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Estrategia didáctica para el desarrollo de la actividad motora infantil

Didactic strategy for the development of children's motor activity

Estratégia didática para o desenvolvimento da atividade motora infantil

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Resumen

El desarrollo de la actividad motora infantil constituye un eje fundamental en la formación integral durante la primera infancia, ya que incide directamente en la maduración neurológica, emocional y social del niño. El objetivo de la investigación estuvo dirigido a elaborar una estrategia pedagógica educativa, con un enfoque lúdico-multidisciplinar, que potencie el desarrollo de la actividad motora en niños de educación básica durante la clase de educación física. La investigación se desarrolló con un enfoque mixto, combinando métodos cualitativos y cuantitativos, se enmarcó dentro de un alcance descriptivo-explicativo. La validación del estudio se realizó a través de un diseño experimental, específicamente en su modalidad pre-experimental. Se implementó como instrumento evaluativo adaptado al enfoque lúdico-multidisciplinar del estudio, el Test Bruininks-Oseretsky de Proficiencia Motora (BOT-2), con el objetivo de identificar, caracterizar y evaluar las habilidades motoras de los niños sujetos de estudio. Los resultados obtenidos, evidencian que los niños con menor rendimiento inicial lograron avances significativos, mediante un enfoque progresivo y lúdico que permitió un desarrollo equilibrado entre la motricidad general y la transformación positiva de la competencia motriz, evaluada finalmente de adecuada, consolidando el valor pedagógico del plan integrador implementado en la clase de educación física.

Palabras clave: estrategia pedagógica educativa, desarrollo motor, educación física.

Abstract

The development of motor activity in children is a fundamental axis in integral education during early childhood, as it directly affects the neurological, emotional, and social maturation of the child. The objective

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of the research was aimed at developing an educational pedagogical strategy, with a playful-multidisciplinary approach, that enhances motor activity development in children of basic education during physical education classes. The research was carried out with a mixed approach, combining qualitative and quantitative methods, framed within a descriptive-explanatory scope. The validation of the study was conducted through an experimental design, specifically in its pre-experimental modality. It was implemented as an evaluative instrument adapted to the playful-multidisciplinary approach of the study, the Bruininks-Oseretsky Test of Motor Proficiency (BOT-2), with the aim of identifying, characterizing, and evaluating the motor skills of the children involved in the study. The results obtained show that children with lower initial performance achieved significant progress through a progressive and playful approach that allowed for a balanced development between general motor skills and the positive transformation of motor competence, ultimately assessed as adequate, consolidating the pedagogical value of the integrative plan implemented in physical education class.

Keywords: educational pedagogical strategy, motor development, physical education.

Resumo

O desenvolvimento da atividade motora infantil constitui um eixo fundamental na formação integral durante a primeira infância, uma vez que incide diretamente na maturação neurológica, emocional e social da criança. O objetivo da pesquisa foi elaborar uma estratégia pedagógica educativa, com uma abordagem lúdico-multidisciplinar, que potencialize o desenvolvimento da atividade motora em crianças da educação básica durante as aulas de Educação Física. A investigação foi desenvolvida com uma abordagem mista, combinando métodos qualitativos e quantitativos, e enquadrou-se em um alcance descritivo-explicativo. A validação do estudo foi realizada por meio de um desenho experimental, especificamente em sua modalidade pré-experimental. Como instrumento de avaliação adaptado à abordagem lúdico-multidisciplinar do estudo, foi implementado o Teste de Proficiência Motora de Bruininks-Oseretsky (BOT-2), com o objetivo de identificar, caracterizar e avaliar as habilidades motoras das crianças participantes da pesquisa. Os resultados obtidos evidenciam que as crianças com menor desempenho inicial alcançaram avanços significativos por meio de uma abordagem progressiva e lúdica, que possibilitou um desenvolvimento equilibrado entre a motricidade geral e a transformação positiva da competência motora, avaliada ao final como adequada, consolidando o valor pedagógico do plano integrador implementado nas aulas de Educação Física.

Palavras-chave: estratégia pedagógica educativa; desenvolvimento motor; Educação Física.

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INTRODUCTION

The development of children's motor activity constitutes a fundamental pillar in comprehensive early childhood education, as it directly influences the neurological, emotional, and social maturation of the child. During early childhood, it is crucial to consolidate fundamental motor skills and facilitate the transition toward more coordinated movements. In this regard, movement is conceived not only as a biological function but also as a means of expression, identity construction, and personality development (Vygotsky, 1978). Motor skills are the abilities that, during this period, are primarily developed to support the performance of complex activities required for participation in a wide range of lifelong activities, such as games and sports. These skills can be classified into locomotor, non-locomotor, and manipulative abilities (Bernate & Babativa, 2023).

According to Quispe *et al*. (2025), motor development during childhood constitutes an essential foundation for the child's holistic growth, enabling the acquisition of physical, cognitive, and emotional skills that promote autonomy and interaction with the environment. The early years of life are critical for the consolidation of motor patterns, and appropriate stimulation can prevent later difficulties in learning and socialization. Children's motor development is generally divided into two major categories: gross motor skills and fine motor skills. The former involves large body movements, such as running or jumping, whereas the latter refers to more precise movements, such as drawing or manipulating small objects.

In this context, authors such as Pastrana *et al*. (2023) argue that gross motor skills directly influence flexibility, coordination, and the acquisition of body schemas, making them essential for comprehensive development from the earliest years. Likewise, Cabrera and Dupeyrón (2024) emphasize that fine motor skills require systematic stimulation to achieve precision, consistency, and technical mastery in school-related tasks such as handwriting and the use of instruments. Reyes and Paradas (2023) further contend that human movement should not be understood solely as physical displacement but also as a form of communication, interaction, and meaning-making in relation to the surrounding environment. This transdisciplinary perspective recognizes motor development as a natural life phenomenon linked to the expression of emotions, beliefs, and needs (Hernández *et al*., 2024).

Motor stimulation in early childhood is systematically implemented throughout the school years, particularly among seven-year-old children, to prevent regression in previously acquired skills. The application of structured strategies enhances postural control, visuomotor coordination, and problem-solving abilities within the school environment. Pedagogical activities should be integrated in ways that enable children to develop body awareness and greater autonomy in their movements (Basurto & Grasst, 2025). In this sense, physical activity during childhood represents a fundamental pillar for comprehensive motor development in both its fine and gross dimensions (Morales *et al*., 2023).

Physical Education, as a discipline that plays a decisive role in achieving these objectives, is recognized as a central axis in motor and cognitive development. Rodríguez *et al*. (2020), Aguilar, Piña, Jarque, (2024) state that its influence lies in supporting the developmental stages associated with motor growth during childhood and is grounded in body-related conceptualizations aimed at optimizing anatomical and gestural movement throughout this stage of life. Furthermore, research has shown that school-based Physical Education directly contributes to improvements in skills such as balance, coordination, laterality, and motor precision (Calero *et al*., 2024; Mainer-Pardos *et al*., 2025; Moreno-Apellaniz et al., 2024; Villanueva-Guerrero *et al*., 2024). Through play-based methodologies, it promotes the acquisition of fundamental motor patterns that serve as the basis for more complex learning processes.

According to Bezerra *et al*. (2023), school Physical Education optimizes motor development while encouraging exploration, play, and body expression. For authors such as Suárez (2025), play constitutes an essential pedagogical tool for motor development in early childhood, enabling children to explore, coordinate, and strengthen their physical abilities in playful contexts. Didactic games—whether physical, manipulative, or digital—have demonstrated positive effects on gross motor skills, including balance, coordination, and locomotion, as well as on fine motor skills, particularly precision and visuomotor coordination. Cudeiro, Piña, Trejo del Pino (2023), Cuesta (2025) asserts that play and movement in early childhood education contribute significantly to the development of cognitive skills such as attention, memory, and self-regulation. Through play-based activities adapted to educational settings, children enhance both socialization and motor autonomy.

Although the specialized literature has documented significant scientific advances in supporting motor development during early childhood, conceptual gaps and practical limitations still hinder the effective implementation of strategic models designed to stimulate physical skills. Intervention proposals frequently emphasize their general benefits but often lack the didactic and methodological resources necessary to adapt activities to individual characteristics (Calero *et al*., 2026; Calero-Morales *et al*., 2026). The incorporation of personalized approaches into the school curriculum, together with the application of innovative methods that foster active participation through play, contributes to enhancing overall motor development during the early stages of life (Uribarri *et al*., 2024).

The shortcomings described above justify the need for a comprehensive approach that complements play as a cross-cutting element in the child's overall development and promotes interdisciplinarity between Physical Education and Pedagogy. Together, these disciplines reinforce the role of play not merely as entertainment but as an educational strategy for holistic development in early childhood. Based on this problem statement, the objective of the present study was to design an educational pedagogical strategy, grounded in a playful and multidisciplinary approach, aimed at enhancing motor activity development among primary school children during Physical Education classes.

METHODOLOGY AND METHOD

The research was conducted using a mixed-methods approach, integrating qualitative and quantitative methods, with a descriptive-explanatory scope. The evaluation of the teaching strategy employed a one-group pre-experimental design with measurements taken before and after the intervention (pretest–posttest). This approach made it possible to examine the changes recorded in the development of children's motor activity during the implementation of the proposed strategy, within the usual context of Physical Education classes and taking into account the participants' characteristics.

Participants

The study population consisted of children approximately seven years of age attending the Minerva Educational Institution in Guayaquil, Ecuador. The sample comprised 35 participants, selected through non-probability purposive sampling, according to the characteristics and accessibility conditions established for the intervention.

The inclusion criteria were: (a) being enrolled at the educational institution during the research period; (b) being approximately seven years of age; (c) attending Physical Education classes during the intervention period; (d) having informed consent from parents or legal guardians; and (e) expressing willingness to participate through the corresponding informed assent.

The exclusion criteria were: (a) not meeting the established age or enrollment requirements; (b) lacking authorization from a legal guardian or not providing assent; and (c) presenting any condition that prevented safe participation in physical activities, when such a condition had been identified and documented. Participants who expressed a desire to withdraw during the study were free to do so without any academic consequences.

Procedures

Regarding this design, Chávez et al. (2020) point out that pre-experimental studies are characterized by the application of an intervention to a single group, without incorporating a comparison group. This type of design may be appropriate in educational and social contexts where institutional conditions make the implementation of more rigorous experimental designs difficult. Furthermore, it allows preliminary evidence to be obtained regarding the changes observed following an intervention, provided that the variable of interest is measured before and after its implementation using appropriate assessment instruments. In keeping with this methodological approach, the present study included an initial assessment of motor skills, followed by the implementation of the teaching strategy over eight weeks and a final assessment of the same participants.

Participants were selected through non-probability purposive sampling, with the Minerva Educational Institution, located in Guayaquil, Ecuador, serving as the research setting. The sample consisted of 35 primary school children, all aged seven years. A Physical Education

teacher also participated, providing information on the development of teaching activities and the methodological changes observed throughout the process. Therefore, the selection of the children and the teacher's participation were based on purposive criteria associated with the characteristics of the educational context and the research objectives.

The empirical methods focused on collecting qualitative and quantitative data. Systematic observation was conducted during Physical Education classes to examine children's performance in physical and recreational activities, as well as the manifestations of their motor skills. In addition, interviews were conducted with the teacher to explore their perceptions of the relevance of pedagogical interventions aimed at strengthening students' motor skills and abilities. Furthermore, the official subject curriculum was reviewed and analyzed to assess its methodological and practical consistency with the participants' characteristics and needs.

To organize the assessment of the research techniques and instruments, dimensions and indicators were established to define the specific aspects under analysis. According to Cresp *et al*. (2024), the use of dimensions and indicators facilitates the connection between research procedures and empirical reality by making it possible to identify and operationalize the specific elements under investigation. In this regard, their application made it possible to structure the assessment of children's neuromotor competencies and the didactic-methodological aspects associated with the Physical Education teaching process.

Nevertheless, the pre-experimental design used presents limitations in establishing causal relationships between the teaching strategy and the observed changes. The absence of a control group prevents comparisons between the participants' progress and that of children who did not receive the intervention. Moreover, during the eight-week implementation period, external factors may have influenced the results, including the natural motor maturation processes associated with age and physical activity experiences outside the scheduled classes. A potential practice effect resulting from the administration of the same instrument at two different time points should also be considered, since familiarity with the tasks may have influenced performance during the final assessment. Finally, regression to the mean cannot be ruled out, particularly among participants who obtained low initial scores.

These threats constitute inherent limitations of the research design, and no documented procedures are available to establish that they were controlled. Consequently, the results are interpreted as changes observed between the initial and final assessments during the period in which the strategy was implemented, without attributing them exclusively to the intervention. This consideration defines the scope of the conclusions and highlights the need for future research incorporating comparison groups and more rigorous control procedures to estimate more accurately the contribution of the strategy to the development of children's motor activity.

Table 1. Methodological Description for Evaluating the Development of Motor Activity in Primary School Children

DIMENSIONS	INDICATORS	INSTRUMENTS
Children's Neuromotor Competence	1. Fine motor precision2. Fine motor integration3. Motor dexterity4. Bilateral coordination5. Balance6. Agility and speed7. Upper-limb coordination8. Strength	Structured observationBruininks–Oseretsky Test of Motor Proficiency, Second Edition (BOT-2)

Didactic-Methodological and Instructional Dimension	1. Design of play-based motor activities aligned with learning objectives2. Appropriate selection of instructional strategies for motor development3. Effective use of teaching methods and educational materials during the instructional process. Methodological competence according to the pedagogical context5. Continuous assessment of the teaching–learning process6. Management of time and space within the Physical Education setting	Interview with the Physical Education teacher

During the research process, the Bruininks–Oseretsky Test of Motor Proficiency, Second Edition (BOT-2) (Bruininks, 2005) was implemented as an assessment instrument adapted to the playful-multidisciplinary approach of the study. The purpose of its application was to identify, characterize, and evaluate the motor skills of the participating children. The test was selected for its ability to measure specific indicators of both fine and gross motor coordination, balance, strength, agility, and manual dexterity through eight defined subtests.

In the initial phase, corresponding to the first week of the intervention, the BOT-2 test (Table 2) was administered to determine the dimension of children's neuromotor competence. Subsequently, following the implementation of the Integrated Plan of Physical and Play-Based Activities, the assessment was administered again in order to compare the progress achieved by the children in relation to the development of motor activity.

A methodological scale combining qualitative and quantitative approaches was employed to evaluate performance across the BOT-2 subtests. Scores ranging from 1 to 4 were assigned to each level, reflecting the degree of observed motor proficiency, from very limited to outstanding performance. The quantitative component facilitated measurement through numerical values, while the qualitative approach provided a descriptive interpretation of motor behavior, considering aspects such as precision, coordination, fluency, and control.

Table 2. Qualitative–Quantitative Methodological Scale for Evaluating Each BOT-2 Subtest Based on Performance Levels Ranging from 1 to 4 Points

Assessment Indicators	Performance Description
4 points	Outstanding performance (above average)
3 points	Adequate performance (within the average range)
2 points	Limited performance (below average)
1 point	Poor performance (well below average)

Table 3. Assessment Scale According to Children's Performance in the Bruininks–Oseretsky Test of Motor Proficiency (BOT-2)

Subtest (Bruininks–Oseretsky Test of Motor Proficiency – BOT-2)	Representation of Children's Performance During Physical and Play-Based Activities	Scoring Range
Fine Motor Precision	High level of precision demonstrated during fine motor activities and exercises.	Scores ranging from 1–4 points
Fine Motor Integration	Effective coordination of movements required during the activities and exercises.	Scores ranging from 1–4 points
Manual Dexterity	Control and skill demonstrated during object-manipulation activities.	Scores ranging from 1–4 points
Bilateral Coordination	Synchronization of both sides of the body during dynamic activities and exercises.	Scores ranging from 1–4 points

Balance	Ability to maintain stability in different positions throughout the activities.	Scores ranging from 1–4 points
Agility and Speed	Quickness and efficiency in performing sequential movement activities.	Scores ranging from 1–4 points
Upper-Limb Coordination	Control demonstrated during activities involving throwing, catching, or manipulating objects.	Scores ranging from 1–4 points
Strength	Ability to sustain muscular force during pushing, lifting, or jumping activities.	Scores ranging from 1–4 points

Table 4. Interpretive Ranges Based on the Total Scores Obtained in the Bruininks–Oseretsky Subtests According to Children's Performance for the Assessment of Motor Competence

Overall Score (Maximum = 32 Points)	Interpretation of Motor Competence
28–32 points	Excellent motor competence
22–27 points	Adequate motor competence
16–21 points	Limited motor competence
8–15 points	Poor motor competence

The information obtained through the semi-structured interview with the Physical Education teacher and structured observation was analyzed using thematic content analysis. Initially, the records were organized and reviewed to identify units of meaning, assign codes, and group them into categories related to children's motor development.

Four analytical categories were established: 1) difficulties in motor skill development, concerning coordination, balance, agility, precision, and strength; 2) children's participation and responses, considering motivation, willingness, and engagement in activities; 3) pedagogical strategies and implementation conditions, encompassing organization, teacher guidance, and the resources used; and 4) changes observed during the intervention, related to motor performance, autonomy, and participation.

Information integration was conducted through methodological triangulation, comparing the teacher's perceptions and observational records with the frequencies obtained from the initial and final BOT-2 assessments. This procedure made it possible to identify similarities, differences, and complementary evidence across sources. Qualitative rigor was supported by coding traceability, consistency between interpretations and original records, and consideration of both convergent and divergent evidence.

The intervention was conducted over eight weeks through a program comprising 24 physical and recreational activity sessions, scheduled three times per week and integrated into regular Physical Education classes. The strategy was structured into five work blocks: A) global neuromotor coordination exercises; B) precision and balance activities involving coordinated movements; C) spatial and temporal perception and organization exercises; D) activities aimed at developing muscular strength and endurance; and E) recreational and play-based activities focused on sensory integration and motor coordination.

The program involved the progressive and complementary implementation of the five blocks, incorporating reinforcement activities and the integration of the skills addressed. Each session included teacher guidance, practical execution of the exercises, and feedback on children's performance, with difficulty adjustments according to the participants' characteristics.

The initial BOT-2 assessment was conducted before the intervention, while the final assessment took place upon completion of the 24 sessions, during the eighth week. This sequence made it possible to compare the distribution of motor performance levels before and after the implementation of the strategy.

Data Analysis

Data analysis involved descriptive and inferential statistics, considering the one-group pre-experimental design with pretest–posttest measurements. Individual records from the 35 children were paired across assessments, and absolute and relative frequencies were calculated to describe motor competence levels. Scores obtained from the 1-to-4-point rating scale applied to the Bruininks–Oseretsky Test of Motor Proficiency (BOT-2) subtests were treated as ordinal data, since they represented hierarchical performance levels without assuming equal distances between categories. Accordingly, the Wilcoxon signed-rank test for paired samples was used to compare initial and final assessments, as it is suitable for dependent ordinal measurements without requiring normally distributed scores. Statistical significance was set at $p < 0.05$, with 95% confidence intervals considered where applicable. Effect size was estimated using the r coefficient, calculated from the standardized Wilcoxon statistic and the square root of the number of valid pairs. Inferential findings were interpreted alongside descriptive distributions, considering the direction and magnitude of differences. When multiple motor indicators were compared, the Holm–Bonferroni adjustment was considered to control the risk of Type I error. Given the absence of a control group, findings were restricted to observed differences between assessments, without attributing exclusive causality to the intervention.

Results

The posttest results showed a favorable distribution of motor competence across the six indicators evaluated (Table 5). The highest combined proportions of adequate and outstanding performance were observed in fine motor precision and integration, upper-limb coordination, and balance, each reaching 68.6%. This was followed by bilateral coordination (68.5%), agility and speed (62.9%), and strength (62.8%).

Regarding the deficient category, the largest decreases in the reported frequencies were observed in upper-limb coordination and strength, both declining from 45.7% in the pretest to 8.6% in the posttest. Fine motor precision and integration also showed a decrease from 42.9% to 8.6%, while bilateral coordination decreased from 17.1% to 11.4%. In the posttest, outstanding performance reached 31.4% in bilateral coordination, 28.6% in fine motor precision and upper-limb coordination, 25.7% in strength, 22.9% in balance, and 20.0% in agility and speed.

Table 5. Comparative distribution of children's motor competence levels before and after the intervention (pretest–posttest)

Motor competence indicators	Assessment	Poor n (%)	Limited n (%)	Adequate n (%)	Outstanding n (%)
Fine motor precision and integration	Pretest	15 (42.9)	6 (17.1)	14 (40.0)	Not reported
	Posttest	3 (8.6)	8 (22.9)	14 (40.0)	10 (28.6)
Motor skills and bilateral coordination	Pretest	6 (17.1)	24 (68.6)	5 (14.3)	Not reported
	Posttest	4 (11.4)	7 (20.0)	13 (37.1)	11 (31.4)
Balance	Pretest*	Not disaggregated	26 (74.3)*	9 (25.7)*	Not reported
	Posttest	4 (11.4)	7 (20.0)	16 (45.7)	8 (22.9)
Agility and speed	Pretest*	Not disaggregated	26 (74.3)*	9 (25.7)*	Not reported
	Posttest	4 (11.4)	9 (25.7)	15 (42.9)	7 (20.0)
Upper-limb coordination	Pretest*	16 (45.7)*	Not disaggregated	19 (54.3)*	Not reported
	Posttest	3 (8.6)	8 (22.9)	14 (40.0)	10 (28.6)
Strength	Pretest*	16 (45.7)*	Not disaggregated	19 (54.3)*	Not reported

	Posttest	3 (8.6)	10 (28.6)	13 (37.1)	9 (25.7)

The descriptive analysis revealed a more favorable distribution of motor competence in the final assessment across the indicators evaluated (Table 6). Fine motor precision and integration showed that 68.6% of the children reached adequate or outstanding levels, compared with 42.9% classified as poor in the initial assessment. Similarly, bilateral coordination showed a favorable final distribution, with 68.5% of participants achieving adequate or outstanding performance, whereas 68.6% had initially been classified at a limited level.

Regarding balance and agility and speed, the final assessment showed adequate or outstanding performance in 68.6% and 62.9% of participants, respectively. For upper-limb coordination and strength, these proportions reached 68.6% and 62.8%, respectively. However, the initial assessment grouped some indicators, preventing individual comparisons and limiting the interpretation of changes in these dimensions.

Overall, the findings indicate a more favorable descriptive distribution of motor competence following the implementation of the teaching strategy, particularly in fine motor precision and bilateral coordination. Nevertheless, these results should be interpreted as observed differences between assessments rather than as evidence of a causal effect attributable exclusively to the intervention.

Table 6. Descriptive summary of motor competence levels before and after the implementation of the teaching strategy

Indicator or dimension	Initial assessment	Final assessment	Descriptive interpretation
Fine motor precision and integration	42.9% poor	68.6% adequate or outstanding	More favorable final distribution
Motor skills and bilateral coordination	68.6% limited	68.5% adequate or outstanding[1]	More favorable final distribution
Balance	Grouped with agility and speed: 74.3% limited	68.6% adequate or outstanding	Does not allow an isolated comparison
Agility and speed	Grouped with balance: 74.3% limited	62.9% adequate or outstanding	Does not allow an isolated comparison
Upper-limb coordination and strength	Grouped indicators: 45.7% poor	Separate indicators: 68.6% and 62.8% adequate or outstanding, respectively	Does not allow an individual comparison

In the simulated scenario, both indicators showed statistically significant differences between the initial and final assessments (adjusted $p = 0.0029$). Fine motor precision and integration achieved an effect size of $r = 0.631$, while motor skills and bilateral coordination showed an effect size of $r = 0.613$. These values would represent changes of considerable magnitude in both indicators (Table 7).

Table 7. Illustrative inferential analysis of changes in children's motor competence using the Wilcoxon signed-rank test

Motor competence indicators	Valid pairs	Pairs with changes	Z	Two-tailed p-value	Effect size (r)	Adjusted p-value (Holm)
Fine motor precision and integration	35	25	−3.154	0.0016	0.631	0.0029
Motor skills and bilateral coordination	35	27	−3.184	0.0015	0.613	0.0029

The educational pedagogical strategy based on physical exercises and games, together with the integration of multiple disciplines during Physical Education classes, had a positive impact on the motor development of children at this stage. The main shortcomings identified

regarding the use of diagnostic methods to characterize motor activity development among primary school children during Physical Education classes were associated with pedagogical, structural, and methodological factors.

A) Results of the Structured Observation of the Teaching–Learning Process in Physical Education Classes

During the direct observation of Physical Education classes, several deficiencies in children's motor development were identified, closely associated with individual factors characteristic of this developmental stage:

Difficulties were observed in the synchronization of body movements, particularly during bilateral coordination exercises and dynamic movement sequences. These limitations affected the proper execution of skills such as running, throwing, catching, and jumping, thereby restricting active participation.

Some children exhibited rapid fatigue in response to moderate physical exertion, as well as weakness in both upper and lower limbs, limiting their ability to perform activities such as climbing, pushing, or holding objects.

Difficulties in fine motor precision were evident when manipulating small balls, threading objects, or performing finger movements.

Differences in motor skill levels were observed among the children, with some requiring continuous support. This situation contributed to reduced motivation and limited active engagement in physical and play-based activities.

A degree of rigidity was identified in the structure of the classes, with limited flexibility to encourage creativity and spontaneous movement.

B) Results of the Interview Conducted with the Physical Education Teacher Based on the Indicators Used to Assess the Children's Neuromotor Competence Dimension

Table 8. Interview Protocol Administered to the Physical Education Teacher for Pedagogical Assessment Purposes

Interview Questions	Never (N)	Sometimes (S)	Always (A)
1. Do you use exercises to stimulate fine motor precision in specific tasks such as throwing, catching, or manipulating objects?			X
2. Do you promote the integration of play-based activities to enhance neuromotor development?		X	
3. Do you apply strategies to improve the speed and accuracy of children's movements?		X	
4. Do you include physical exercises that involve the simultaneous use of both sides of the body?		X	
5. Do you use physical activities to develop both static and dynamic balance?			X

6. During physical activities and games, do you incorporate the development of agility and speed to improve reaction capacity and locomotor skills?		X	
7. Do you use physical exercises and play-based activities during class to strengthen upper- and lower-limb coordination?		X	
8. When planning learning objectives and curricular content, do you focus on the development of muscular strength?		X	

Assessment Scale:
N = Never | S = Sometimes | A = Always

B) Deficiencies Identified Through the Physical Education Teacher's Perceptions Based on the Interview Findings

 It was observed that pedagogical sessions exhibited shortcomings in the structure and articulation of learning objectives, resulting in fragmented practice with limited monitoring and systematic assessment of motor development.

 The teacher indicated that motor development is not considered a priority within the school curriculum, reducing the time allocated to Physical Education classes and limiting its contribution to the child's holistic development.

 Limited specialized training and professional development opportunities were identified regarding the design of appropriate pedagogical activities and the identification of specific motor difficulties among children.

 There was insufficient incorporation of exercises and play-based activities aimed at enhancing bilateral coordination, balance, agility, limb coordination, and muscular strength, thereby compromising the development of fundamental skills such as running, jumping, maintaining postural stability, and performing simultaneous movements involving both sides of the body.

C) Analysis of the Review of Physical Education Plans and Programs Focused on the Assessment Aspects of the Neuromotor Dimension

The review of curricular and methodological documents related to Physical Education in primary education revealed several shortcomings affecting children's motor development. These deficiencies were associated with limited approaches, lack of curricular updating, and insufficient pedagogical contextualization, as evidenced by the following findings:

 The reviewed content focuses on the development of skills and abilities in a general manner, without emphasizing the comprehensive development of motor competence. Physical performance tends to be prioritized over play, body exploration, and neuromotor expression.

 The documents do not effectively integrate motor development with cognitive, emotional, and social dimensions, nor do they employ movement as a cross-curricular tool for learning.

 The absence of clear assessment criteria within the Physical Education program persists, as specific instruments and indicators for evaluating motor development progress are not included. Assessments are generally limited to broad observations without systematic monitoring or individualized feedback.

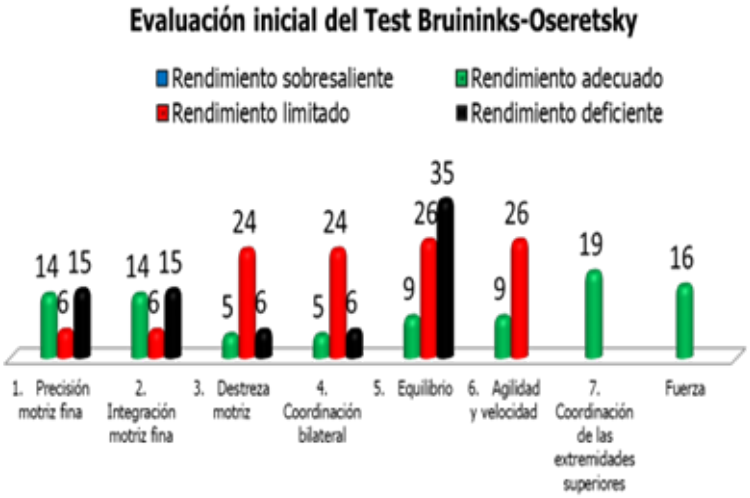
 Limited incorporation of updated theoretical foundations was identified. The methodological approaches continue to reflect traditional models, without integrating advances in neurodevelopment, psychomotor education, or play-based pedagogy.

 A disconnect was observed between motor development theory and teaching practice, hindering the effective implementation of evidence-based educational strategies.

 Limitations were identified in the planning of didactic proposals capable of responding to children's interests, contexts, and actual developmental needs.

D) Results of the Initial Assessment Using the Bruininks–Oseretsky Test of Motor Proficiency (BOT-2) Administered to Primary School Children

Figure 1. Graphical Representation of the Initial Assessment Results of the Bruininks–Oseretsky Test of Motor Proficiency (BOT-2)



The figure shows the results of the initial application of the Bruininks–Oseretsky Test of Motor Proficiency (BOT-2) to assess motor development in 35 primary school children. The indicators of fine motor precision and fine motor integration revealed that 6 children achieved a limited performance level, presenting difficulties in performing controlled movements with their fingers and hands, particularly during the manipulation of balls and small objects. A larger group of 15 children showed poor performance, with difficulties in hand–eye and foot–eye coordination, reflecting a lack of overall movement control and precision. However, 14 children demonstrated adequate performance, meeting the evaluative criteria expected for their age group. Overall, it was observed that several children were able to perform isolated movements but showed limitations when combining multiple actions simultaneously.

Regarding the indicators assessing motor dexterity and bilateral coordination, the results showed that 5 children achieved an adequate performance level, standing out in tasks requiring alternation and synchronization of movements between both sides of the body. A total of 24 children were classified within the limited performance range, showing slow and disorganized movements. The remaining 6 children presented poor performance, with significant difficulties coordinating bilateral actions such as throwing and catching balls. These findings indicate that the children are still in the process of developing fluidity in more complex movements.

For the indicators related to balance, agility, and speed, considerable variability was observed. A total of 9 children achieved an adequate performance level, which was more evident during dynamic games, demonstrating good postural control when walking on unstable surfaces or maintaining a single-leg stance, as well as displaying rapid and accurate responses.

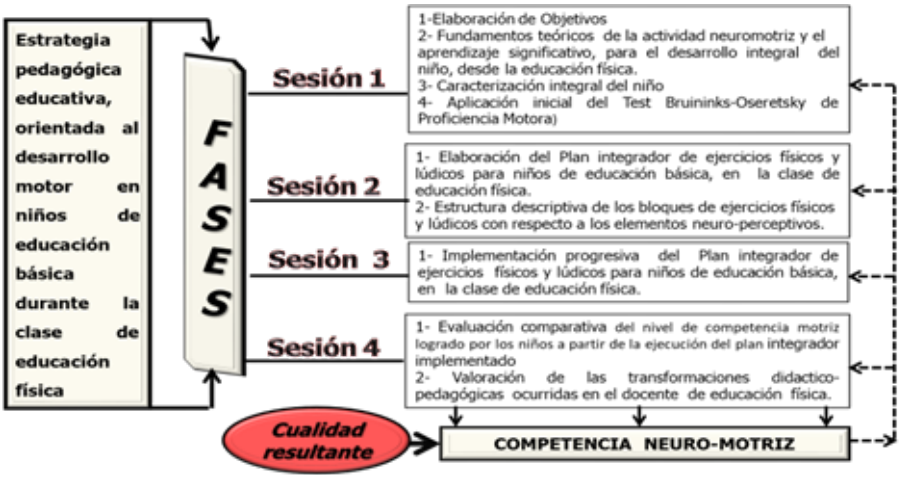
In contrast, 26 children were classified within the limited performance range, requiring more time to react, move, and adjust to rapid changes in direction.

Finally, the indicators of upper-limb coordination and strength showed that only 19 children achieved an adequate performance level, demonstrating muscular strength and coordination during the exercises, particularly in activities involving the upper limbs. Meanwhile, 16 children were assessed as having poor performance, characterized by frequent falls and limited ability to respond to physical stimuli. These results suggest the need to strengthen neuromotor activity.

The overall analysis of the initial results obtained from the Bruininks–Oseretsky Test of Motor Proficiency reveals the need for a pedagogical intervention aimed at strengthening motor development in primary school children. The scores obtained demonstrate limitations in specific areas of comprehensive physical development, which negatively affected children's performance, with motor competence levels ranging from limited to poor. These findings provide a baseline for implementing educational actions focused on promoting the child's comprehensive development.

An educational pedagogical strategy focused on promoting motor development among primary school children during physical education classes.

Figure 2. Graphical design of the educational pedagogical approach employed in physical education for children at the primary education level



The educational pedagogical strategy is grounded in the criteria proposed by Pérez et al. and has been contextualized to the present research for addressing children who exhibit motor disorders during early childhood. These authors conceptualize it as a framework encompassing teaching styles and instructional techniques. Within Physical Education practice, pedagogical strategies are established as broad structures that provide methodological and didactic support, based on the interdependent relationship among the principles of educational action, teaching–learning processes, and the content of the latter within the context in which these processes take place.

Session 1

General Objective

To promote the comprehensive development of basic and specific motor skills in primary school children through playful activities that integrate physical, cognitive, emotional, and social aspects during physical education classes.

Specific Objectives

 To strengthen fine and gross motor coordination through structured physical and recreational activities involving manipulative materials, motor circuits, and precision games.

 To develop agility, balance, and speed through progressive exercises that stimulate body stability during physical education classes.

 To enhance bilateral coordination and muscular strength through group dynamics incorporating synchronized movements and pushing activities adapted to the physical level of the children participating in the study.

Theoretical Foundations Contextualized to Neuro-Motor Activity and Meaningful Learning for the Child's Integral Development through Physical Education

Physical education at the primary school level is recognized as an essential factor in children's motor development. According to González and Pérez (2023), the teaching strategies implemented in this area should focus on strengthening fundamental motor skills such as locomotion, jumping, balancing, throwing, and catching. These movements not only contribute to physical development but also enhance cognitive and emotional learning. The authors emphasize that formative physical education enables the conceptualization and structuring of these motor actions, promoting the child's progressive development throughout the motor life cycle.

The use of psychomotor games has emerged as an effective pedagogical strategy for child motor development. In this regard, Burgos et al. (2023) argue that play facilitates the acquisition of fundamental motor skills while providing a recreational environment that promotes meaningful learning. They explain that psychomotor games enable enjoyable teaching–learning experiences, enriching the child's physical, social, cognitive, and emotional development. This strategy is particularly useful for overcoming the limitations of traditional pedagogies, fostering a more dynamic and inclusive approach to physical education.

In the same vein, Chicaiza *et al*. (2025) indicate that school physical education should incorporate physical exercises that integrate general motor skills and are adapted to the developmental stages of childhood. They highlight that implementing structured physical exercise programs in primary education contributes to motor development, strengthens self-esteem, enhances concentration, and improves group interaction. Activities such as motor circuits, rhythm-based games, and locomotor dynamics facilitate the acquisition of basic motor skills, particularly in school contexts where movement constitutes an essential component of the teaching–learning process.

According to Batista et al. (2021), when physical education is approached from a playful perspective, children are able to develop capacities such as coordination, balance, laterality, and spatial perception, which are fundamental elements for academic and social performance.

Session 2

1. Development of the Integrative Plan of Physical and Recreational Exercises to Enhance Motor Activity in Primary School Children During Physical Education Classes

2. Descriptive Structure of Physical and Recreational Exercise Blocks in Relation to Neuro-Perceptual Elements

Block A. Global Neuro-Motor Coordination Exercises

Exercise 1: Cross-Coordination Circuit

Objective: To stimulate bilateral coordination, laterality, and sensorimotor integration.

Materials: Hoops, cones, ropes, and small balls.

Methodological Development:

 The teacher instructs the children to perform cross-body movements, touching the left knee with the right hand and the right knee with the left hand. A circuit is then organized using stations that include: alternating jumps through hoops from right to left; zigzag walking between cones while holding a ball; throwing and catching balls while alternating hands; and walking along a rope while maintaining balance with arms extended. Each child rotates through the stations every two minutes.

 Stretching exercises involving coordinated arm and leg movements are performed at the end of the circuit.

Basic Guidelines: Self-exploration and positive reinforcement are encouraged. The teacher guides and corrects postures while promoting playful participation and sustained attention.

Block B. Precision and Balance Exercises Through Coordinated Movement

Exercise 2: Precision, Balance, and Motor Coordination

Objective: To improve throwing accuracy and dynamic balance.

Materials: Hoops and small balls.

Methodological Development:

The teacher places several hoops of different colors one meter apart. Each child throws a ball attempting to land it inside a hoop. Subsequently, the child walks along a straight line marked on the physical education area leading to the hoop where the ball landed, maintaining balance with arms extended. If the child successfully completes both tasks—throwing accurately and walking without stepping off the line—a point is awarded.

Basic Guidelines: Difficulty may be increased by modifying the distance between hoops or their size. The activity enhances hand–eye coordination, dynamic balance, and postural control.

Block C. Spatial–Temporal Perception and Organization

Exercise 3: Upper-Limb Coordination

Objective: To improve hand–eye coordination and movement dissociation between both hands.

Materials: Small balls and a stopwatch.

Methodological Development:

The teacher initially instructs children to perform alternating arm movements and forward and backward arm circles.

Children stand two meters apart, with one child facing forward and the other positioned behind. Holding a ball in each hand, they simultaneously throw the right-hand ball forward and the left-hand ball backward. The exercise alternates according to the teacher's commands over a period of 30 seconds, with speed progressively increasing.

Basic Guidelines:

Variations include throwing at different rhythms and using balls of different sizes. Controlled repetition, stimulus variation, and positive reinforcement are promoted. The teacher should encourage concentration and accuracy.

Block D. Strength Development as the Basis of Motor Performance and Endurance

Exercise 4: Physical Exercises Aimed at Strength Development

Objective: To develop lower-limb explosive strength and muscular endurance.

Materials: Jump boxes and cones.

Methodological Development: The teacher instructs children to perform gentle jumps and joint mobility exercises involving both upper and lower limbs. Children complete a sequence of jumps over boxes of varying heights positioned 50 centimeters apart. They then run in a zigzag pattern around five cones before returning to the starting point by walking.

Basic Guidelines: The exercise improves lower-limb power, aerobic endurance, and coordination during locomotor movements.

Block E. Diverse Recreational and Play-Based Activities

Objective: To stimulate sensory integration and motor coordination.

Methodological Development:

The teacher designs a pathway using different textures, including mats, sand, small stones, fabric pieces, and sponges. Upon instruction, children walk barefoot across the surfaces while performing specific movements such as jumping, turning, and balancing on one foot. The teacher then asks the children to describe their bodily sensations and identify their favorite texture experienced during the activity.

Basic Guidelines: The activity enhances body awareness, sensory perception, and the connection between sensory stimuli and motor responses.

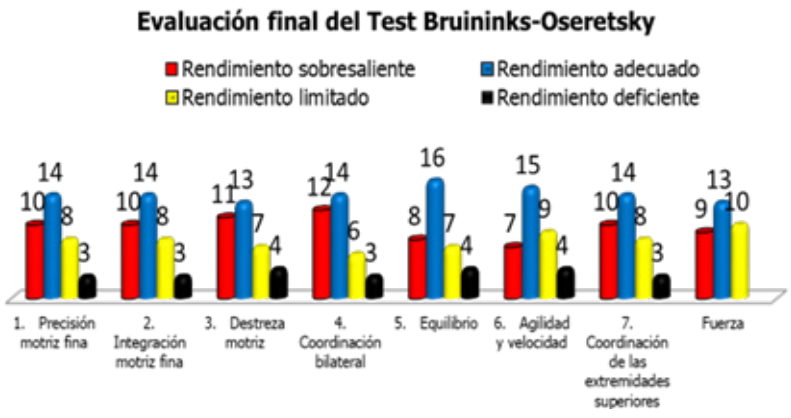
Session 3

1- Progressive Implementation of the Integrative Plan of Physical and Recreational Exercises for Primary School Children During Physical Education Classes

Over an eight-week period, the integrative plan of physical and recreational exercises designed to enhance motor activity in primary school children was implemented during physical education classes. The plan was incorporated through systematic work blocks, considering the indicators of the Child Neuro-Motor Competence dimension. In the eighth week, the final administration of the Bruininks–Oseretsky Test was conducted to identify changes in the motor competence of the participants included in the study.

2. Comparative Evaluation of the Level of Motor Competence Achieved by Children Following the Implementation of the Integrative Plan

Figure 3. Graphical representation of the final evaluation results of the Bruininks–Oseretsky Test



The final administration of the Bruininks–Oseretsky Test to the 35 participating children revealed notable improvements in motor competence. Initial assessments of the established indicators yielded scores below the average required to achieve favorable outcomes across the different parameters evaluated. Following the implementation of the Integrative Plan of Physical and Recreational Exercises, substantial progress was observed in motor development, particularly in indicators related to fine motor precision and fine motor integration.

In the domain of fine motor precision and fine motor integration, 10 children achieved outstanding performance, demonstrating significant progress in tasks requiring hand–eye control and visuomotor coordination, as well as improvements in activities involving neuromotor skills. Meanwhile, 14 children were classified within the adequate performance range, and 8 exhibited limited performance. Only 3 children demonstrated deficient performance. Compared with the initial assessment, a reduction was observed in the number of children presenting limited or deficient performance in these areas, reflecting the positive impact of the implemented integrative plan.

Regarding motor proficiency and bilateral coordination, the results were also favorable. More than half of the children achieved either adequate or outstanding performance levels, with 11 children classified as outstanding and 13 as adequate, while 7 were categorized as limited and 4 as deficient. Through the implementation of the exercises during physical education classes, the children demonstrated greater fluency of movement and enhanced coordinative variability.

Similarly, bilateral coordination showed considerable improvement. Twelve children achieved outstanding performance, 14 reached an adequate level, only 6 demonstrated limited performance, and 3 remained within the deficient category. These findings reflect improvements in tasks involving ball throwing and catching, coordinated locomotor movements, and greater precision and confidence during motor execution. The evaluations indicate that systematic practice throughout each lesson, combined with increased motivation toward physical exercise, facilitated the development of more complex motor patterns.

The indicators of balance, agility, and speed also exhibited marked progress. Children who initially experienced difficulties maintaining stability or performing rapid and controlled movements achieved significant improvements. In the balance indicator, 8 children attained outstanding performance, 16 adequate performance, 7 limited performance, and only 4 remained in the deficient category. In agility and speed, results were slightly lower, with 7 children achieving outstanding performance, 15 adequate performance, 9 limited performance, and 4 deficient performances.

Although there remains room for improvement, the findings demonstrate strengthened postural stability and enhanced capacity for rapid movement, particularly among children who were initially assessed at lower performance levels. While some cases of limited performance persisted, the number of children within this category decreased substantially. Improvements in postural musculature and reaction capacity indicate favorable progress, demonstrating that the integrative plan promoted not only movement development but also greater bodily confidence.

Finally, aspects related to upper-limb coordination and muscular strength showed generalized improvement. Activities involving pushing or manipulating relatively heavy objects were performed more effectively by the majority of participants. In the upper-limb coordination indicator, 10 children achieved outstanding performance, 14 adequate performance, 8 limited performance, and 3 deficient performances. In the strength subtest, 9 children attained outstanding scores, 13 achieved adequate performance, 10 demonstrated limited performance, and only 3 were classified as deficient. These findings suggest that the physical and recreational intervention exerted a positive influence on muscular development and functional coordination,

although strength remained the domain exhibiting the greatest variability among participants.

Overall, the proportion of children achieving outstanding performance across the evaluated indicators increased compared with the initial assessment. This finding suggests that the progressive and play-based approach of the integrative plan facilitated balanced development of both fine and gross motor skills. Taken together, the test results reflect a positive transformation in the motor competence of the participating children, who generally achieved adequate levels of performance, thereby reinforcing the pedagogical value of the implemented intervention.

2- Assessment of the Didactic–Pedagogical Transformations Experienced by the Physical Education Teacher

With the implementation of the educational pedagogical strategy, the teacher, as the primary facilitator of physical activities, evolved into a mediator of motor learning. This transformation involved a comprehensive integration of the pedagogical objectives of each lesson, prioritizing the holistic development of the child. The teacher strengthened awareness of the importance of adapting activities to individual needs, recognizing motor diversity as a fundamental component of the teaching–learning process within the educational environment.

The implemented strategy also contributed to methodological innovation. This change became evident through the incorporation of active and play-based methodologies, such as movement stations, motor circuits, and cooperative games. These practices promoted active participation, autonomy, and creative thinking among the children. Furthermore, formative assessment procedures were integrated to monitor motor progress in real time, enabling the teacher to adjust activities according to the achievements and challenges experienced by each child.

The use of assessment instruments such as the Bruininks–Oseretsky Test strengthened the pedagogical evaluation process, leading the teacher to adopt a more analytical and systematic approach to motor assessment. Through the observation of physical performance, qualitative and quantitative data were interpreted, comparisons were established, and specific interventions were designed. This transformation enhanced the quality of pedagogical monitoring, allowing for the precise identification of motor competence levels and facilitating the orientation of instructional practices toward clearly defined objectives.

By working with an educational pedagogical strategy centered on play and movement, the teacher also developed greater sensitivity toward the emotional and social impact of physical education. A collaborative learning environment was fostered, strengthening the relationship between teacher and students and positioning physical education classes as spaces for comprehensive development that extend beyond motor skill acquisition.

The results obtained through the implementation of the educational strategy aimed at promoting motor development in primary school children demonstrate significant improvements in motor skills, consistent with previous studies examining physical activity as a key contributor to holistic development during childhood. According to Álvarez and Couto (2020), psychomotor development during the early years of life is crucial for the formation of children's bodily and cognitive identity. Consequently, educational strategies should simultaneously integrate physical, emotional, and social components to achieve holistic learning outcomes.

Similarly, González et al. (2023) emphasize that strategies based on personalized physical activity adapted to the school environment maximize their impact on motor development. In the present study, children responded positively to activities designed according to the identified educational needs. The implemented actions reinforce the importance of child-centered pedagogical planning, in which the child assumes an active and central role in the teaching–learning process during physical education classes.

Furthermore, the systematic review conducted by Bermello *et al.* (2024) highlights that physical education should extend beyond the mere execution of exercises by incorporating teaching methodologies that promote play, bodily exploration, and motor expression.

In this regard, the educational pedagogical strategy presented in this study was organized according to this perspective, incorporating playful dynamics that fostered neuro-motor development, communication skills, and teamwork. Consistent with these findings, the study conducted by Bósquez et al. (2024) demonstrated that the use of play-based teaching strategies in primary education contributes to the consolidation of strong motor competencies, particularly within educational settings. This assertion is reflected in the results obtained in the present study, where children with lower initial performance levels achieved significant improvements following the implementation of the integrative intervention plan.

The study has limitations related to its one-group pre-experimental design, without a control group or random assignment, which prevents the influence of external factors, child maturation, or previous experience on the observed changes from being ruled out. Furthermore, the purposive sample of 35 children from a single educational institution limits the generalizability of the findings to other school populations. The adaptation of the BOT-2 rating scale using categories ranging from 1 to 4 also restricts comparability with studies employing the original instrument's standardized scoring system. In addition, assessments were conducted only before and after the intervention, with no subsequent follow-up to determine whether the observed changes were sustained over time. Finally, although teacher interviews and systematic observation were incorporated, the qualitative data require a more detailed description of their analytical procedures and integration with the quantitative findings. Consequently, the results should be interpreted as descriptive variations temporally associated with the implementation of the strategy, without attributing causality or assuming its definitive effectiveness.

Conclusions

The initial assessment identified difficulties in the development of motor skills among the participating children, particularly in motor proficiency, bilateral coordination, balance, agility, and motor precision. These findings highlighted the need to incorporate pedagogical activities adapted to their characteristics and needs.

The multidisciplinary, play-based teaching strategy made it possible to organize physical and recreational activities around the development of neuromotor coordination, precision, balance, spatial and temporal perception, strength, and sensory integration, promoting a more structured approach to Physical Education lesson planning.

3) The final assessment revealed a more favorable distribution of motor performance levels. Adequate or outstanding performance rates of 68.6% in fine motor precision and integration, 74.3% in bilateral coordination, 68.6% in balance, and 62.9% in agility, speed, and strength were observed. These findings describe the performance patterns of the assessed skills at the end of the intervention.

The implementation of play-based and participatory activities was accompanied by favorable changes in teaching dynamics, particularly in task organization, teacher guidance, the use of cooperative games, and the adaptation of activities to children's needs.

The strategy represents a relevant pedagogical alternative for addressing children's motor activity in Physical Education. However, given the pre-experimental design and the absence of a comparison group, the observed changes do not allow the results to be conclusively attributed exclusively to the intervention. Further research involving larger samples and comparison groups is recommended.

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Conflictos de intereses

Los autores declaran que la presente investigación y su redacción no presentan ningún conflicto de interés; es un artículo inédito y no ha sido aceptado para publicación en otra editorial.

Contribución de los autores

Todos los autores trabajaron en la redacción, metodología y culminación de este artículo científico.