximum score of 20. It is also important to consider evaluating its psychometric properties, such as content validity and reliability (for example, using Cronbach's alpha coefficient), to ensure the accuracy of the results.

Once written informed consent was obtained from the parents or guardians, the assessments were conducted individually by trained evaluators in the field of psychology at the Polytechnic University of Tulancingo. The assessment was administered in a single session lasting approximately 60 to 75 minutes per participant, in a quiet, distraction-free environment. Anonymity and confidentiality of the results were guaranteed, in compliance with the ethical guidelines for psychological research and with the approval of the corresponding institutional body.

The collected data were analyzed using the statistical software SPSS (IBM SPSS Statistics). Initially, descriptive statistics were calculated, including the mean (M), standard deviation (SD), and minimum and maximum values of the RIAS general intelligence index (GI) and the total score on the mathematics aptitude test. Subsequently, a correlational analysis was performed using Pearson's correlation coefficient (r) to identify the linear relationship between GI and performance on the mathematics aptitude test. Prior to this analysis, the assumptions of normality and linearity of the data were verified.

Results

The results allow us to identify the participants' cognitive level and mathematical performance. Table 1 presents the descriptive statistics for the study variables. The general intelligence index (GI) showed a mean of 103.40 (SD = 6.94), falling within the normative average range (M = 100 ± 15) for the general population, suggesting adequate cognitive development in the participants of the Peraj program .

Regarding academic performance, the average score on the mathematical aptitude test was 11.27 out of a maximum of 20 possible points (SD = 3.79).

Table 1. Descriptive Statistics of the Cognitive and Academic Profile (N = 11)

Variable	N	Media (M)	Standard Deviation (SD)	Minimum	Maximum
General Intelligence (IG) RIAS	11	103.40	6.94	95	115
Mathematical Aptitudes (Raw Score)	11	11.27	3.79	4	17

Note: Original work

To fulfill the second objective, a Pearson correlation was performed between the variables. The results (Table 2) indicated a positive correlation between general intelligence and mathematical aptitude. The correlation coefficient obtained was r = 0.75, which was statistically significant (p = .008). According to the criteria for interpreting effect size, this value can be considered high. This finding suggests that students with higher IQ tend to obtain higher scores on the mathematical aptitude test.

Table 2. Pearson correlation between General Intelligence (GI) and Mathematical Aptitudes (N = **11)**

Correlation	IG of RIAS	Math Score
IG of RIAS	1	0.75 **
Math Score	0.75 **	1
Note: p < .01.		

Note: Original work

Discussion

The purpose of this research was to evaluate general intelligence and mathematical aptitude levels in a group of primary school students participating in the Peraj mentoring program . The study focused on characterizing and performing a descriptive-correlational analysis of these variables. In this respect, it aligns with findings reported in the literature (Montañez Romero & Beltrán de la Rosa, 2022), which center on the assessment of skills in a school population.

Peraj student group has an IQ score of 103.40 (SD = 6.94), which falls within the average range. This value is consistent with the mean for the general population of their age. Furthermore, it suggests that the mentoring model is associated with a level of cognitive functioning within expected parameters, a relevant factor for academic performance and adaptation to academic demands (Reynolds & Kamphaus , 2003; Tabiani , 2024).

In the area of academic skills, the average performance on the mathematical aptitude test was 11.27/20. Although this score represents a low-intermediate level of mastery of the skills evaluated, it is important to interpret it in the context of the integral development promoted by Peraj , which is not limited to the direct instruction of content, but also considers the strengthening of emotional and cognitive skills that underlie learning (General Directorate of Educational Guidance and Attention, UNAM, 2010; Peraj , 2020).

One of the study's key findings is the positive correlation between general intelligence and mathematical aptitude, with a coefficient of $r = .75$ ($p < .008$), which is statistically significant and of high magnitude. This correlation is consistent with the theoretical relationship between intellectual ability and academic performance reported in the literature (Watts & Joyner, 2022). In the context of Peraj , this result is particularly relevant as it demonstrates the association between these two variables in the studied population.

The results allow us to characterize the participants' profile, demonstrating that their cognitive abilities—particularly their intelligence quotient—are associated with performance in a fundamental academic skill such as mathematics, suggesting an adequate organization of their intellectual resources and their application in learning (Balsamo et al., 2019). Furthermore, the mentoring offered by the Peraj program can contribute to strengthening logical reasoning and other relevant cognitive processes, which is consistent with the observed relationship between intelligence and academic performance, and supports the relevance of implementing interventions that integrate cognitive and psychosocial support (Balsamo et al., 2019; Peraj , 2020).

It is crucial to recognize that the main limitation of this study is the small sample size (N = 11) and the cross-sectional design, which does not allow for establishing causal relationships or generalizing the results beyond the specific context of the Polytechnic University of Tulancingo. Furthermore, the absence of a control or comparison group limits the ability to attribute the results directly to Peraj 's intervention . Additionally, the use of

convenience sampling may introduce biases that affect the representativeness of the sample.

In the future, research is recommended that adopts a longitudinal (pre-post) design that includes a control group, which will allow confirmation of the hypothesis that the Peraj intervention produces a significant improvement in cognitive and psychosocial skills (measurement of the affective and motivational profile) compared to students who do not participate in the program (Peraj , 2020).

Conclusions

Based on the descriptive and correlational results, it is concluded that the cognitive profile of the beneficiaries of the Peraj program falls within the normative average range, evidenced by an IQ index of 103.40. Furthermore, a strong positive association was identified between IQ and mathematical aptitude (r = .75). These results suggest that intellectual capacity is related to performance in academic skills, which is consistent with the literature in this area.

These results highlight the relevance of mentoring support in the educational context, particularly in relation to the development of cognitive and academic skills. In this sense, programs like Peraj become relevant within the educational system by promoting support spaces that can link basic education with higher education. However, these implications should be interpreted with caution, since the benefits associated with other dimensions, such as socio-emotional development or the professional competencies of mentors, were not directly evaluated in this study.

Future lines of research

Based on the study's results, several lines of research for future work have been identified. First, longitudinal studies with pre- and post-intervention measurements are recommended to more accurately assess the impact of the Peraj program on cognitive and academic development.

Secondly, it is suggested that comparison groups be incorporated to allow for contrasting the performance of participants with students who are not part of the program, which would provide further evidence of its effects. Finally, it is proposed that the analysis be broadened to include socio-emotional variables, considering that Peraj 's

support could be related to aspects such as self-confidence, emotional regulation, and school responsibility.

Finally, it is suggested that the study be replicated with larger samples and in diverse educational contexts, such as urban and rural environments or different socioeconomic levels, in order to strengthen the generalizability of the findings and consolidate the empirical evidence on the effectiveness of the mentoring model.

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