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Original article

Early stimulation and motor skills in students with Attention Deficit/Hyperactivity Disorder

Estimulación temprana y habilidades motrices, para estudiantes con trastorno por déficit de atención e hiperactividad

Estimulação precoce e habilidades motoras em alunos com transtorno de déficit de atenção e hiperatividade

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ABSTRACT

Attention deficit hyperactivity disorder is a neurodevelopmental disorder that arises in childhood and is becoming increasingly common in primary education classrooms. However, many teachers lack the necessary training to address this problem and meet the needs of these students. Therefore, the objective of the study was to develop a system of

early stimulation exercises to benefit the development of basic motor skills, facilitate biopsycho-socioemotional growth and the affective and effective disposition of learning, from the school stage, in the Physical Education class. A non-probabilistic sampling was used with conventional students and three with this educational need and their Physical Education teacher. The measurement of inclusion and attention variables was carried out using indicators, an observation guide, documentary analysis, a survey and interviews. The results revealed a lack of knowledge in the use of teaching-learning strategies related to attention to diversity, and the need for continuous training and self-training was highlighted to improve intervention in the classroom. Consequently, a system of exercises was designed and validated, with a systemic-structural-functional approach, in an educational unit in De La Salle, Ecuador. A mixed and pre-experimental methodology was used , with pre- and post-test results that confirmed the effectiveness of the exercise system in educational practice.

Keywords: basic motor skills, physical education, early stimulation, inclusion, attention deficit hyperactivity disorder

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RESUMEN

El déficit de atención e hiperactividad es un trastorno del neurodesarrollo que surge en la infancia, y se hace cada vez más común, en las aulas de educación primaria; sin embargo, muchos docentes carecen de la preparación necesaria para abordar esta problemática y atender las necesidades de estos estudiantes, por lo que el objetivo del estudio fue elaborar un sistema de ejercicios de estimulación temprana para beneficiar el desarrollo de habilidades motrices básicas, facilitar el crecimiento biopsico-socioemocional y la disposición afectiva y efectiva del aprendizaje, desde la etapa escolar, en la clase de Educación Física. Se empleó un muestreo no probabilístico con estudiantes convencionales, y tres con esta necesidad educativa y su docente de Educación Física. La medición de variables de inclusión y atención, se realizó mediante indicadores, guía de observación, análisis documental, encuesta y entrevistas. Los resultados revelaron un desconocimiento en el uso de estrategias de enseñanza-aprendizaje relacionadas con la atención a la

diversidad, y se destacó la necesidad de la formación continua y autoformación, para mejorar la intervención en el aula; en consecuencia, se diseñó y validó un sistema de ejercicios, con el enfoque sistémico-estructural-funcional, en una unidad educativa De La Salle, Ecuador. Se empleó una metodología mixta y prexperimental, con resultados en el pre- y pos-test, que confirmaron la efectividad del sistema de ejercicios, en la práctica educativa.

Palabras clave: habilidades motrices básicas, Educación Física, estimulación temprana, inclusión, trastorno por déficit de atención e hiperactividad

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RESUMO

A Perturbação de Défice de Atenção/Hiperatividade, uma perturbação do neurodesenvolvimento que surge na infância, é cada vez mais comum nas salas de aula do ensino básico. No entanto, muitos professores não têm a preparação necessária para abordar estas questões e responder às necessidades destes alunos. Foi utilizada uma amostragem não probabilística com alunos convencionais, três crianças com esta necessidade educativa e o seu professor de Educação Física. As variáveis de inclusão e atenção foram medidas através de indicadores, um guião de observação, análise documental, um inquérito e entrevistas. Os resultados revelam uma falta de conhecimento na utilização de estratégias de ensino-aprendizagem relacionadas com a atenção à diversidade. Destaca-se a necessidade de formação contínua e de auto-formação para melhorar a intervenção em sala de aula. Além disso, foi concebida e validada uma estratégia didática inclusiva baseada num sistema de exercícios através de uma abordagem sistémica estrutural e funcional numa unidade educativa de De La Salle, Equador, utilizando uma metodologia mista e pré-experimental. Os resultados do pré e pós-teste confirmaram a eficácia da estratégia didática na prática educativa. Este estudo centra-se no desenvolvimento de um sistema de exercícios de estimulação precoce para beneficiar o desenvolvimento das capacidades motoras básicas, facilitar o seu crescimento bio-psico-sócio-emocional e a sua disposição afectiva e efectiva para a aprendizagem desde a fase escolar na aula de Educação Física, centrado na atenção à diversidade, especialmente em alunos com esta perturbação.

Palavras-chave: Educação física, estimulação precoce, competências motoras básicas, inclusão, perturbação de défice de atenção/hiperatividade (PHDA).

INTRODUCTION

According to the latest report from the World Health Organization (OMS, 2022), 8.8% of the world's population suffers from attention deficit hyperactivity disorder (ADHD), with a prevalence of 2.4% in children aged five to nine. In Ecuador, 5% of children have it.

The etiology of ADHD is not entirely clear, it is assumed to be a disorder of some factors with a biological, genetic and sociocultural basis, which requires an arduous diagnosis and management of children (Gámez, et al., 2022). To reveal the presence of ADHD in the school stage, the behaviors associated with the disorder must be noticeable, within a period of six months and present more than six different symptoms, specified in the DSM-V manual (APA, 2014). ADHD is classified into three subtypes:

- ADHD-I: is associated with inattention.
- ADHD-HI: impulsivity and hyperactivity predominate.
- ADHD-C: This is the most common, represented by the combination of the first two.

Research conducted by the Center for Disease Control and Prevention (2022) agrees that inattention, hyperactivity, and impulsivity are the main bases of ADHD; for this reason, professionals aim for these therapeutic and pedagogical objectives. In addition, it impacts modern society in terms of economic expenditure, family stress, low self-esteem, and hinders the process of comprehensive development and learning in the population that suffers from it (Eleanor , et al., 2020).

Is there treatment for this disorder? Yes, the main treatment is pharmacological; currently, two types of medications are used: psychostimulants and non-psychostimulants, according to Nácher (2021), with the aim of reducing the symptoms shown in subtype I such as inattention, difficulties in organizing and planning tasks; subtype II, with difficulty in self-

regulating emotional impulses, such as tantrums, aggression (biting, pushing and hitting); and subtype III, which combines the aforementioned symptoms.

Based on the theoretical contribution of Folgar (2013), a multimodal treatment is manifested that according to the latest report of the National Institute of Mental Health has a comprehensive approach, covering the psychosocial-emotional context of the student together with his/her family, during the school stage.

Parents play an important role in creating security, positive examples for the development of values and discipline; raising children with this disorder highlights the importance of understanding, balance and professional support. Children with ADHD require a family with clear rules and a stable environment; it is crucial that parents coordinate with professionals to set limits, support autonomy and instill learning habits, without allowing manipulation.

Physical and psychomotor education, for example, is not only essential for the motor development of students, but it also directly influences brain performance. It has been studied that practicing a sport favors concentration, attention and motivation, important aspects in any learning process (Bueno, 2019, p.43).

Authors such as Pompa et al. (2017) agree on the benefits of physical exercise for students with ADHD. Most of the references are oriented towards the practice of some sport, and that Physical Education (PE) favors the improvement of behavior, soft skills and academic performance of these students.

Cidoncha `s research (2010) mentions that PE has a favorable role because it allows working on muscle inhibition, postural control, relaxation and self-esteem, fundamental aspects in people with ADHD, which benefits them in academic performance, social relationships and self-knowledge. For students with ADHD it is important to:

- Assume responsibilities such as collecting and storing sports equipment used in class.
- Promote games that involve more movement and energy expenditure, followed by relaxation and calming exercises.

- Propose cooperative games.
- Carry out activities from simple to complex.
- Contribute with exercises towards the acquisition of fine motor skills.

It is important to mention that PE classes play a leading role in the development of positive cognitive and behavioral processes; in this sense, the role of the teacher is crucial because motivation, varied practices and a theoretical-scientific foundation are important to meet their needs and improve basic motor skills (BMS) in a systematic and effective manner (Rojas et al., 2020).

It is considered necessary to evaluate motor tasks according to the age of the students, as it allows identifying basic and complex patterns of their body movements, to intervene in the stages of evolutionary development and resolve situations in different aspects of life.

Garófano (2017) mentions that the HMB are classified as: locomotor, non-locomotor and projection/reception, which include walking, running, moving, turning, jumping and dynamic balance. Walking is a natural movement that evolves from crawling to walking; running is distinguished by the aerial phase, a natural element of the locomotor system; displacement allows moving from one point to another and is essential for other skills; turns involve rotations of the body; and when jumping the body is suspended in the air, all of which are key indicators of motor development. Finally, dynamic balance, which requires coordination and learning, is considered crucial in movement control.

According to Maqueira (2020), it is important to care for children from an early age, since they need optimal performance of exercises that stimulate their physical-motor and socio-emotional development, as well as continuous use to stimulate different intellectual, psychomotor and socio-emotional activities. In this sense, the role of early stimulation (ET in Spanish) is mentioned, by offering different stimuli and levels of scientifically organized and structured actions, facilitating the perception of the environment and promoting short, medium and long-term integration.

ET is understood as the set of activities that can be applied from before birth until six years of age, where greater brain plasticity is manifested, therefore, it is convenient to apply it in healthy children and in those with real or potential disorders in their development, to stimulate their compensatory capacities; therefore, the objective of the study was to develop a system of ET exercises to benefit the development of HMB, facilitate biopsycho-socioemotional growth and the affective and effective disposition of learning from the school stage in the PE class.

MATERIALS AND METHODS

The population of the present study was represented by a total of eighty students, two classroom teachers and one PE teacher, from a Private Educational Unit founded by the Brothers of the Christian Schools, in the city of Guayaquil, province of Guayas, Ecuador. Through a non-probabilistic sampling, 39 conventional students and three students diagnosed with ADHD were selected and characterized as follows:

Table 1. *Characterization of the study sample of cases with ADHD*

Educational need	Male (n-2 - 90%)		Female (n-1 - 10%)		Total (n-3 - 100%)	
	Age (years)					
	M	**DS**	**M**	**DS**	**M**	**DS**
ADHD - Subtype 1 (n-1 - 33.3%)	**4**	-	-	-	4	-
ADHD - Subtype 1 (n-1 - 33.3%)	-	-	**6**	-	6	0
ADHD - Subtype 2 (n-1 - 33.3%)	**6**	1	-	-	6	-

The analysis of the study sample determined that the average age was between five and six years, with the highest percentage of the sample being male. The individual characteristics provided by the responsible agencies within the institution (DECE) described the following characteristics:

Table 2. *Key characteristics of the study sample*

Child	ADHD Diagnoses (ICD-10/DSM-5)	Cognitive characteristics (ICD-10/DSM-5)	Motor characteristics	Recommendations for physical activity
1 (4 years)	F.90.9 (Attention deficit hyperactivity disorder, unspecified)	Significant difficulties with concentration and sustained attention, tendency to be distracted. (DSM-5: 314.00)	Adequate motor coordination in simple activities, difficulty in complex movement actions.	Prepare alternating activities with high and low intensity to maintain focus and motivation.
2 (6 years)	F.90 (Attention deficit hyperactivity disorder, predominantly inattentive subtype) F81.3 (Mixed developmental disorder of school learning)	Significant difficulties with concentration and sustained attention, tendency to be distracted. (DSM-5: 314.00). Difficulty with arithmetic, reading, and spelling (DSM-5: 315.1-315.2)	Moderate motor coordination in simple activities, difficulty in complex actions of precision in coordinated movements.	Promote activities that promote agility with positive reinforcement and integrating the areas of logical-mathematical reasoning and language.
3 (6 years)	F.90.1 (Attention deficit disorder) predominantly hyperactive/impulsive)	Significant difficulties in social context has difficulty waiting for turn, interrupts or performs actions without waiting or receiving permission (DSM-5: 314.01)	High energy, adequate motor coordination in simple activities, difficulty in complex motor actions of precision, coordination and perception.	Encourage participation in activities that promote agility and coordination, giving instructions on how to order, deliver and collect sports equipment, positive reinforcement and motivation.

This research focused on employing a mixed, sequential, and experimental design that allowed for a comprehensive understanding of the effectiveness of the exercise system by combining the objectivity of quantitative data with the depth of qualitative data. This methodology sought to explain how ET influenced the motor development of students with ADHD in a practical educational environment.

The study used a mixed approach combining experimental, pre- and post-intervention measures and a phenomenological design. In the quantitative component, observation sheets were used to assess progress in HMB; teacher surveys to measure perceptions about ET; and validations by seven experts, in which five specialists with experience in inclusive education and curricular adaptations participated. Each instrument was subjected to an evaluation process based on a Likert scale from 1 to 5.

Direct observation allowed to investigate the phenomenon in its external manifestation and its causes, to disintegrate the intrinsic cause of the problem as a fundamental part of participant observation in the initial phase of the work, to then move on to experimentation, through activities with a multilateral, multifaceted and multidisciplinary purpose that allowed the subject of study to interact with the environment in an affective and effective way, the declaration of the dimensions for the inclusion of students with ADHD and conventional students in the sample, and to reveal and explain the phenomenological characteristics of the object of study.

According to the methodological design, the additional observation technique was applied as an instrument, the HMB battery, for children between five and seven years old, designed and validated by (González, 2021). The instrument evaluated the HMB, through three dimensions and 16 tests: locomotion (five tests), manipulation (eight tests) and stability (three tests), each test was evaluated with a maximum of five points.

In the qualitative component, interviews were conducted with a PE teacher and students; after the intervention, their experiences and perceptions about the impact of the applied exercise system were explored. Structured surveys were conducted with classroom teachers with a sociological interest that allowed their opinion to be known, and with the documentary analysis, relevant information was collected to differentiate it with presentations of documents associated with the subject.

The methods applied in the theoretical foundation phase of the study were synthetic analysis, analysis of results and construction of conclusions, expressed through the

hypothetical-deductive method; the scope of the research was associated with the applicative-explanatory method, supported by descriptive and inferential statistics.

The application of the methods allowed to find the causes of the problem to be solved. An analysis of educational documents and study plans present in the institution was also carried out. The systemic-structural-functional method was used to conceive the system of adapted exercises, prioritizing the analysis of the interrelations between the different components of the system, the structure and function of each proposed exercise.

The statistical mathematical method allowed the processing of the data obtained, in an objective and reliable manner, the tabulation and characterization of open questions was used. The analysis was based on the theoretical support of various authors and on the process of inclusion in the PE class, which led to identifying five relevant dimensions to evaluate the field work and carry out a systematic work that delved into the object of study, and identified areas to develop or improve, to achieve the established objectives.

Table 3. *Evaluation of the level of inclusion.*

Dimensions	Low	Medium	High
Interaction and Participation	4 - 9	10 - 15	16 - 20
Respect and Empathy	3 - 7	8 - 11	12 - 15
Adaptation and resources	3 - 7	8 - 11	12 - 15
Achievements and developments	4 - 9	10 - 15	16 - 20
Atmosphere and sense of belonging	1 - 2	3 - 4	5
Inclusion	**15-35**	**36-55**	**56-75**

The quantitative data were analyzed using descriptive statistical techniques (observation and survey) and comparative techniques to evaluate the knowledge of classroom teachers and the results of the HMB tests, using appropriate statistical tests to determine significant differences before and after the intervention. The qualitative data from the interviews with PE teachers and students allowed to identify conclusive evidence on the applied research proposal.

For this reason, the need for cooperation from the educational community to promote a pedagogical and didactic approach that fostered moral values as the central axis of inclusive training was relevant. The general objective was to create a system of ET exercises focused on the development of HMB, with the purpose of improving academic performance and contributing to the comprehensive well-being of students, both in their current school stage and in their future development.

RESULTS & DISCUSSION

The expected results were based on a phenomenological design, since the aim was to describe the experiences of a particular group that shared the same teaching-learning environment. They were presented at two moments, since they were collected in observation sheets, at the beginning to determine the diagnosis of the HMB and the level of inclusion in the PE class.

Each exercise was evaluated on a Likert scale, accompanied by correct execution, performance, predisposition and integration among peers. The execution of each session of the exercise system was two 45-minute class periods; the global and systemic-structural-functional method was applied, together with a didactic sequence that is a fundamental part of Lasallian pedagogy, followed by an evaluation process that included a pre- and posttest, to observe the changes in the students.

Description of the results

According to the observation sheet carried out during the PE, developed in a regular class, without the implementation of the proposal, it was found that the level of inclusion was low; little interaction with the resources, due to the lack of adaptations within the class; therefore, the sense of belonging, interaction and participation in the activities had to be reinforced and increased.

In the in-depth interview with PE teachers, they stated that they had not received training on the special educational needs of students with ADHD, and that what was done was empirical. Regarding the detection of the level of motor development, they mentioned that

at the beginning of the school year a diagnostic evaluation was carried out, and the didactic sequence was used for the development of the classes; however, no techniques or strategies were applied to work with these students. They also recognized the need for support from parents, teachers, and the DECE to achieve the objectives of the school year, and for training to know and use methods that benefit motor and cognitive development.

As a result of the interview with the family of the student with ADHD, it was revealed that they sought professional help, felt surprised at the diagnosis of the disorder, had difficulties with obeying instructions at home, with carrying out the daily routine, creating study habits, the importance of emotional reward, communication, discipline, clear rules, interaction to know what is easy or difficult for them to learn, and the observation of improvements in their behavior. When addressing the challenges they faced, they raised the issue of lack of time to maintain communication, the desire to learn about ADHD, and the need for support from students for future studies.

In the interview with students with ADHD, they expressed their liking for classes with music exercises, breathing exercises to relax, the use of balls that made them feel confident in their grip and balance, and hugs at the end of classes.

After the pre-experiment, a significant transformation was observed, as an increase in the level of inclusion, the sense of belonging, and participation in activities was achieved, in interaction with adapted resources within the classroom.

Table 4. *Level of inclusion according to the observed dimensions*

Dimensions	Low	Medium	High	Total score	Level of inclusion
Interaction and Participation.	6			35	Low Level
Respect and Empathy		12			
Adaptation and resources	5				
Achievements and developments		8			
Atmosphere and sense of belonging		4			
Inclusion	(15-35)	(36-55)	(56-75)		

As a result of the quantitative analysis, the average of overall inclusion in the observed group was 34 points on the Likert scale, according to the 33rd and 66th percentile, which represented a low level. It was observed that the students showed respect and empathy in addition to valuing the achievements of their peers.

Improvements were considered to be made through the proposal to reinforce the sense of belonging, interaction and participation, since before the application of the exercise system, they felt little included in the activities. Below are the results obtained after applying the Combrach alpha with the battery to evaluate the HMB of students with ADHD.

Table 5. *Results of analysis of collected information.*

Categorized Ideas	Analysis of observation	Analysis of the semi-structured interview	Codes
Social integration	During the system sessions, an increasing interaction between students with ADHD and their peers was observed. At the beginning, the student was isolated, however, with the adaptations, visual materials, use of music, relaxation exercises and hug therapy, the peers interacted together.	Teachers mention that the class has become inclusive, the classroom teacher says "I see that they are more integrated and are predisposed to carry out the activities, especially the student with ADHD."	Improve communication. Active participation. Empathy between peers.
Skills Development	Progress in motor skills is recorded, evidenced by correct execution in the directed exercises.	Students show increased self-confidence and skills, students say "Now I can catch the ball better than before and without dodging it"	Motor improvement. Increased confidence. Development of motor and cognitive skills.
Attitude and Perception	Students' reactions during and after the exercises show positive progress in the adaptations and inclusion of classmates with ADHD.	Students express positive emotions: "I like the dances, the exercises, we all do them and also the group hugs at the end of classes, they make us feel good"	Positive skills. Accept adaptations. Group empathy. Pleasant feelings.

The surveys applied to classroom teachers showed that most shared subjects at the same level and that the main barriers they faced in implementing ET strategies were the lack of

workshops, materials, educational resources, and training in this area of teaching; in relation to the PE class, they mentioned the need for training on this topic in order to implement appropriate strategies.

The exercise system designed for inclusion in PE classes from the interaction and development of the HMB in students with ADHD, was based on the results obtained, combining activities emphasized with the didactic sequence of inclusion and the development of the HMB in synergy with ET exercises. The contribution of the present work is corroborated by what was presented by Albornoz and Hernández (2020); Crespo (2018); Incarbone et al. (2012).

The objectives of the exercise system were:

1. Promote the integration of students with ADHD, through systematized activities from simple to complex.
2. Improve and develop the HMB of students with ADHD.
3. Promote a safe, enjoyable, and effective learning environment that encourages active participation by students with ADHD.

The implemented system had four phases:

Phase 1. Diagnosis

Aim: Identify the characteristics of the study group investigated, in this phase it was essential to carry out the following actions:

- Selecting instruments to apply: DECE diagnostic observation and review guide.
- Preparation and management of the instruments to be applied, evaluation criteria and indicators of the HMB and inclusion.
- Instruments application.
- Tabulation of results
- Recognition of the results obtained from the diagnosis.

The diagnosis guaranteed the characterization of ADHD in students and enabled the adaptation of physical activities, implements to be used, context and student preferences.

Phase 2. Planning

Aim: planning of the activities to be carried out, the didactic sequence was taken as a basis to catapult the inclusion of students with ADHD and their peers, the following actions were specified:

- Selection of exercises with the essential adaptations.
- Preparation of activities within the projection.
- Conducting classes in accordance with systematization.

Table 6. *Example of the activities of the prepared planning.*

TEACHING SEQUENCE PLANNING								
Basic Motor Skills	Recognize the body schema							
Aim	Correctly develop and recognize the body schema, through stationary exercises for the correct use of the body in future activities.							
Method	Global and systemic structural.							
Duration	2 periods of 45 minutes.							
Resources	Speaker, human body parts, cones, plates, mats, balls and hoops (ulas).							
Activity	Developing the body scheme: traveling ball.							
Day 1 and 3 of the week (Wednesday and Friday)	Workplace	Volume	Intensity	Series	Repetitions	Density		
	Classroom or sports hall						MICRO BREAK	MACRO PAUSE
Initial part of the session (15 min)	Prescription/activity	13 min	Moderate				2 min After the warm-up- I lie	

	Motivation	Ejaculation: Let us remember that we are in the holy presence of God… Let us adore Him: " Lord, guide our body and strengthen us in every exercise. Amen." Cognitive Dissonance: Do I know the parts of my body? Purpose: to recognize the parts of the human body.		Mild	
START	Framing	Rules: Establish clear rules and regulations for the class. Restorative actions: You will get extra points for assertive participation in class. Adaptations: Give encouragement, motivate, value achievements, positive reinforcement, and remind students of instructions with rules. Sensory warm-up (with music): *1 Deep breathing, joint mobility and lubrication, increased heart rate with walking, jogging and the fruit game (makes a body movement when mentioning a certain fruit; E.g. mango = polichilenas). Adaptations: location in a strategic place, constant feedback , valuing achievements and positive reinforcement.		Mild Moderate	
	Main part of the session (20 min)	Prescription/activity			
DEVELOPMEN	Enunciation	Name of the exercise: traveling ball Explanation of the activities. Familiarization with the body parts using the ball. Adaptations: Student-teacher and encouragement.	2 min	Mild	1 min

Modeling	Teacher shows how to perform each movement and names the body parts using the ball at each hoop station. Description: A circuit of hoop stations is formed. Students walk to each station where they observe an image of the human body that they touch with the ball provided. Station 1: ball on the head. Station 2: ball on the forehead, etc. and so on with each body part. Adaptations: Images of the different body parts at each station, constant feedback , assessing achievements and positive reinforcement.	2 min	Moderate	2 series	1 min	2 min. after the stations
Simulation	Teachers and students perform the exercise following the instructions, forming work groups, providing support, correcting errors and clarifying doubts at each station of the exercise. Adaptations: Images of the different parts of the body at each station, constant feedback , assessing achievements and positive reinforcement.	2 min	Moderate	2 series	1 min	2 min. after the stations
Exercise	Student performs only the exercise demonstrated by the teacher, works correctly at each station, has skill in the exercise by reducing the time spent at each station. Adaptations: grade effort level, assess exercise performance, continuous motivation and feedback .	2 min	Moderate	2 min	1 min	2 min. after the stations
Demonstration	Students demonstrate mastery of each exercise by using the ball on the bodies of their classmates located at the different stations. Adaptations: congratulate achievements and promote those not achieved and motivate.	2 min	Moderate	2 min	1 min	2 min. after the stations
Final part of the session (10 min)	Prescription/activity					

CLOSING	Synthesis	Cool down (with music): *2 Remember the name of the exercise. (Feedback). Breathing and relaxation exercises (5 min) Hug therapy (group hug between everyone, 1 min). Ejaculation: Long live Jesus in our hearts. Forever! Body hygiene.	8 min	Mild	2 min after the cool down
	Homework	Do the exercise learned in class with your parents.		Mil	
OBSERVATIONS: References/Bibliographic resources:					
*1: https://youtu.be/ZIiukxvv424?si=g2g1ePQvbEhiIES7 *2: https://youtu.be/UQW1C8j0FZo?si=YZ19luQrDieL9eAd					

Phase 3. Execution

Aim: execution of the activities provided for in the ET plan, for the development of HMB in students with ADHD, through the following actions:

- Appropriate use of teaching resources and media.
- Primary use of the system within the exercises, organization and interaction of proprioceptive motor learning.
- Use of the teaching sequence through motivation, framing, enunciation, simulation modeling, exercise, demonstration, synthesis and conclusions (home assignment).
- Application of activities within planning.

Phase 4. Control and progress

Objective: to check the level of effectiveness of the exercise system in the PE class, through the following actions:

- Selection of dimensions and indicators (Table 3), in favor of continuous improvements.
- Use of mathematical and statistical methods.
- Tabulation of pre- and posttest results.

- Analysis and synthesis of the results obtained.

In this part of the research, the results obtained from observing the activities at both moments of the experiment showed that the first described the results and the second confirmed the level of importance in the application of the proposed system.

Table 7. *Pre and post evaluation results of the HMB*

Basic motor skills test	ADHD 1		ADHD 2		ADHD 3		Total	
	PRE	POST	PRE	POST	PRE	POST	PRE	POST
March	3	5	3	5	3	5	3.00	5.00
Run	3	5	3	5	2	5	2.67	5.00
Horizontal Jump	3	5	2	5	2	5	2.33	5.00
Jump with right foot	3	5	3	5	2	5	2.67	5.00
Left foot jump	2	5	1	4	2	5	1.67	4.67
Locomotion								
Throwing with both hands	2	5	3	5	3	5	2.67	5.00
Right hand throw	3	5	3	5	2	5	2.67	5.00
Left handed throw	2	5	2	5	1	4	1.67	4.67
Catch with both hands	2	5	2	5	2	5	2.00	5.00
Kick with right foot	3	5	3	5	2	5	2.67	5.00
Kick with left foot	2	5	2	5	1	5	1.67	5.00
Reception with right foot	2	4	3	4	2	4	2.33	4.00
Left foot reception	2	3	2	3	1	3	1.67	3.00
Handling								
Dynamic balance	2	5	3	5	3	5	2.67	5.00
Static balance with right foot	2	5	2	5	2	5	2.00	5.00
Static balance with left foot	2	4	2	4	2	4	2.00	4.00
Stability								
Basic motor skills	38	76	39	75	32	75	36.33	75.33

Once the exercise system was developed, it was implemented in the research sample over a period of 90 days. Empirical validation was carried out through the pre-experiment with the support of the observation guide that evidenced the data collected. Along with this procedure, the document review method was used to analyze the programming of the exercise system, the teacher's planning and the record of individualized attention of the students.

Table 8. *Pre- and post-inclusion level results*

Dimensions	Pre - test rating	Observations (Relevant/ Comments)	Posttest Rating	Observations (Relevant/ Comments)
Interaction and Participation	6	Needs reinforcement.	18	He/she shows willingness to participate in activities.
Respect and Empathy	12	It is very pleasant to interact with peers.	14	It is very pleasant to interact with peers.
Adaptation and resources	5	It is necessary to adapt resources to improve your skills development process.	14	He/she uses adapted resources and is willing to organize them in each class.
Achievements and developments	8	Brotherhood is present in the group.	16	The group is full of brotherhood and always collaborating with the teacher, respecting and motivating their classmates.
Atmosphere and sense of belonging	4	Needs reinforcement.	5	He/she feels like an indispensable part of the classes alongside his classmates.

The system was developed over a 12-week period with 45-minute sessions, which were implemented in a time frame suitable for the adaptation and the process of experiences of students with ADHD. Each session of the system was planned in favor of the construction of learning with feedback from previous sessions; the systematized structure guaranteed a path conducive to student adaptations. The contribution of the proposed system allowed to resolve several deficiencies of the HMB in PE classes; the contents of the system had a sociological, pedagogical, didactic and inclusive conception.

The results obtained in the present research coincided with the assessments made by Guillen et al. (2019) on the strategies focused on sensory-motor stimulation, for the development of HMB and familiarization with specific motor skills.

Similarly, Pérez et al. (2022) stated that offering experiences through motor actions at the primary level linked to joy, pleasure, enjoyment, and enjoyment served to improve HMB; and Castro et al. (2023) highlighted the current relevance of HMB and academic performance in primary school students, the unification of motor development programs in

the school environment. This postulate reinforced what was stated in the system, by providing highly integrative and inclusive activities.

The work carried out by Castillejo et al. (2024) showed which activities with a systemic-structural-functional approach were effective for the development of HMB in students with ADHD, and the positive transformations in the group, after their application.

On the other hand, accessibility and use of resources was a determining factor in the success of curricular adaptations, as pointed out by Pachito et al. (2024) who argued the need for a proactive approach, and the strengthening of inclusive practices, to ensure that all students, especially those with ADHD, had equal opportunities to participate and benefit from the educational experience; these practices were promoted and systematized in classrooms, and effectively contributed to their comprehensive development, by promoting more meaningful and lasting learning.

CONCLUSIONS

In this work, it was demonstrated that the use of exercises adapted to the EN of students with ADHD fostered a collaborative environment, improved and developed the BHM. The effectiveness of PE for multimodal treatment, based on the systematization of relevant research, facilitated the creation of an inclusive and equitable learning environment, which reinforced the importance of curricular planning with comprehensive participation.

The proposed system in the socio-emotional and cognitive aspects demonstrated its effectiveness by positively transcending in the context of the PE class, with a high level of acceptance. The expansion of the proposed system served as a multidisciplinary contribution to the different subjects and achieved a favorable impact on the students, since relevant transformations were evident that marked and served as a model for future studies.

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The author is responsible for writing the work and analyzing the documents.