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Development of basic motor skills in children with attention deficit and hyperactivity disorder, in Physical Education

Desarrollo de habilidades motrices básicas en niños con trastorno por déficit de atención e hiperactividad, en Educación Física

Desenvolvimento de habilidades motoras básicas em crianças com transtorno de déficit de atenção e hiperatividade na Educação Física

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ABSTRACT

The development of basic motor skills in children with attention deficit and hyperactivity disorder is studied and the objective was to design and validate an inclusive teaching strategy in an educational unit in Ecuador, using a mixed and pre-experimental methodology. An intentional and stratified non-probabilistic sampling was used, with inclusion criteria, the sample was made up of five children with attention deficit and hyperactivity disorder, in their class group, and their Physical Education teacher. The measurement of the inclusion-attention variables of the disorder with an educational



approach and the development of basic motor skills was carried out using eight indicators, with the use of an observation guide, documentary analysis, and supported by the simple scoring technique to group the observed data. As a result, an inclusive didactic strategy is presented for the development of basic motor skills in children with attention deficit and hyperactivity disorder during Physical Education classes, designed through the structural and functional systemic approach that showed its effectiveness in the educational practice, when comparing the results of the pre- and post-test, through the non-parametric test of signs.

Keywords: Inclusive physical education, teaching strategy, basic motor skills, hyperactivity

RESUMEN

Se estudia el desarrollo de habilidades motrices básicas en niños con trastorno por déficit de atención e hiperactividad y se planteó como objetivo diseñar y validar una estrategia didáctica inclusiva en una unidad educativa del Ecuador, con el empleo de una metodología mixta y preexperimental. Se utilizó un muestreo no probabilístico intencional y estratificado, con criterio de inclusión, la muestra la conformaron cinco niños con trastorno por déficit de atención e hiperactividad, en su grupo clase, y su docente de Educación Física. La medición de las variables inclusión-atención del trastorno con enfoque educativo y el desarrollo de habilidades motrices básicas, se realizó mediante ocho indicadores, con el empleo de una guía de observación, el análisis documental, y apoyada en la técnica de tarjado simple para agrupar los datos observados. Como resultado se expone una estrategia didáctica inclusiva para el desarrollo de las habilidades motrices básicas, en niños con trastorno por déficit de atención e hiperactividad, durante las clases de Educación Física, diseñada a través del enfoque sistémico estructural y funcional que mostró su efectividad en la práctica educativa, al comparar los resultados del pre- y postest, por medio de la prueba no paramétrica de los signos.

Palabras clave: Educación Física inclusiva, estrategia didáctica, habilidades motrices básicas, hiperactividad



RESUMO

Estuda-se o desenvolvimento de habilidades motoras básicas em crianças com transtorno de déficit de atenção e hiperatividade e o objetivo foi desenhar e validar uma estratégia de ensino inclusiva em uma unidade educacional no Equador, utilizando uma metodologia mista e pré-experimental. Foi utilizada uma amostragem não probabilística intencional e estratificada, com critérios de inclusão, a amostra foi composta por cinco crianças com transtorno de déficit de atenção e hiperatividade, da sua turma, e seu professor de Educação Física. A mensuração das variáveis inclusão-atenção do transtorno com abordagem educativa e desenvolvimento de habilidades motoras básicas foi realizada por meio de oito indicadores, com uso de guia de observação, análise documental e apoiado na técnica de pontuação simples para agrupar os dados observados. Como resultado, apresenta-se uma estratégia didática inclusiva para o desenvolvimento de habilidades motoras básicas em crianças com transtorno de déficit de atenção e hiperatividade durante as aulas de Educação Física, desenhada através da abordagem sistêmica estrutural e funcional que mostrou sua eficácia na prática educativa, ao comparar os resultados. do pré e pós-teste, por meio do teste não paramétrico de sinais.

Palavras-chave: Educação física inclusiva, estratégia de ensino, habilidades motoras básicas, hiperatividade

INTRODUCTION

Attention deficit and hyperactivity disorder (ADHD) is the most common psychiatric disorder in childhood; it is a chronic process with a high comorbidity that will influence the functioning of the individual in adulthood and affects several facets of the infant's life from school, social and family point of view; considerations that make it a topic of interest to the scientific community in general, but with greater emphasis on the pedagogy sectors.

ADHD generates an impact on contemporary society that causes significant economic expenses, family stress, and academic and vocational problems. It also causes effects in



reducing the self-esteem of people who suffer from it and hinders the correct development of the activities that human beings face (White et al., 2020).

According to studies, where those by Gámez et al stand out. (2022); Posner et al. (2020); Secanell and Núñez (2019), the etiology is not completely clarified, it seems evident that it is a multifactorial disorder with a biological brain basis and genetic predisposition that interacts with environmental factors; which makes the diagnosis and management of children difficult.

In general, researchers from the Center for Disease Control and Prevention (2022) agree that inattention, hyperactivity and impulsivity constitute the three fundamental cores of ADHD. That is why, professionals identify them as the main therapeutic and pedagogical targets to keep in mind when caring for these children. On the other hand, Mills et al. (2019); Ortiz et al. (2020); Sanabra et al. (2021) consider that ADHD transcends the socio-cultural and economic level. This means that its prevalence represents 5% of the world population and its main limitation is that, in 75% of cases, the symptoms last for life.

There are several aspects where children with this disorder interact, but without a doubt, in education in general and Physical Education (PE), in particular, they require teaching resources that allow this special educational need (SEN) to be addressed differently, with an inclusive focus, which is associated with the development of pedagogical skills of the professional in this area of knowledge.

For their part, authors such as Lafebre and Aldas (2022); Rodríguez et al. (2022) maintain that inclusive PE refers to the participation of all students, according to their potential and characteristics, regardless of their skills, knowledge and capacities to perform in class. Evaluations that are shared by the authors of this research.

Based on the arguments expressed, it can be argued that the productive methods of PE every day support teaching from an inclusive approach, where joint elaboration, the game method and guided discovery are important elements for a class from this perspective (Bennasar 2022; González et al., 2022).



To achieve a truly inclusive PE class, it is essential to keep in mind the needs and characteristics of each student. Combat discriminatory language immediately and physical activities and adapted games should be encouraged and organized in teams, as they are a good tool to practice inclusion and encourage exchange.

The theoretical debate carried out allows to affirm that there is potential in PE to offer a class with an inclusive approach, which demands adequate didactic attention to students with ADHD. However, the process in physical-educational practice is not always a faithful reflection of the theoretical postulates.

In the educational unit that serves as a reference for the study, low levels of cooperation between boys and girls during PE classes, and poor didactic treatment of motor skills that, in essence, do not reveal enough adaptations for children with ADHD are frequently observed. In this direction, the objective is proposed to design and validate an inclusive teaching strategy for the development of basic motor skills, in children with ADHD, during PE classes.

MATERIALS AND METHODS

The research carried out was experimental with a mixed approach. The pre-experiment variant was used with a single group, a pretest was applied, then the independent variable was introduced and finally a posttest. Subsequently, a comparison was made between both tests, using the non-parametric technique of signs, to show the existence or not of significant differences. The measurements were taken into account by the same personnel and the observations at the same time and context.

The study population was made up of all teachers and students at the elementary level of an important educational unit in the Portoviejo canton, in the Republic of Ecuador, as explained in Table 1. Intentional and stratified non-probabilistic sampling was carried out in the research, where the inclusion criterion of the sample was the parallel -class group with the largest number of children with attention deficit and hyperactivity disorder enrolled, and their PE teacher. As a result, the research sample was made up of five children



with ADHD and the PE teacher. In determining the sample, it was had the support of the Student Counseling Department (DECE) of the aforementioned educational unit.

Table 1. Study population and sample

Strata	Population	Sample
Children	69	22
Children with ADHD	15	5
Teachers	3	1
Total	85	28

The theoretical study of the variables involved together with their empirical manifestations in the indicated educational unit allowed, through the use of the structural and functional systemic approach technique, the design of the inclusive didactic strategy for the development of basic motor skills in children with ADHD, during PE classes.

Once the strategy was designed, it was applied to the research sample for a period of 60 days. Its empirical validation was carried out through pre-experiment with the support of an observation guide for data collection. Likewise, from the empirical point of view, the document review method was used to analyze the planning or programming of the teacher's class and the record of individualized attention of the students. For its quantification, the simple scoring technique was used, which consists of grouping the observed data in series of five for better quantification.

In order to obtain the data from the different sources of information declared in stratified sampling, it was necessary to operationalize the variables, with the objective of obtaining the indicators to be able to observe them. Which can be seen in the following table.



Table 2. Dimensions and indicators used in the research.

Dimensions	Indicators
Educational inclusion of children with ADHD in PE class.	1-They show participation in the cooperation activities guided by the teacher. 2-They carry out the interaction as guided by the teacher. 3. They communicate with the group members and the teacher.
Development of basic motor skills.	4-They show adequate participation in the development of basic motor skills. 5-They demonstrate adequate performance in the activity of basic motor skills.
Attention to attention deficit and hyperactivity disorder in children.	6-They pay attention to the instructions and tasks oriented by the teacher during PE class. 7-They interact with their classmates and the teacher during PE class. 8-They express restlessness, impulsivity and distraction during PE class activities.

RESULTS

Next, a synthesis of the didactic strategy carried out in the research is presented, showing the main phases and actions that are interrelated with each other. The proposed strategy has the following components: general objective, phases and actions. The objective of the strategy is to promote inclusion from the development of basic motor skills in children with ADHD, during PE class. Structure of inclusive didactics for the development of basic motor skills, in children with ADHD, during PE classes:

Phase 1. Diagnosis

Its objective is to: identify the main characteristics of the group of students investigated. During this phase it is necessary to carry out the following actions:

- Selection of the instruments to apply (observation of PE classes and review of the teacher's documents)



- Preparation of personnel on the handling of the instruments, in particular, criteria on the indicators to be observed, the form of data tabulation and how to interpret the results are unified.
- Conducting a seminar on two specific contents, the first on the characteristics of children with ADHD and the second on the main elements of an inclusive PE class.
- Application of instruments.
- Tabulation of the results.
- Identification of the regularities emanating from the diagnosis.

The result of the diagnostic study must guarantee, not only the knowledge of the particularities in relation to the need for the student's disorder, but also the possibilities of adaptation of physical activities, instruments or implements, the context and their likes and preferences.

Phase 2. Planning

Objective: plan the activities to be carried out in the PE class, to achieve the inclusion of children with ADHD.

Actions:

- Hold a talk about ADHD and its main characteristics, manifestations and behavior followed by children.
- Selection of activities and analysis of their adaptation possibilities.
- Brainstorm ideas about forms of instrumentation in the inclusive PE class.
- Preparation of the activity plan.
- Carry out class planning.

Phase 3. Application

Objective: apply the activity plan to develop basic motor skills in children with ADHD during PE class.



Actions:

- Manage auxiliary media and other teaching resources.
- Analysis of the PE practice area and organizational forms for interaction and motor learning.
- Conduct preparation workshops.
- Apply the activity plan.

Example of one of the activities of the prepared plan

Activity Name: Sensory Ball Relay Race

Necessary materials:

- Sensory balls of different sizes, textures and colors.
- Cones or markers to create lanes on the ground.
- An outdoor space or gym with enough room to run.

Instructions:

Preparation: Cones or markers are placed to create lanes on the ground so there is enough space for children to run without bumping into each other. The sensory balls are distributed in a line, at one end of the playing area.

Team formation: Children are divided into small teams of equal size. It is tried to ensure that teams are balanced in terms of skills and special needs.

Basic Rules: The basic rules of the relay race are explained and include passing a sensory ball from one team member to the next. The goal is for all team members to complete a lap of the lane with the ball and then deliver the ball to the next runner.



Inclusive adaptations:

- Children with ADHD are given constant activities to avoid the inattention that is a characteristic trait in them.
- He is given roles of checking the rules in order to control his characteristic impulsivity a little.
- The pace of activities is systematically changed to control hyperactivity.

Celebration: Celebrate the achievements of all teams and emphasize the importance of working together and having fun.

Phase 4. Evaluation and improvement

Objective: compare the level of effectiveness of the inclusive teaching strategy.

Actions:

- Select the dimensions and indicators (table 2).
- Apply the statistical and mathematical methods described above.
- Tabulate the results (use the charting technique).
- Analyze the results.
- Prepare an improvement plan.

In this section of the research, the results obtained during the observation of 10 teaching activities are presented, in both moments of the pre-experiment carried out, which goes through two fundamental steps, the first, the description of the results and the second, the knowledge of the level of significance.

Step 1. Description of the results obtained

Dimension 1. Educational inclusion of children with ADHD in PE class



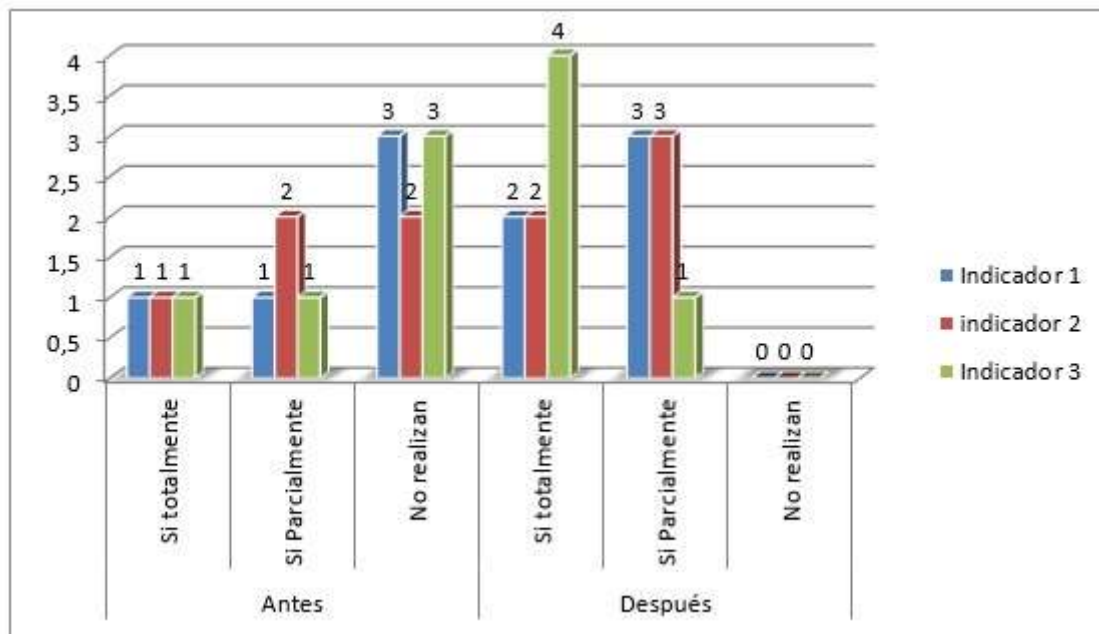


Figure 1. Results of the first dimension

In correspondence with the indicators of this dimension, an assessment is made between before and after applying the strategy, as illustrated in Figure 1.

Results of indicator 1 of the educational inclusion dimension of children with ADHD in PE class. When evaluating the results obtained in this indicator, it can be seen that before applying the strategy, only one student, for 20% of the sample, meets the requirements of the indicator to be placed in the category, yes completely. While in the partially yes, a student is also located for the same percentage. The remaining three students representing 60% are in the non-performing category. These results denote very low levels of inclusion in the PE class.

However, an important transformation can be seen during the second moment of the pre-experiment, since two students, for 40% of the sample, are in the yes completely category and the remaining three, for 60%, are in the yes partially category; no student is found in the category, they do not perform. These results denote that the developed strategy has been effective.



Results of indicator 2 of the educational inclusion dimension of children with ADHD in PE class. The results of this indicator are similar to those of the previous one, at the moment before applying the strategy, it is evident that only one is located in the yes completely category; while two do it partially and that same amount is located in the category of not doing it; after the strategy was implemented, as in the previous indicator, there were improvements in the sample studied, since two students achieved yes completely and the remaining three achieved yes partially. These results show that the strategy influences the transformation of the sample.

Results of indicator 3 of the educational inclusion dimension of children with ADHD in PE class. Analyzing the results of this indicator shows that only one student is located in the yes completely category at the time before applying the research, one in yes partially and three in the category they do not do. After applying the strategy, there are important improvements, since in the totally yes category there are four students for 80%, in the partially yes category there are one, for 20%. It is noteworthy that none of the students at this point in the research are in the category of not performing, aspects that denote the important changes that have occurred in the indicator.

Dimension 2. Development of basic motor skills

The results of this dimension are represented in figure 2. They are described below.



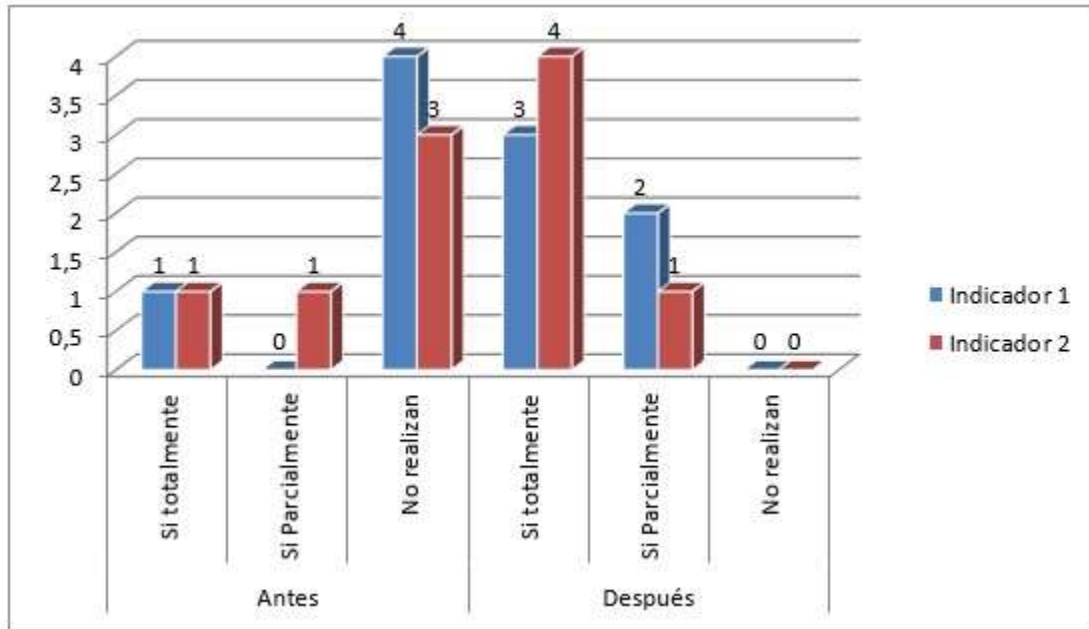


Figure 2. Results of the second dimension

Results of indicator 1 of the dimension development of basic motor skills. In the first indicator of this dimension, it is observed that before applying the strategy, only one student, for 20%, is in the highest category of the scale, none is located in the yes partially and the majority, 80%, did it in the they do not perform, aspects that show that there are limitations.

In the second moment of the study carried out, after applying the strategy, important improvements are evident, three students are in the highest category of the scale and two, in itself partially, this denotes the effectiveness of the presented strategy.

Results of indicator 2 of the dimension development of basic motor skills. When evaluating the results of the second indicator, it can be seen that they are very similar to the previous ones, one student is located in the maximum category of the scale, one, partially, and 60% in what they do not do. Once the developed strategy has been applied, important transformations are evident in the sample, since four are located in themselves completely and one in itself partially, thus confirming the importance of the proposal presented.



Dimension 3. Attention to attention deficit and hyperactivity disorder in children

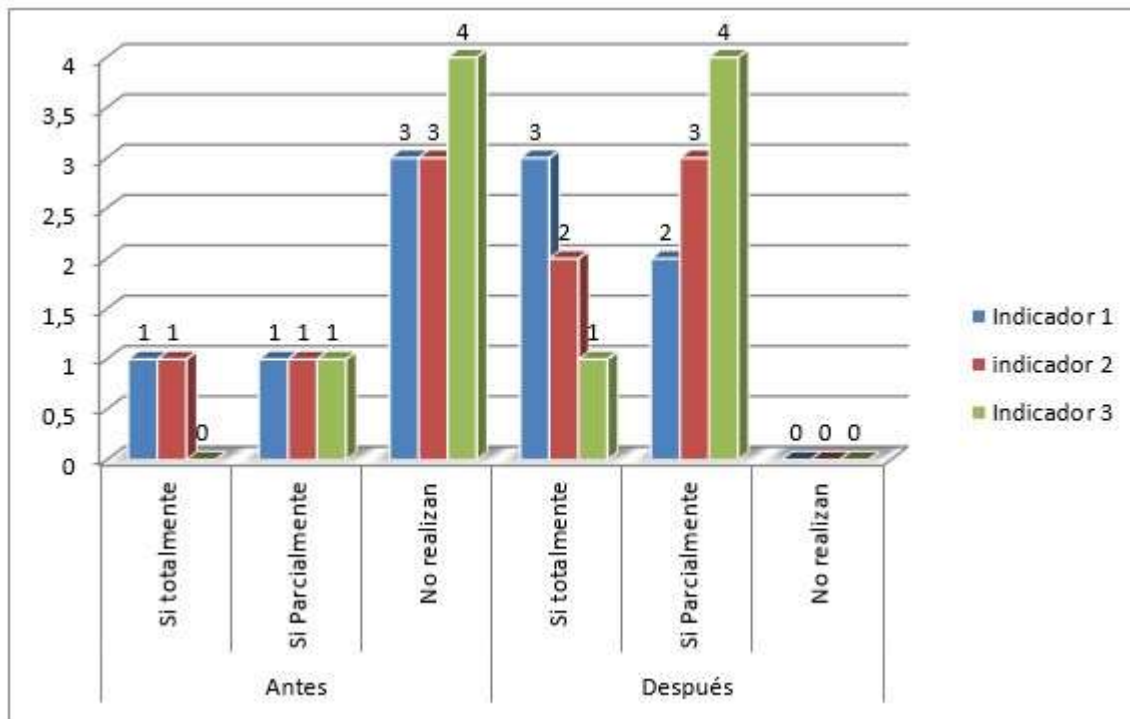


Figure 3. Results of the third dimension

Results of indicator 1, dimension of attention deficit and hyperactivity disorder in children. When analyzing the results of graph 3, it is observed that in this indicator, before applying the proposal presented, only one student is in the totally yes category, one in partially yes and three in do not perform; after applying the resources of the strategy, three are located in yes completely and the remaining two in yes partially; transformation that demonstrates the effectiveness of the activities of the inclusive PE class in the improvement of these children.

Results of indicator 2, dimension of attention deficit and hyperactivity disorder in children. The results are similar to the previous ones, one is located in the category with the highest score on the scale, one, partially, and the majority were located in not performing; once the strategy has been applied, two are observed in the category of yes completely and three in yes partially, this points towards the effectiveness of the developed strategy.



Results of indicator 3, dimension attention deficit and hyperactivity disorder in children. In this indicator, at the initial moment of the research, no student was in the category with the highest score on the designed scale, only one in yes partially and 80% do not perform. In the second moment, one student was placed in the yes completely category and the remaining four, for 80%, yes partially.

When analyzing the results in a general way, a positive transformation is observed in the investigated sample in all indicators. Aspect that denotes the level of effectiveness of the strategy.

Step 2. Knowledge of the level of significance

The research validation process begins with the formulation of the statistical hypothesis that constitutes the starting point in the organization of the inferential statistics used to know the significance between both moments of the pre-experiment.

Statistical hypothesis:

H₀: $m = m_0$ H₀: The inclusion in the development of basic motor skills, in children with ADHD, during PE classes remains the same after the didactic strategy is applied.

H₁: $m \neq m_0$ H_a: The inclusion in the development of basic motor skills, in children with ADHD, during PE classes changes after the teaching strategy is applied.

Setting the level of significance. In the case of this research, the confidence level of $\alpha=0.05$ was set, equivalent to 95% reliability, which allows giving a higher level of significance to the results obtained in the pre-experiment carried out.



Interpretation:

Table 3. Results of the application of the sign test.

Contrast statistics			
	Educational inclusion after - Educational inclusion before	HMB after - HMB before	ATDAH after - ATDAH before
Exact sig. (bilateral)	0.05	0.05	0.04
a. Test of signs			
b. The binomial distribution has been used.			

Source: Processed with SPSS version 2.0

When carrying out a general analysis of each of the three dimensions selected in the research, changes are seen from one measurement to another, a significant aspect from a statistical point of view, since p does not exceed 0.05 in any of the cases, which allows to accept the scientific hypothesis of the research carried out, where H_1 is fulfilled, since it is shown that the inclusion in the development of basic motor skills in children with ADHD, during PE classes changes significantly after the didactic strategy is applied, with a value no greater than p 0.05 (table 3).

DISCUSSION

The results presented in the design of the inclusive teaching strategy coincide with the assessments made by Quitián and Bernal (2020), who affirm that the educational process must have a flexible approach that allows necessary adjustments or adaptations to be made within the teaching-learning process, in this way, inclusive PE can offer access, active and permanent participation, if it has the material, regardless of its conditions.

In that same direction, García et al. (2019) refer to the student proposing some variation of execution when performing motor actions; it is reaffirmed that flexibility must go beyond the adaptation offered by the teacher, consider the likes and preferences of the learner, actively participate and communicate, as a principle of inclusive PE.



In another direction, the work of Lozada and Vargas (2020) highlights not only the role of access, participation and integration, but also emphasizes the value of improving basic motor skills, due to the significant changes it generates in the students with special needs. This postulate reinforces what is explicit in the inclusive teaching strategy, by offering flexibility for working in pairs, groups and other organizational forms of PE, in search of support and help for motor learning.

CONCLUSIONS

In the theoretical study developed in the present research, although an extensive bibliography was found on the content, it is necessary to delve deeper into the specificity of the development of basic motor skills, since it lacks methodological tools that articulate inclusive PE with the characteristics of the children with ADHD.

The results obtained in the research showed the effectiveness of the inclusive teaching strategy to develop basic motor skills in children with ADHD, during the PE class, since after its application there were important positive transformations in the sample.

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Conflict of interest statement:

The author declares that there are no conflicts of interest.

Author's contribution:

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



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