


## EXPERIENTIAL LEARNING AND THE OPTIMIZATION OF LEARNING IN STUDENTS WITH NEURODEVELOPMENTAL DISORDERS THROUGH EDUCATIONAL PERSONALIZATION

## APRENDIZAJE EXPERIENCIAL Y LA OPTIMIZACIÓN DEL APRENDIZAJE EN ESTUDIANTES CON TRASTORNOS DE NEURODESARROLLO A TRAVÉS DE LA PERSONALIZACIÓN EDUCATIVA

 <https://doi.org/10.70335/sapiendus.1.1.5>JEFFERSON EDUARDO CABRERA-AMAIQUEMA<sup>1</sup>, IRLIN YOINER QUINTERO-MOREIRA<sup>2</sup>,  
CINTHYA MARBEL OVIEDO-BONILLA<sup>3</sup>, RENATA PAOLA CERVANTES-AVILÉS<sup>4</sup>

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## ABSTRACT

**Introduction:** This study examines the impact of experiential learning and educational personalization on students with neurodevelopmental disorders, such as ADHD, ASD, SLI, and dyscalculia, through innovative methodologies focused on educational inclusion. **Objective:** To evaluate how educational personalization, through strategies such as learning through play and plastic expression games, optimizes the learning process and reduces barriers in the educational environment. **Methodology:** The research was conducted in educational institutions in Guayaquil, employing a quantitative approach with data collection and analysis techniques using SPSS. Indicators of performance, effort, stress, and learning perception were analyzed in neurodivergent students. **Results:** Findings reveal significant improvements in learning efficiency and performance perception, as well as a reduction in stress and frustration levels. Additionally, the study highlights the importance of interinstitutional collaboration and family involvement in teaching-learning processes. **Conclusions:** Experiential learning-based educational personalization proves to be an effective and viable strategy for inclusive education. Its integration into curricular planning can enhance teaching across various educational levels, fostering students' holistic development.

**Keywords:** Adaptive learning; Educational inclusion and planning; Neurodevelopmental disorders; Pedagogical strategies; Personalized education.

1. Ph.D. (c). Docente Titular Auxiliar 1, Instituto Tecnológico Superior Bolivariano de Tecnología. Guayaquil (Ecuador); Doctorando en Dirección de Proyectos, Universidad de Investigación e Innovación de México (UIIX). E-mail: jecabrera8@bolivariano.edu.ec.
2. Psicóloga. Tutora Académica, Universidad Bolivariana del Ecuador. Durán (Ecuador).
3. Economista (e). Asistente Administrativo, Instituto Tecnológico Superior Bolivariano de Tecnología. Guayaquil (Ecuador). E-mail: cmoviedo@bolivariano.edu.ec.
4. Licenciada (e). egresada, Universidad Javeriana, Bogotá (Colombia); Directora Creativa, JLA Ediciones. Guayaquil (Ecuador). E-mail: re-cervantes@javeriana.edu.co.



## RESUMEN

**Introducción:** Este estudio analiza el impacto del aprendizaje experiencial y la personalización educativa en estudiantes con trastornos del neurodesarrollo, como TDAH, TEA, TEL y discalculia, a través de metodologías innovadoras centradas en la inclusión educativa. **Objetivo:** Evaluar cómo la personalización educativa, mediante estrategias como aprender jugando y juegos de expresión plástica, optimiza el proceso de aprendizaje y reduce barreras en el ámbito educativo. **Metodología:** La investigación se desarrolló en instituciones educativas de Guayaquil, empleando un enfoque cuantitativo con técnicas de recolección de datos y análisis mediante SPSS. Se analizaron indicadores de desempeño, esfuerzo, estrés y percepción del aprendizaje en estudiantes con neurodivergencias. **Resultados:** Los hallazgos reflejan mejoras significativas en la eficacia del aprendizaje y la percepción del desempeño, así como una reducción en los niveles de estrés y frustración. Además, se resalta la importancia de la colaboración interinstitucional y el involucramiento familiar en los procesos de enseñanza-aprendizaje. **Conclusiones:** La personalización educativa basada en el aprendizaje experiencial demuestra ser una estrategia efectiva y viable para la educación inclusiva. Su incorporación en la planificación curricular puede optimizar la enseñanza en diversos niveles educativos, favoreciendo el desarrollo integral de los estudiantes.

**Palabras clave:** Aprendizaje adaptativo; Inclusión y planificación educativa; Trastornos del neurodesarrollo; Estrategias pedagógicas; Educación personalizada.

## INTRODUCTION

Personalized education is a learning process according to the student's opinions and preferences. The individualization of instructional programs, learning style, and student interests differentiates ways of controlling the student's learning pace in groups (Delgado-Mendoza et al., 2024). Another type of personalized education refers to the generation of personalized content made from an analysis of the materials under certain curricular preferences and is defined as an educational strategy to increase student performance, creating classes in an attractive way and designing particular materials.

The official report regarding the 2018-2019 academic years with census data on non-university education places that 10.9% of students who are studying non-university education have neurodevelopmental disorders (Rivera & Alicia, 2024). The group of students who present these school difficulties shares a common denominator in the dizzying and diverse morphology presented by these disorders, which we know are even shared by 26% of the school-age child population, as well as by the students who face more unfavorable curricular situations; something that he has taken into account in his study. Aggravated by a diversity of affected levels that is added to the disorder, making it difficult to assume if those responsible for the creation and promotion of meta-learning in education, personal intelligence or adaptability require access to the reality of each of these processes (Bermejo, 2024).

Learning disorder (ADD) is a neurobiological condition that consists of the inability to receive, retain or interpret information, which hinders conventional teaching, because skills are not developed in a "normal"

way; likewise, ED affects at the sensory level, generating difficulties in hearing or seeing correctly, emotional and environmental difficulties such as family problems or cultural differences. The most common examples of ED are: dysgraphia, which is the difficulty of writing; dyscalculia, which involves difficulty learning or understanding mathematics; and dyslexia, which is a developmental disorder of reading. It can often be seen reflected in difficulty with word spelling, phonological and reading comprehension, processed through the brain areas of the frontal and temporal cortex (Garzón et al., 2024).

The study analyses the diversity of students with neurodevelopmental disorders and proposes policies, strategies and measures. The design is still received with reservations; an aspect that could be alleviated using a psychoeducational language, if possible, with the support of ICTs and resources based on collaborative architecture. The evolution of the healthy child report from birth to 7 years of age places a marked emphasis on neurodevelopmental disorders. Some propose a precise nomenclature of this disorder because 105 patients analyzed presented neurodevelopmental alterations and the research process has raised this information for application through various recreational strategies in public and private educational units in the city of Guayaquil – Ecuador.

## THEORETICAL FRAMEWORK

The personalization of educational models according to the needs or idiosyncratic characteristics of each student has become a social demand and, at the same time, a primary objective to be addressed (San Martín et al., 2024). This premise reaches its greatest relevance when thinking about students with SEN who may slow down or limit their possibilities, aspects aggravated by the tendency that predominates in contemporary educational contexts where the approach to teaching and learning is based on the classroom as a homogeneous group and "with a single walking pace" (Vaca et al., 2024). In addition, it is obvious that at the time of reflection it is necessary to keep in mind that current neuroscience has advanced a large amount of knowledge about the cognitive, emotional, and motivational processes of people, the basis of learning and, in addition, through these, has provided evidence about how brains are unique and idiosyncratic to each other.

Neurodevelopmental Disorders according to the DSM-V occur at an early age in the development of the infant from the beginning of their school stage, and are characterized by a deficit that produces deficiencies in personal, social, academic or occupational functioning, in the context of research and for the purpose of presenting this reflective advance, the analysis has been limited to a specific group of disorders that were collected by Forbes et al., (2024) and which are directly based on the detailed content of the DSM-V:

**Intellectual Disability:** is characterized by the lack of general mental abilities, such as reasoning, problem solving, planning, abstract thinking, judgment, academic learning, and learning from experience.

**Autism spectrum disorder (ASD)** is characterized by persistent deficits in social communication and interaction in multiple contexts, including deficits in social reciprocity, nonverbal communicative behaviors used for social interaction, and skills in developing, maintaining, and understanding relationships.

Until the publication of the new edition of the Diagnostic and Statistical Manual of Mental Disorders, Asperger's syndrome was considered a separate disorder. While now this name has disappeared and is part of a spectrum shared under the name of Autism Spectrum Disorder, in which the five disorders that made up the disappeared classification are assimilated and one of the five diagnostic subgroups also shares the term Asperger's.

Attention-Deficit/Hyperactivity Disorder (ADHD) is defined by problematic levels of inattention, disorganization, and/or hyperactivity-impulsivity. Inattention and disorganization involve the inability to follow tasks, that they seem not to hear, and that they lose materials at levels that are incompatible with age or developmental level. Hyperactivity-impulsivity involves excessive activity, nervous movements, inability to sit still, intrusion into other people's activities, and inability to expect that are excessive for age or developmental level.

During the research bias and psychological correlation with one of the professional co-authors in the area, results are identified and therefore documented with respect to other Neurodevelopmental Disorders there are: Specific Learning Disorders, Motor Disorders (the physical part intervenes) and Communication Disorders.

The incipient development of the neuroscience of education has been transformed into a new discipline that is based on how biological and philosophical-social evidence about the human brain can be transformed into pedagogical practice applicable to the design and development of educational proposals adaptable to the challenges and personal goals of students in the knowledge society (Gutiérrez, 2024). Thus, and beyond physiological characteristics such as the influence of sleep or the importance of an adequate diet in the teaching-learning process, evidence has been provided on a series of aspects related to contextual variables that contribute to the effectiveness and efficiency of the different instructional models, reduce factors that generate demotivation and modify students' emotions. In view of the cognitive difficulties presented by students with specific neurodevelopmental disorders, it is necessary to propose a series of guidelines that affect the organization of teaching action in the classroom, which allow this group of students to be offered the possibility of progressing in their development, despite individual differences.

From a scientific perspective (part of a doctoral, practical and technical field training) the strategies that are most effective, compared to others, to facilitate the teaching-learning process in these students are shown. It advocates for personalized educational models and the use of direct adaptive personnel, which will allow students with specific neurodevelopmental disorders, from a universal learning design, to modify and adapt algorithms to offer the most appropriate intervention to their cognitive profile, facilitating true progress through personalized training and their full social inclusion from the creative-functional (Guerrero-Altamirano, 2023).

According to the data presented by Rivadeneira-Coello (2024), high comorbidity subject to data that show a compatibility between diagnoses in a data located "between 50% and 90% of cases, usually conditions the educational response, which involves the need to work on two or more interrelated or simultaneous objectives" (p. 56). making the selection of educational activities and strategies more complex, since they should

take these interrelationships into account. In addition, the underlying keyword is also decisive, so it conditions the differences in the aforementioned group from other organic or environmental alterations or concomitant with the brain disorder. For example: common or severe motor and sensory disorders, a certain underlying personality, and environmental effects.

The objective of the research has been to analyze and study the results of the methodological application of "learning by playing" and "games of plastic expression" with psychological reasoning and a reflection on how a correct educational planning can help a less forced and more organic inclusion in different educational environments, applying the study mainly in the city of Guayaquil in which the sampling institutions and researchers coexist.

## METHODOLOGY

The work methodology has followed a process of three phases: an exploratory one, in which there is a bibliographic review on the subject; descriptive, a longitudinal field study to meet the proposed objective; and the last, a critical evaluation of the proposed creative-behavioral interventions.

First, to define the JEP and AJ methodology as part of a project approved by the Directorate of Community Liaison of the Universidad de las Artes (Ec) and articulated inter-institutionally with the University of Guayaquil, the Faculty of Transporte y Vialidad of the Instituto Superior Universitario Bolivariano de Tecnología (ITB-U), Fe y Alegría Ecuador Foundation, Michugo Dorado Foundation, JLA S.A.S and the Ministry of Education (MINEDUC); stands out as a comprehensive initiative that integrates pedagogical and creative practices through cooperation with various educational units in Guayaquil. It arose in response to the curricular reform of Cultural and Artistic Education (ECA) of 2017, allowing the incorporation of artistic-creative activities from primary to 2nd year of Unified General Baccalaureate (BGU) in the training curriculum and that includes in its research bias a methodological design for the optimization of learning in students with neurodevelopmental disorders through educational personalization.

The project recognizes the importance of linking life projects that address basic knowledge of creativity and therefore applies artistic, creative, innovation and sustainability workshops with a community approach, promoting intercultural dialogue and making identity projections visible in public spaces (Serrano-Macias, 2022). The procedures used to carry out this study have been qualitatively applied, using both primary and secondary data. The data has been processed through the selection of qualitative and quantitative variables that include the observations carried out in the learning sessions. By obtaining qualitative data, the analysis has been carried out from a descriptive-inductive perspective to identify, from these results, the existing patterns or regularities in performance, which will be key to being able to establish inferences about the cause-effect relationship.

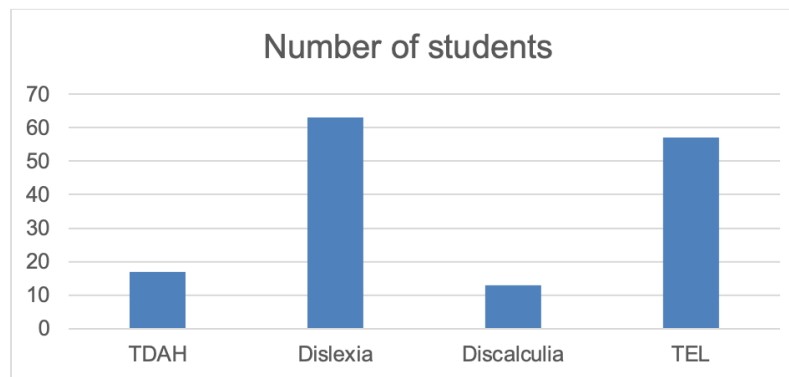
The purpose and justification of this study has been to understand and explain reality in order to, based on the analysis and interpretation of the data, be able to generalize results to similar situations and to be able to develop proposals for educational improvement. In view of the present situation experienced in schools, the

new teaching methodological scenario proposed is based on personalized education and the promotion of student self-management for the development of curricular skills of the twenty-first century. In this way, this study has served to propose educational didactic solutions, based on the pedagogical implementation of PBL in a personalized way. This project is based on the previous observation in schools of the high failure in schoolchildren with neurodevelopmental disorders due to the inadequacy of traditional teaching-learning pedagogical models.

## RESULTS

The participating schools were selected voluntarily by agreement of the school's ownership, the measures to be implemented and the commitment to teacher training. Dependent variable the teaching process and the learning process will be taken into account.

**Figure 1.**  
*Sampling Identification*



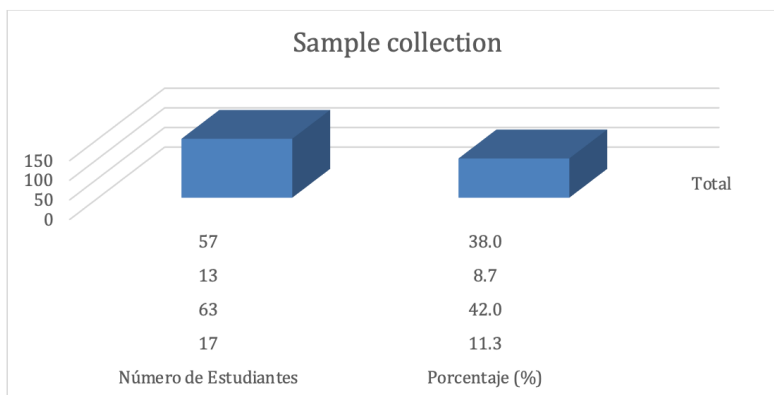
*Note:* Population detail: students with neurodevelopmental disorders The study is carried out with a group of 150 students diagnosed with different neurodevelopmental disorders: 17 with ADHD, 63 with dyslexia, 13 with dyscalculia and 57 with SLI or specific language disorders. The chart was obtained and presented in their native language (Spanish) at the 8th International Congress of Pedagogical Sciences.

The teaching process will be measured by means of a questionnaire addressed to teachers, validated for this study. Attention to diversity in the planning and development of the teaching process will be quantified. Teacher planning will be measured using the answer to three general questions regarding the universal design of learning on how they will approach the different phases of the teaching process in the teaching programmed and, in addition, based on three items of a more specific nature for each subject on the use of technical aids, methodological adaptations and level of intellectual work. The learning process will be measured by the grade and attitude towards the disciplines of the subject affected; The evolution of the number of subjects passed by the student will be observed, and the grades will not be observed.

### Participants

Coming from different centers where they receive treatment in Guayaquil, sectoral discrimination was applied based on the technical possibilities for the project. The main criterion for inclusion of students focuses on having a previous diagnosis of ADHD, ASD or SLI, or associated symptoms.

**Figure 2.**  
*Sampling Identification*



**Note:**The chart was obtained and presented in their native language (Spanish) at the 8th International Congress of Pedagogical Sciences.

In the same way, the choice falls on those who, according to data inferred from family documentation and direct observation of the latter, do not have psychoeducational reports older than 12 months, so that the conclusions of the stages that are individualized respond to the current needs of each student and can plan an optimal intervention for the generalization of these. The exclusion criteria are those children who carry out extracurricular educational support in which exercises and activities are already personalized according to their needs, children with diagnosed mental retardation, absence of family reports, associated but undiagnosed symptoms, and if they needed to modify or acquire the necessary habits that they were working on in the summer school.

**Figure 2.**  
*Sampling distribution*

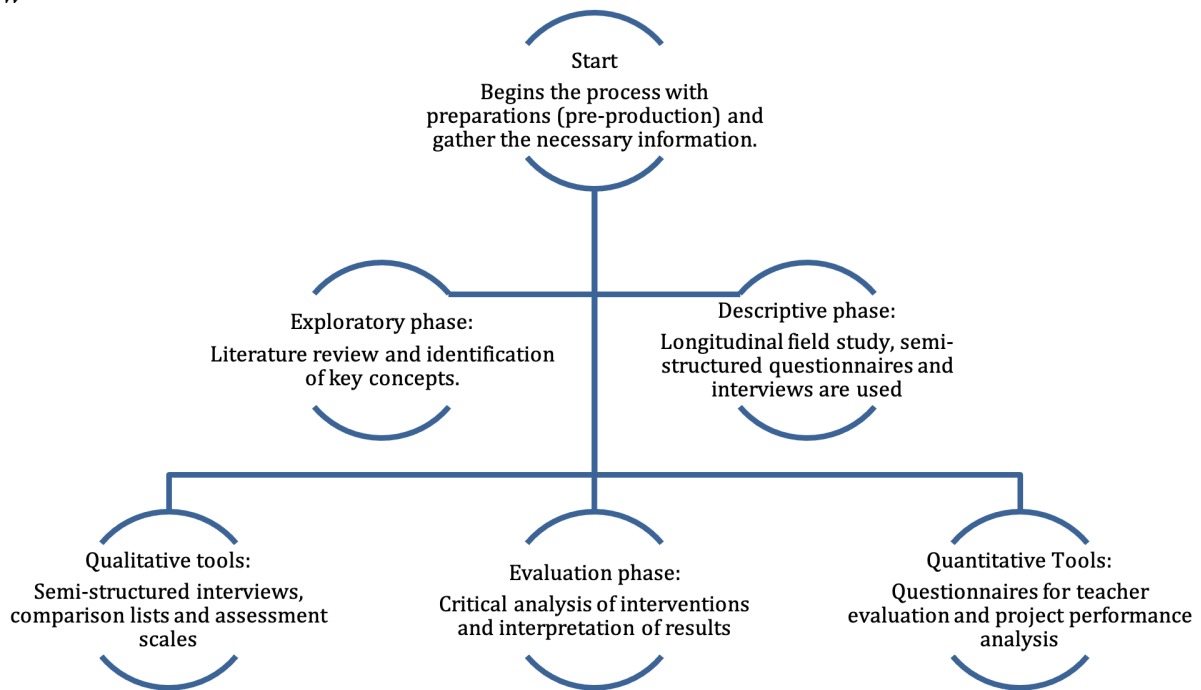
Sex	ADHD	Dyslexia	Dyscalculia	TEL	Total
<b>Male</b>	12	40	8	35	95
<b>Female</b>	5	23	5	22	55
<b>Total</b>	17	63	13	57	150

The final sample of 11 students is composed of two female students and nine male students. According to the diagnosis of the students, five students have Specific Language Disorder, Autism Spectrum Disorder and two students; the General Directorate of Attention to Diversity in its grades for schools has not revealed enough information to break down the students who only have Attention Deficit Hyperactivity Disorder of those who jointly have ADHD and ASD. These are all the students in whom the symptoms of the different Nonverbal Learning Disorders (NVLD) could be classified as "mild", one school and another behavioral or emotional-social or two exclusively from each area.

### Data collection toolst

For data collection, quantitative and qualitative collection instruments are used that allow data to be collected for different purposes (in-depth understanding of processes in exploratory stages, identification of concepts and evaluative variables, in the implementation phase or evaluative in the acquisition of methodological skills), obtaining information of different types (personal characteristics, metacognitive processes, satisfaction and results of acquired learning). Among the study subjects, we highlight students in the 10th year of Basic Pedagogy and 1st year of Unified General Baccalaureate (Ecuadorian model) who present neurodevelopmental disorders.

**Figure 3.**  
*Process Flow*

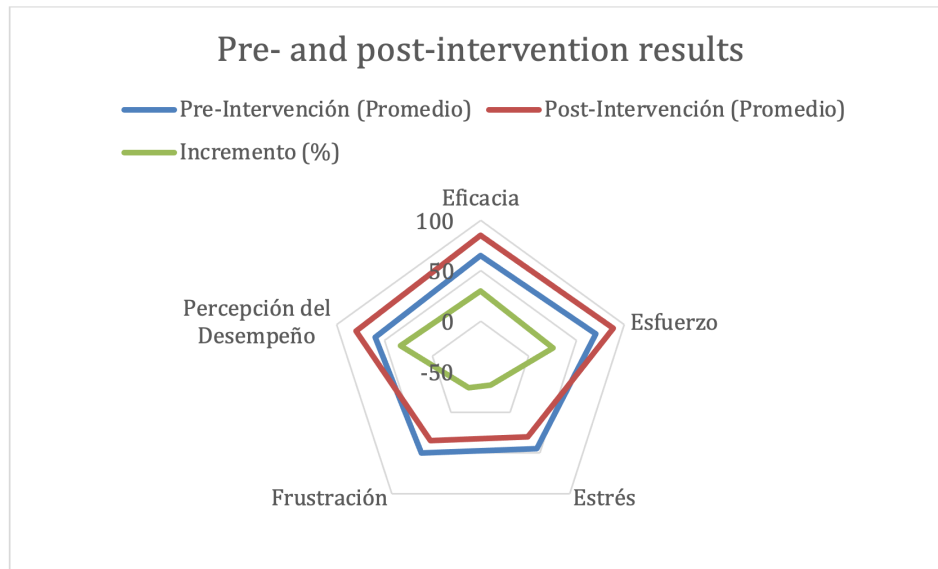


**Note:**The process methodology was developed in 4 educational units of the Fe y Alegría Southern Regional Network, 2 private educational units (Urdesa and Mapasingue Este), 2 public educational units (Ministry of Education) and 2 higher education institutions.

For data collection with a qualitative approach, the Interactive Instruments are used with the support of the SPSS technological platform, which has different tools that allow the exploration, description and analysis stage for the processes that are carried out at a depth level. Among the quantitative instruments, the use of the technological platform stands out, interrogatively, semi-structured interview, checklist and metric scale. The Interactive Instruments is a technological complement for the development of the unit, facilitating its visualization by previously registered users.

When analyzing the data obtained after the completion of the two previous questionnaires of the social measure of learning quality, we have obtained some significant results with respect to the variable of Personal Educational Needs (NEPs).

**Figure 4.**  
*Triangulation of pre- and post-intervention outcomes*



**Note:** A significant increase in the competencies of effectiveness, effort, and performance perception is observed after the intervention, with notable reductions in stress and frustration levels. The data show a generalized improvement in the performance indicators, demonstrating the effectiveness of the strategies applied. The percentage increase represents the positive change in each variable, reinforcing the usefulness of personalized interventions in specialized educational contexts. The chart was obtained and presented in their native language (Spanish) at the 8th International Congress of Pedagogical Sciences.

In a general setting, that is, without taking into account the etiology of the neurodevelopmental disorder presented in the sample, we can highlight that subjects who have this disorder obtain significantly lower scores than those who do not have any. Along the same lines, the competence for autonomy is clearly lower in the experimental group, compared to the group with a total absence of NEPs.

**Table 2.**  
*Comparison of the scales of methodological application*

Competence	Pre-Intervention (Average)	Post-Intervention (Average)	Increase (%)
<b>Efficiency</b>	65	85	30
<b>Effort</b>	70	88	25,7
<b>Stress</b>	45	30	-33,3
<b>Frustration</b>	50	35	-30
<b>Performance Perception</b>	60	80	33,3

In this sense, if we get a little closer to the etiology of the neurodevelopmental disorder, we can see that the group with ADHD is the one that obtains lower values in the variable of life support, which takes significantly lower values than the remaining group. Although in general, they have lower scores than the group that does not suffer from any NEP disease. If we compare the group with ASD with respect to the rest of the sample, we found no significant differences in any of the NEP variables. Continuing with our hypothesis, another of the data analyzed that we consider important to highlight is that the group that presents some type of alteration derived from the general developmental disorder that does not present mental retardation differs from the general group, standing out in two of the variables analyzed, including a higher index of pleasant interpersonal relationships and a follow-up to the correct routines for daily life greater. Finally, and despite talking about a mere contrast of our information, the group with intellectual disability obtains lower scores than the others in all variables, that is, the greater the disability, the lower the quality index in all variables.

## DISCUSSION

The advances of this research show that the implementation of personalized methodologies aimed at students with neurodevelopmental disorders contributes significantly to the development of both academic and emotional competencies. The use of strategies such as "learning by playing" and "games of plastic expression" not only favors the acquisition of knowledge, but also strengthens soft skills necessary for their integral performance in the school environment.

The results highlight an increase in the indicators of effectiveness, effort and perception of performance, accompanied by a notable reduction in stress and frustration levels. These findings confirm the effectiveness of adapted pedagogical strategies and reinforce the importance of a universal learning design that allows the particularities of each student to be addressed.

## CONCLUSION

The use of technological tools such as SPSS, in this context, has facilitated the analysis and interpretation of the data obtained, allowing the effectiveness of the interventions carried out to be validated. Likewise, the importance of inter-institutional articulation is recognized, which has made possible a more holistic implementation of the proposed activities, which reaffirms that educational personalization is not only a necessity in contemporary education systems, but also an ethical commitment that responds to the demands of inclusion and equity in diverse contexts. The correct planning and application of these methodologies can transform the teaching-learning processes, becoming a replicable model for future educational interventions.

In this context and to guarantee its continuity, it is essential that educators acquire competencies in the design and implementation of personalized pedagogical strategies, which consider the cognitive and emotional particularities of students with neurodevelopmental disorders. At the level of results, strengthen

interpretations for more rigorous monitoring and adjust to the individual needs of students, guaranteeing data-based interventions. From the data that continue to be obtained, systematizing successful strategies such as "learning by playing" and "games of plastic expression," adapting them to different educational contexts, will allow them to expand their scope and generate a positive impact in other scenarios where educational inclusion must be accompanied by joint work with the families of students, promoting their involvement in the learning processes and consolidating an environment of comprehensive support.

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