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Original article

Methodology for the development of basic coordinative qualities, in Physical Education at initial level 2

*Metodología para el desarrollo de las cualidades coordinativas básicas, en la Educación
Física del nivel inicial 2*

*Metodologia para o desenvolvimento das qualidades coordenativas básicas em Educação
Física no nível inicial 2*

Carmen Jacqueline Cevallos Zambrano^{1*}  , Fredy Rafael Rosales Paneque² 

¹ Ecuadorian Federation of Sports for People with Visual Disabilities. Manabi, Ecuador.

² Therapeutic Physical Activity and Combat Sports Study Center, Faculty of Physical Culture, University of Holguín. Holguín, Cuba.

* Email for communication: cevazamjack.28@gmail.com

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ABSTRACT

The physical culture professional contributes, with important contributions, to the improvement of the programs; applies physical exercise to education, from the earliest ages and promotes comprehensive training. The objective of this work was to design a



methodology for the development of basic coordinative qualities in Physical Education of the initial level 2. To this end, a pre-experimental design study of minimum control was carried out, lasting two years (2020-2021). The selected sample responded to a stratified, non-probabilistic intentional sampling. Methods from the theoretical and empirical levels were used, such as: analysis and synthesis, inductive-deductive, systemic-structural-functional, measurement, experiment, expert judgment and descriptive statistics, as well as research techniques, among which stand out documentary analysis, structured observation, interview and survey. The methodology was carried out through the implementation of physical exercises. 229 children from initial level 2 participated. Based on the diagnosis made, it was determined that dynamic balance (46.3 %) and general dynamic coordination (43.7 %) were evaluated as fair, in addition to difficulties in all movement patterns, gross and fine motor skills, reflexes, reactions and postural patterns. The study showed that the development of basic coordinative qualities can be improved in Physical Education at initial level 2.

Keywords: basic coordinative qualities, Physical Education, children, initial level 2.

RESUMEN

El profesional de cultura física contribuye, con aportes importantes, al perfeccionamiento de los programas; aplica a la educación el ejercicio físico desde las primeras edades y favorece la formación integral. El objetivo de este trabajo consistió en diseñar una metodología para el desarrollo de las cualidades coordinativas básicas en la Educación Física del nivel inicial 2. Para ello, se realizó un estudio de diseño preexperimental de control mínimo, con dos años de duración (2020-2021). La muestra seleccionada respondió a un muestreo intencional estratificado, no probabilístico. Se emplearon métodos de los niveles teórico y empírico, tales como: análisis y síntesis, inductivo-deductivo, sistémico-estructural funcional, medición, experimento, criterio de expertos y estadística descriptiva, así como técnicas de investigación entre los que destacan, análisis documental, observación estructurada, entrevista y encuesta. La metodología se realizó mediante la implementación de ejercicios físicos. Participaron 229 niños del nivel inicial 2; a partir del diagnóstico



realizado se determinó que el equilibrio dinámico (46,3 %) y la coordinación dinámica general (43,7%) fueron evaluados de regular, además de dificultades en todos los patrones de movimiento, la motricidad gruesa, la fina, los reflejos, las reacciones y patrones posturales. El estudio mostró que se puede mejorar el desarrollo de las cualidades coordinativas básicas en la Educación Física del nivel inicial 2.

Palabras clave: cualidades coordinativas básicas, Educación Física, niños, nivel inicial 2.

RESUMO

O profissional de cultura física contribui, com contribuições importantes, para o aprimoramento dos programas; Aplica o exercício físico à educação desde tenra idade e promove uma formação integral. O objetivo deste trabalho foi desenhar uma metodologia para o desenvolvimento de qualidades coordenativas básicas em Educação Física do nível inicial 2. Para tanto, foi realizado um estudo de desenho pré-experimental de controle mínimo, com duração de dois anos (2020-2021).). A amostra selecionada respondeu a uma amostragem estratificada e não probabilística intencional. Foram utilizados métodos dos níveis teórico e empírico tais como: análise e síntese indutivo-dedutivo sistêmico-estrutural-funcional medição experimento julgamento de especialistas e estatística descritiva bem como técnicas de pesquisa dentre as quais se destacam a análise documental observação estruturada, entrevista e inquérito. A metodologia foi realizada por meio da execução de exercícios físicos. Participaram 229 crianças do nível inicial 2; A partir do diagnóstico realizado, constatou-se que o equilíbrio dinâmico (46,3%) e a coordenação dinâmica geral (43,7%) foram avaliados como regulares, além de dificuldades em todos os padrões de movimento, motricidade grossa e fina, reflexos, reações e padrões posturais. O estudo mostrou que o desenvolvimento das qualidades coordenativas básicas pode ser melhorado na Educação Física no nível inicial 2.

Palavras-chave: qualidades coordenadas básicas, Educação Física, crianças, nível inicial 2.



INTRODUCTION

One of the first demands that the environment makes on the motor development of the human being is neuromuscular coordination, which ranges from disordered or uncoordinated movements of the upper extremities in pursuit of reaching a certain object (hand-eye relationship), to the possibility of mastering the body to achieve the different basic motor skills.

Regarding motor development, Iceta and Yoldi (2020) expressed:

Over the years there has been a lot of debate about the concept of development, until today and simplifying, two models are taken into consideration: the interactional, which considers that development is the result of the simultaneous action of genetic and environmental factors. and the transactional model according to which genetic and environmental factors, endowed with plasticity, modify each other. (p 36)

At the international level, studies have been carried out on the development of coordinative qualities (Moreno and Moreno 2019) and in the research of Cenizo *et al.* (2016) 16 types of tests stand out, but no studies on the sociocultural influence or the role of symbolic interactionism are reported.

Research was consulted where it is stated the need to know the level reached by girls and boys is raised, to determine the projections of their work, in order to enhance this development, Moreno and Moreno (2019) consider:

These studies have made an important contribution to the pedagogical practice of Cuban preschool education, both for their novelty and for their enriching ideas. On the other hand, there is agreement about the great importance of children's development in early childhood. (p.5)

According to Pérez (2013), coordinative qualities have an influence on the adherence to the practice of physical exercise and therefore on health, because "The more multifaceted and diverse the scope of learning action, the broader the bases will be (...) for a later strong and successful personality in sport" (Detlev, 2004, p.12).



The origin of coordinative qualities in children appears throughout their lives as a consequence of early stimulation and the various living conditions of the environment that surrounds them. This aspect, which varies so much in different countries, given their economic, cultural and socio-political development, greatly influences the biological, morphological, psychological and social characteristics of human development, although the influence of genetic load is not denied.

Children in preschool or initial level 2 (4 to 5 years) have already obtained a wealth of experiences of their reality, which allows them to use different basic forms of movement. Therefore, at the end of four years, speed exercises can be encouraged, but with small efforts. The development of muscles favors the development of coordination abilities. (p. 124)

From the above, the importance of the development of coordinative qualities is highlighted, internationally recognized by authors such as Bolaños (2017), Cenizo *et al.*, (2016), Cortegaza (2003) and Pérez *et al.* (2009) since they associate them with the learning of basic motor and sports skills and even with the development of basic physical abilities; they are also significant for aspects such as the relationship with the surrounding world, eye-hand coordination, eye-pedal coordination and space-time orientation that contribute to structuring their intelligence.

On the other hand, in Ecuador there has been evident interest in research on coordinative qualities that, although applied to other ages, have served as a theoretical reference due to the need that has been attributed to it; for example, the program to develop coordinative qualities in the sub 7 category of the Independiente Sporting Club of Cantón Manta (2017) referred to Football, but more attracted to basic motor and sports abilities.

Another important contribution is that of Prieto *et al.* (2019) who propose an interesting proprioceptive training program that has been taken into account in this study and, although it is aimed at women's soccer, it can be considered as a contribution to the development of coordinative qualities:



The relationship of coordination to neuronal structures. Proprioception as a means of recognizing the position and movement of your body structures in motor activity. Since EP enhances intra- and intermuscular coordination and improves the static and dynamic balance of the processes. The EP constitutes the information related to the internal and peripheral areas of the body that control posture, joint stability and conscious sensations. (p. 126)

Physical Education of the initial level 2, belonging to District 13D02 Circuit 13D02C01_02 of Zone 4 "Los Esteros" Parish, it does not respond to the learning needs in the development of basic coordinative qualities, which has been confirmed in a recurring diagnosis under the professional and research experience of the authors on the topic.

From the analysis of these limitations and the research consulted, it was possible to appreciate the lack of theoretical-methodological foundations, due to the fact that there is no systematized theoretical base; the theoretical foundation of the basic coordinative qualities for the teaching-learning process at initial level 2 is scarce; there is no need for a methodology for the development of basic coordinative qualities and little importance towards Physical Education classes.

Consequently, the objective is proposed to design a methodology for the development of basic coordinative qualities in Physical Education at the initial level 2 of the Manta Canton.

MATERIALS AND METHODS

The study was carried out with a pre-experimental minimal control design, through an initial and final test, in which after the first diagnosis, the independent variable was managed, with the application of the methodology.

The present research was developed in the Manta Canton, Province of Manabí, Republic of Ecuador, belonging to District 13D02 zone 4, made up of a population of seven Parishes; Of them, the "Los Esteros" Parish was randomly selected with its "Circuit" 13D02C01_02, which consists of a total of eleven schools or Fiscal Educational Units (UEF in Spanish) and in turn,



five schools were randomly selected as the population for the study, two suburban and three urban (Costa Azul, Galileo Galilei, Altamira, Josefa Mendoza de Mora and 10 de Agosto).

The Population was the total enrollment of 297 children from the initial level 2, from the five schools and the sample shown in Table 2 was the result of 229 children from all the schools, with 115 girls and 114 boys who at the time of applying the field test they were in the class (representative sample that exceeds the total, as if 171 had been applied by strata). The sample also consisted of 13 teachers and 154 parents who participated in the diagnosis of the current situation and the post-test of the status of basic coordinative qualities at initial level 2, under the authorization of the District Director of the Manta Canton.

Various scientific methods were applied that provided the collection of information for the development of basic coordinative qualities in Physical Education of the initial level 2 of the Manta Canton, Province of Manabí, which allowed obtaining and processing the results of the pre-experiment.

Theoretical and empirical methods and research techniques were used, including: analysis and synthesis, inductive-deductive, systemic-structural-functional, documentary analysis, methodological and source triangulation, structured observation, interview and survey.

Gessell psychomotor development scale and the indications of the manual for the surveillance of child development of the Pan American Health Organization (PAHO) applied to children at the initial level 2 were applied, with the objective of reaffirming the relevance of the coordinative qualities of gross/fine motor skills and essentially, to personal social study.

The test advocates the need to appreciate the quality of movement and to do so, the child must be assessed from all positions, all movement patterns, gross and fine motor skills, reflexes, reactions, abnormal postural patterns, fixations of postures, the integration of the hands, balance and it is necessary to know how to identify that while moving, you need to appreciate the quality of their movements and the signs of normality and abnormality present.



Arhein and Sinclair Test was applied modified, which measures hand-eye coordination, foot-eye coordination, general dynamic coordination, simultaneity of movements, spatial orientation, static balance, dynamic balance, rhythm, motor memory, fine motor skills, and to which modifications were made. To the modifications, according to what was analyzed above all in the quantitative evaluation scale, a qualitative evaluation scale is added.

Based on the study carried out on the basic coordinative qualities and the need to modify the scale of the Arhein and Sinclair test, the work of statistical analysis is facilitated and at the same time criteria can be given on the quality of movement based on observation and evaluation of movement.

Three observers were used and the evaluation was given by consensus. When making the qualitative assessment of each test, according to the score established for each result B = 5; R = 3; M = 0 and the qualitative average evaluation was awarded for Good (B in Spanish), if 5 or 4 points are obtained; Fair (R in Spanish), if 3 or 2 points are obtained and Poor (M in Spanish), if less than 2 points are obtained.

RESULTS AND DISCUSSION

After obtaining the information from the observation, the interview, the survey, the tests, the development scale and the analysis of documents, results were determined that existed throughout the process of development of the basic coordinative qualities in Physical Education of the level initial 2.

The absence of Physical Education teachers at this level of teaching was confirmed, which activities are applied by teachers with degrees in Initial Education for all areas of the study curriculum, predominant use of sedentary type activities in closed spaces (classrooms), limitations of facilities and spaces and little relationship between physical activities and curricular content for these ages.



It was proven that there is a lack of knowledge of the basic coordinative qualities of children, so the teachers have not been able to determine the highest, average or lowest level of development; there were limitations in the application of methods that arouse children's interest and allow active participation in their own development; the influence of the sociocultural and material environment (symbolic interactionism) was not taken into account in relation to the performance of physical activities and parents were not involved in the learning process and motor development of children in the community. (Tables 1 and 2).

Arhein and Sinclair test results

Table 1. - Global qualitative assessment of the Arhein and Sinclair test

Qualitative assessment	Coordination oculus manual		Coordination oculus foot		Coordination dynamic general		Simultaneity of movements		Static balance	
	Fr.	%	Fr.	%	Fr.	%	Fr.	%	Fr.	%
B	22	9.6	140	61.1	31	13.5	35	15.3	52	22.7
M	144	62.9	6	2.6	98	42.8	112	48.9	111	48.5
R	63	27.5	83	36.2	100	43.7	82	35.8	66	28.8
Total	229	100	229	100	229	100	229	100	229	100

Table 2 - Global qualitative assessment of the Arhein and Sinclair test

Qualitative assessment	Dynamic balance		Rhythm		Orientation space		Motor memory		Fine motor	
	Fr.	%	Fr.	%	Fr.	%	Fr.	%	Fr.	%
B	35	15.3	26	11.4	3	1.3	36	15.7	Four	1.7
M	88	38.4	125	54.6	126	55.0	123	53.7	Five	2.2
R	106	46.3	78	34.1	69	30.1	70	30.6	Two	0.9
Total	229	100	229	100	229	100	229	100	229	100

The tables present the overall results of the tests, the parameters of fair (R) and poor (M) are accentuated, this revealed shortcomings in the process of development of the basic coordinative qualities in Physical Education of the initial level 2 of the Manta Canton.



The highest fair rating was found in dynamic balance at 46.3% and general dynamic coordination at 43.7 %. The other tests reduced the percentage of fair, to the minimum of 25.5 % in the hand-eye coordination test.

Hand-eye coordination was rated as poor, with 62.9 %; followed by spatial orientation 55 %; rhythm 54.6 %; motor memory 53.7 %; simultaneity of movements 48.9 %; static balance 48.5 %; fine motor skills 44.5%; general dynamic coordination 42.8 %; dynamic balance 38.4 % and eye-foot coordination with a minimum result of poor, with 2.6 %. This last test was the best scored and in which the children demonstrated accurate skills and abilities.

Table 3. - Sample by schools of the RP Test

No. parallels	Schools	Girls		Children		Total
		Good	Evil	Good	Evil	
1	10 de agosto	3	3	3	3	156 students
3 (A, B, C)	Altamira	9	9	9	9	
4 (A, B, C, D)	Costa Azul	12	12	12	12	
2(A, B)	Galileo Galilei A, B	6	6	6	6	
3 (A, B, C)	Josefa Mendoza de Mora	9	9	9	9	
Total 13	Sub total by students =	39	39	39	39	

Table 3 presents the sample to diagnose the students with the RP test, which arises from the best (B) and lowest (M) results of the application of the *Arhein and Sinclair test*. which, as indicated in the previous table, result in 39 for the measure of (B) and 39 for the measure of (M), both for the female and male gender, with a total of 156 students (Table 4).

Table 4. - Results of the Psychomotor Development Scale (Gessell)

Items	1	2	3	4	5	6	7	8	9	10	eleven	12	13	14	fifteen	16	17
Altamira	22	49	52	51	28	32	31	68	62	42	64	58	9	66	39	19	49
Costa Azul	twenty-one	47	49	48	29	28	27	71	57	42	58	57	eleven	56	31	18	35
10 de agosto	32	62	69	61	39	39	28	72	73	64	82	77	19	81	57	38	32
Galileo Galilei	15	12	37	31	17	19	11	49	54	31	46	59	17	58	29	19	41
Josefa Mendoza	20	41	47	58	24	29	21	69	63	45	52	56	9	69	47	17	24



There was uniformity between the Altamira, Costa Azul and Josefa Mendoza de Mora schools in relation to gross and fine motor skills; however, there was a sustained difference with the Galileo Galilei school that resulted in much lower achievements in twelve of the items on the combined Gessell scale (items 1 to 11 and 15). The intra-family events could not be evidenced, but the little collaboration of the parents in relation to the development of motor activities was evident.

From the results presented, it was determined that there are difficulties in the development of basic coordinative qualities for body development in Physical Education in children at initial level 2; therefore, after analyzing the proposals and alternatives of authors to treat this important area, the contributions of Ibarra *et al.* (2020), Obando (2018), Pérez (2020) and Pirazán *et al.* (2020) were reviewed, which mean the development of motor skills and emphasize the importance of the psychomotor area in the intellectual development of the child.

Other authors, such as González (2018), have also addressed motor skills at an early age and it is considered that in their proposal the methodological guidelines are insufficient, as they are not consistent with the need to adapt the objectives, contents, methods and evaluation of the process to address individual differences.

The authors studied express the details and differences between fine and gross motor skills, as well as the activities that must be carried out for the development of one and the other (Muñiz, 2010). Scholars of this problem also propose actions for the family, exercises and games for the development of basic coordinative qualities, but in none of the cases, a methodology that allows better preparation of teachers and the family, is taken into account, in this sense.

The methodological challenges, although they involve the search for tools and techniques, must be assumed with the definition of criteria and principles that allow structuring an entire work strategy: planning, designing, executing, evaluating and systematizing orderly and coherent processes that have a cumulative logical sequence and that give the result a qualitative transformation from which it was started, for example, the proposal of a methodology was based.



Methodology for the development of basic coordinative qualities in Physical Education at initial level 2 of the Manta Canton

The operation of the methodology is demonstrated in its passage through four stages, each one is developed in steps that include specific actions, so that close relationships of interdependence and continuity are established between them.

First stage. Diagnosis

At this stage, there were used as instruments the structured observation, the in-depth interview with the teachers, the parent survey, the two tests: the *Arhein* and *Sinclair test* modified and Gessell psychomotor development scale, applied to children, who were also part of the sample as an essential step to know the characteristics of the development of basic coordinative qualities at initial level 2 and thus to establish the level of demand in the execution of these activities at a collective and individual level.

It has been revealed that the community pedagogical characterization is not taken into account; therefore, from this analysis it is clear that, in addition to the shortcomings in the delivery of classes, several important aspects for the development process of basic coordinative qualities are alerted, such as:

- Adherence to the requirements of the initial level 2 curriculum from the didactic application.
- Training on coordinative qualities and their development and importance for initial level 2, for teachers and parents.
- The motivation for the development of coordinative qualities for this age group.
- Spaces for the development of basic coordinative qualities in Physical Education at initial level 2.
- The need for autonomy of girls and boys at initial level 2.
- The rhythmic and the development of basic coordinative qualities.



- A logical sequence in the process of developing basic coordinative qualities.

Second stage. Planning

This stage is conceived once the diagnosis of the development of the basic coordinative qualities of Physical Education of the initial level 2 has been carried out, from the organizational point of view; which allows for general planning of the scientific logic of the rest of the stages. Planning has been the key since it contains the development of the system of actions and the plan of play activities for children, its objective is to plan the actions and activities to develop the basic coordinative qualities in Physical Education of the initial level 2. Games for motor development and adaptation to motor changes were proposed:

- Cognitive development games.
- Social development games.
- Pre-sports games.

Third stage. Application

Its objective is to apply what is planned to achieve the development of basic coordinative qualities in Physical Education at the initial level 2, where each child, teachers and parents must raise awareness about the need to carry out the process and its importance from the from a social, educational and intellectual point of view.

Fourth stage. Evaluation

The objective is to evaluate the results obtained in the process of developing the basic coordinative qualities of Physical Education of the initial level 2 and obtain information on the fulfillment of the planned results. It is structured in two phases: process control and adjustment of the corresponding plans.

Between the stages of the methodology there is a relationship of direct coordination, since the elements of the first create the bases and are articulated with the second, which indicates that violating any of them would mean the breakdown of the system and thereby limiting its functioning. The direct connection continues between the application and evaluation



stages that require feedback that, together with the previous stages, if carried out satisfactorily, leads to the development of the proposed methodology retaining its systemic character.

Methods used:

Game method, sensory-perceptive methods and practical methods.

These activities can influence the better comprehensive development of children, according to Carmona (2021), coordinative abilities help to execute movements in an efficient and harmonious way, so they are not only important for human beings, but must also be train throughout life, in an adapted way.

CONCLUSIONS

The insufficiencies detected in the diagnostic study carried out reveal the need to coherently articulate the development process of the basic coordinative qualities in Physical Education of the initial level 2, which made evident the integration of the human, material and institutional resources of the community, that allowed the systemic, integrative and participatory nature that this process demands.

The proposed methodology for the improvement of the process of development of the basic coordinative qualities in Physical Education of the initial level 2, based on its stages, the system of actions and the activity plan, allowed the theoretical postulates of the developed model to be realized in practice, with the coherent use of the human, material and institutional resources of the community.



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Conflict of interests:

The authors declare not to have any interest conflicts.

Authors' contribution:

The authors have participated in the writing of the work and analysis of the documents



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