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Original article

Cooperative activities for the physical flexibility capacity, in students of the Physical Culture career

Actividades cooperativas para la capacidad física flexibilidad, en estudiantes de la carrera Cultura Física

Atividades cooperativas para a flexibilidade física em estudantes de Cultura Física

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ABSTRACT

Through the physical efficiency tests, it is determined how the students' development is behaving during the course and, based on these results, actions can be taken to improve their trajectory. Flexibility is the physical capacity that gives man the possibility to

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perform movements of great amplitude, conditioned by the neuro-myo-articular structures of fixation and stabilization, and when cooperative work is used, the success of an activity of one member depends on the success of the partner. In class observations and interviews with the students of the first year of the Regular Day Course of the Physical Culture career, it is corroborated that in the Physical Efficiency Tests (Pef in Spanish) carried out at the beginning of the course, the level obtained in the physical capacity Flexibility, with respect to the rest of the tests, is the most difficult and very marked in the males, in addition, the variety in the classes and the little use of cooperative work are insufficient, so the objective of the work is aimed at proposing a set of cooperative activities that favor the physical capacity Flexibility in the students of the first year of the Physical Culture course of the Physical Culture and Sport Sciences University (Uccfd in Spanish) "Manuel Fajardo". The inductive-deductive, analysis-synthesis, scientific observation, survey and specialist criteria methods were used. The results were positive for the students after four months of applying the proposal. The specialists assessed the proposal as Very Adequate, which is evidenced by the students' results in the improvement of the level in the flexibility test.

Keywords: Cooperative activities; physical capacity Flexibility; Students.

RESUMEN

A través de las pruebas de eficiencia física, se determina cómo se va comportando el desarrollo de los estudiantes durante el curso y, en función de estos resultados, poder realizar acciones para mejorar su trayectoria. La flexibilidad es la capacidad física que brinda al hombre la posibilidad de realizar movimientos de gran amplitud, condicionada por las estructuras neuromio-articulares de fijación y estabilización y cuando se utiliza el trabajo cooperativo, el éxito de una actividad de un integrante depende del triunfo del compañero. En observaciones a clases y entrevistas realizadas a los estudiantes del primer año del curso Regular Diurno de la carrera de Cultura Física, se corrobora que en las Pruebas de Eficiencia Física (Pef) realizadas al inicio del curso, el nivel obtenido en la capacidad física Flexibilidad, con respecto al resto de las pruebas, es el de mayor dificultad y muy marcado en los varones, además, la variedad en las clases y el poco uso de trabajo cooperativo son insuficientes por lo que el objetivo de trabajo va dirigido a proponer un conjunto de actividades cooperativas que favorezcan la capacidad física Flexibilidad en los estudiantes del primer año de la carrera de Cultura Física de la Uccfd "Manuel Fajardo". Se utilizaron los métodos inductivo-deductivos, análisis-síntesis, observación científica, encuesta y criterio de especialista. Los resultados fueron positivos para los estudiantes después de cuatro meses de aplicarse la propuesta. Los especialistas valoraron de Muy Adecuado la propuesta, lo que se evidencia en los resultados de los estudiantes la mejoría del nivel en la prueba de flexibilidad.

Palabras clave: Actividades cooperativas; Capacidad física flexibilidad; Estudiantes.

RESUMO

Através dos testes de eficiência física, define-se como o desenvolvimento dos alunos está se comportando durante o curso e, dependendo destes resultados, podem ser tomadas medidas para melhorar sua evolução. Flexibilidade é a capacidade física que dá ao homem a possibilidade de realizar movimentos de grande amplitude, influenciados pelas estruturas neuro-mio-articulares de fixação e estabilização, e quando se utiliza o trabalho cooperativo, o sucesso da atuação de um membro depende do sucesso do associado. Nas observações nas aulas e nas pesquisas realizadas com os alunos no



primeiro ano do curso Regular Diurno de Cultura Física, é comprobado que nos Testes de Eficiência Física (Pef) realizados no início do curso, o nível obtido na capacidade física Flexibilidade, em relação ao resto dos testes, é o mais difícil e muito marcado nos homens, Além disso, a variedade nas aulas e o pouco uso do trabalho cooperativo são insuficientes, por isso o objetivo do trabalho é propor um conjunto de atividades cooperativas que privilegiem a capacidade física para a flexibilidade nos alunos do primeiro ano do curso de Cultura Física no Uccfd "Manuel Fajardo". Foram utilizados os métodos indutivo-deducativo, análise-síntese, observação científica, pesquisa e critérios especializados. Os resultados foram positivos para os estudantes após quatro meses de aplicação da proposta. Os especialistas classificaram a proposta como Muito Adequada, o que é evidenciado pela melhoria no nível dos estudantes no teste de flexibilidade.

Palavras-chave: Atividades cooperativas; Capacidade física; Flexibilidade; Estudantes.

INTRODUCTION

Páez (2016, p.2) defines Physical Education as a pedagogical discipline with an eminently formative character, which contributes to the harmonious development of the individual, through the systematic practice of physical activity. This modality tends to generate attitudes, perceptual-motor, physical-motor-cognitive, motor-affective and motor-affective capacities, norms and values. On the other hand, this subject develops in the individual the pleasure and taste for physical activity and incorporates it to their life habits in order to achieve good health in the population.

Basic Physical Capacities (C.F.B.) Muñoz (2019, p. 12) states that,

They are "innate physiological predispositions in the individual, which allow movement and are feasible to measure and improve through training". These are: endurance, speed and flexibility. The physical capacity Flexibility, like other basic physical capacities, has its physiological bases: on the one hand, the relationship of strength with the neuromuscular system and its capacity to produce muscular tensions and, on the other hand, endurance at the metabolic level and its capacity to produce energy. "It is the motor capacity that gives man the possibility to perform movements of great amplitude, conditioned by neuro-myo-articular structures of fixation and stabilization" (Ilisástigui, 1999 p. 18).

The conditioning factors from an anatomical and neurophysiological point of view are joint mobility: maximum degree of movement of each joint and the elasticity of the antagonist muscles: capacity for enlargement of the muscles and recovery of the initial position, strength of the agonist musculature, intermuscular coordination, age and sex.

When talking about flexibility, it is common to use other terms such as joint mobility, range of motion, elasticity and stretching. Some of them can be understood as synonyms, others have their own meanings and, in some cases, far from what is intended. *Mobility*: property of the joints to perform certain types of movements, depending on their morphological structure. *Elasticity*: property of some muscular components to deform under the influence of an external force, increasing their longitudinal extension and returning to their original shape when the action ceases. *Plasticity*: property possessed by some components of muscles and joints to take different shapes from their original ones under the effect of external forces and to remain so after the deforming force has ceased. *Stretching* is a work method related to the



physical capacity of flexibility. It also constitutes a work method for the development of this capacity.

According to **Porta (1998 p. 24)**, flexibility is "*the maximum range of joint mobility or maximum joint mobility*".

Irala (2021, p. 46) states that, flexibility "*is the basic physical quality that allows to reach the maximum possible degree of movement of a joint*". It depends on many variables such as the distensibility of the joint capsule, muscle quality, as well as the stretching capacity of tendons and ligaments, but also on external factors such as temperature, age, sex, and even emotional state. Assuming this concept by the authors, flexibility does not generate movement, but rather makes it possible. It also consists of making muscles, tendons, fasciae and capsules flexible. Depending on the type of muscular activity performed, flexibility can be worked with a dynamic system, that is, with muscular movements or static systems, which involve the maintenance of specific positions to promote muscle stretching, **Delgado (2014)**.

As **Chehaibar (2020. p.13)** states "*Flexibility is the capacity of a joint to perform a joint movement with the maximum possible amplitude*".

Evolution of flexibility

Among the physical capacities to be developed, flexibility is the greatest mobility in the joints and its decrease is observed between the ages of 10-14 years. At this age, the work to develop flexibility is twice as effective as in adults. These authors refer to the fundamental factors that influence flexibility and that are linked to morpho-functional, biomechanical and methodological aspects. Contrary to the rest of the capacities, flexibility involves with growth. The maximum flexibility is found in childhood, but also at the beginning of the pubertal stage, more specifically, around the age of 10-12 years, and then it is progressively lost.

Up to the age of six, the loco motor apparatus is characterized by its great elasticity, and global activities are indicated, with basic movements that allow them to freely exercise their motor skills.

From 6 to 12 years of age, the decrease is not very important, but precisely from this age, due to hormonal changes and anthropometric growth so accentuated, a series of changes occur in the extensibility, until then maintained, opening a point of rupture in the progression of flexibility since its regression is accentuated. From this age onwards, the decrease will depend greatly on the *subject's activity and particular constitution*. In short, flexibility is a capacity that follows a natural process of involution and if we do not pay it some attention, it will suffer a gradual deterioration.

Authors such as **Galindo et al., (2019)** express different manifestations of physical capacity flexibility, among them:

- Passive: depends on the influence of external forces, defines the work potential of this capacity in each joint.
- Active: it is conditioned by the strength of the agonist muscles working in the direction of the movement.



Types of flexibility: anatomical, reserve flexibility, passive, active.

Exercises, forms or methods?

Dynamic exercises are all exercises in which there are movements.

Static exercises: all those in which a position is adopted and maintained for a certain time, without any movement.

Methods for its development: dynamic active, dynamic passive, static passive, static active. On the other hand, to understand cooperative work it is good to know what teamwork is.

The word team implies the inclusion of more than one person, which means that the objective set cannot be achieved without the help of all its members, without exception. It is often thought that teamwork only includes the meeting of a group of people, however, it means much more. **Gutiérrez (cited in Aguilar, 2016)** argues that teamwork is "as a group of people who collaborate and interact to achieve common goals" (p.9).

In one way or another, authors have emphasized the need to favor interpersonal interaction in terms of teamwork as a strategy for promoting learning. It is only now that greater weight is given to historical contributions concerning the educational value of social interaction within the classroom. **Navarro (2013)** alludes to the fact that cooperative learning, based on heterogeneous groups for the development of various activities, can be developed through various work tools, since interactions in the classroom occur spontaneously. Although the pedagogical literature tends to see the relationship between cooperative and cooperative learning in the classroom, it is not always easy to see the relationship between cooperative and cooperative learning.

The main ideas in cooperative learning can be defined as:

Formation of groups

- Positive interdependence.
- Individual responsibility.
- Equal participation.
- Simultaneous interaction.
- Its viability in the face of heterogeneous groups.
- It is suitable for groups with special educational needs.
- They can be used with groups of any age, in any subject.

The educational practice itself, linked to cooperation in Physical Education, admits manifesting elements that make cooperation a valuable instrument in the context for learning in the field of values. Both in games, activities, dynamics, physical challenges and cooperative structures, people go through processes in which it is required to attend to positive group communication, coordination of work and the establishment of relationships between group members, in order to achieve an objective.



In relation to the values and attitudes that are promoted with cooperation in Physical Education, *Antolín et al., (2012)*, suggest that values, ultimately, are taken from the choices with which we commit ourselves, from our own experience, personal experiences in the practice of the value itself, freedom, responsibility, tolerance, dialogue, friendship, cooperation, self-esteem, motor competence, motor creativity, health, self-improvement, respect, solidarity, peace, joy. With cooperative activities, the student is given the joy of experiencing. Working in the classroom with methodologies according to the interactive approach translates into cooperating without partner opposition (*Johnson and Johnson's theory of interdependence, 1999*), which is assumed by *Valdés (2018)*. The group of individuals united with a common goal, using a common methodology, acting in a given space and time, develops complementary skills that allude to cooperative pedagogical skills that translate into how to do it (teacher's role):

- Through the use of communication (interaction)
- Organization (materials, classroom and group use of cooperative techniques)
- Dynamization and assessment of the process and development of cooperation.
- Facilitator of learning autonomy (control, decision making and requirement for students to value the results and progress made).

All of the above must be based on shared values and mutual responsibility.

In the classroom, through the Physical Efficiency Tests (Pef), there is an idea of how the development of the students' physical capacities is behaving during the course and, based on this power, we can take actions to improve them.

Physical Culture career, from observations to classes and interviews conducted with the first students in the 2018-2019 regular daytime course, led to the following problematic situation:

During the Physical Efficiency (Pef) tests carried out at the beginning of the academic course, it was found that the level obtained in flexibility with respect to the rest of the tests is the most difficult, very marked in boys and is worked individually. In addition, in interviews with students, it was shown that there was insufficient variety of flexibility exercises in Physical Education classes in the previous schools, which affect the current results.

To develop this research, it was also consulted works related to physical capacity flexibility, which were very useful to deepen its characteristics from different points of view and from different contexts (*Vaca et al, 2017; Escobar et al., 2018; Peraza et al., 2018; Eras et al., 2020; Oña et al., 2021*).

In view of the above, the objective of this work is framed in: to propose a set of cooperative activities that favor the physical flexibility capacity in the first year students of the Bachelor's Degree in Physical Culture of the UCCFD "*Manuel Fajardo*".



MATERIALS AND METHODS

Theoretical level methods

Inductive-deductive methods were used to identify the problem from practice and make the necessary generalizations; analysis-synthesis were used during the research process, from the study of the theoretical, scientific and methodological foundations to the elaboration of the set of cooperative activities. Analysis of documentary sources was used for the elaboration of the theoretical framework of the research on the basis of the bibliographic and documentary study.

Empirical level methods

Observation was used to obtain direct information about the phenomenon or object investigated. Fifteen classes were observed to evaluate the level of physical flexibility in the students.

The survey with direct and indirect questions made it possible to collect information on the physical flexibility capacity of students, both at the beginning and at the end of the intervention, emphasizing the indicators with deficiencies.

The interview with the teachers allowed to know the criteria related to physical capacity and flexibility in the students of the first year of the Bachelor's Degree in Physical Culture. Methodological triangulation offers the opportunity to improve organizational diagnosis, synthesizing the results derived from the use of multiple scientific methods into a valid and coherent interpretation.

The group interview provided insight into the teachers' aspirations regarding flexibility capacity, how they think and what they would like to do.

The specialist criterion allowed to theoretically validate the proposal of cooperative activities for flexibility in students.

RESULTS AND DISCUSSION

The results of the diagnosis will be described below. When the observation was directed to the physical capacity flexibility, it was shown that the highest response value scale indicates the parameter, *almost never* since the little use of exercises, methods, inadequate language and, above all, the little use of work among peers, which does not facilitate the development of the capacity (Table 1).



Table 1. - Results of teacher observation. Objective: to obtain information on the use of flexibility in the classes

Observer	Center	Date to	Time from	
Professor	Age	Group	Date of transcript: on the same day	
Teacher's experience null-much	Direct teaching	No. of students	Subject	
Summary of the class or activity		Cooperative techniques used.		
Indicator	Rating scale			
In the daily context of the practical teacher's work, how is the physical capacity Flexibility used?	Always	Almost always	Almost never	never
Flexibility exercises are observed in the classroom			12	3
Reflects creativity in flexibility exercises.			15	
There is variability in flexibility activities			15	
Use of production methods		2	11	2
There is correspondence between didactic means and classroom activities.		4	11	
Language used with students is approachable		5	10	
Peer-to-peer work is used to facilitate the development of this capability.			3	12

The results of the student survey correspond to what was observed in the classes, where there is a tendency towards the value scales that *almost never* or *never* occupy the highest places. In this instrument, it is shown that the frequencies of flexibility exercises are scarce, as well as the possibilities of creativity, language development, as well as little cooperative value to help their classmates (Table 2).



Table 2. - Results of the student surveys

Indicator	Rating scale			
	Always	Almost always	Almost never	never
In the daily context of a practical classroom				
How often do you receive the physical capacity flexibility in your classes?		5	150	20
Reflects creativity physical capacity activities flexibility			155	20
There is variability in physical capacity activities flexibility			175	
Use of production methods		10	160	5
There is a correspondence between the didactic means and the physical capacity activities flexibility			175	
The language used with students is accessible to perform these physical capacity exercises flexibility		30	100	25
Teamwork among students to perform the activities for physical capacity Flexibility is evident.			50	125
It reflects the cooperative value among students in carrying out these activities				175

Results of teacher interviews

Objective: to deepen on the physical flexibility capacity to be developed in the students of the first year of the Physical Culture course.

Questionnaire:

1. Do you consider that the first year students have the desired level for the age and career they are studying with respect to physical capacity and flexibility? R/ No.
2. How do you appreciate the diversity of activities to be carried out in the classes for the development of physical flexibility? R/ Scarce.
3. Do you think cooperation and teamwork are necessary in activities for physical capacity flexibility?

R/ Yes, I believe that a new methodology is needed to help the development of the physical capacity flexibility (Table 3).



Table 3. - Flexibility level achieved

Levels	Students	%
I	4	2.2
II	23	13.1
III	88	50.2
IV	60	34.2

It is observed that the highest percentage of students is between level III and IV and corresponds to the results of the instruments mentioned above in the diagnosis. Subsequently, a methodological triangulation is carried out, the graphic image of which is as follows (Figure 1).



Fig. 1. - Methodological triangulation

From this triangulation, it can be seen that there is a correspondence between the weaknesses declared by the students in the survey and what was found in the observation. The responses with the highest incidence were directed to the value scale "Almost never", which represents 85 %, and 12 % to the scale "Never". The rest of the points, corresponding to 6 %, are for the rest of the rating scale. From this, it is derived that it prevails infrequency with which the flexibility is received, insufficient creativity and variability of the flexibility activities. In addition, the didactic means, language, teamwork, as well as the cooperative value used with the students are scarce. This corresponds with the result of the interview with professors, in which it is considered that the students of the first year of the course do not have the desired level for the age and the course they are studying with respect to flexibility and that the diversity of activities is limited and a new methodology is necessary to favor the development of the physical flexibility capacity.

The results of the triangulation allowed to focus the group interview on three fundamental questions:

1. How can teachers' performance be reshaped with respect to physical capacity flexibility?
2. How to engage teachers in the transformation of physical capacity flexibility in our students?
3. What are the ways or alternatives to improve professional performance?



The following answers were obtained that allow us to see the aspirations of the Physical Culture teachers.

1. To achieve a development process towards the improvement of the physical flexibility capacity of teachers, both individually and as a team.
2. Detect together, professor-student-researcher, the processes that need to be improved and derive new priorities to carry out the transformations from the first year of the career.
3. To specify progress alternatives, corresponding to a set of cooperative activities that favor the capacity for flexibility.

The added value of this research is *a proposal of 10 cooperative activities for physical flexibility*.

Objective: to propose the necessary requirements for cooperation and professional affinity links that favor the development of the physical flexibility capacity in students of the first year of the Physical Culture career.

Aspects related to the activities presented

It is advisable for the teacher to take into account some guidelines for action:

- Incorporate these activities and use them systematically for a certain period of time (for two months) until we see that the participants have internalized them. At that point, we introduce another one and combine it with the previous one.
- Describe clearly and precisely the task being proposed.
- Guide pairs/groups to produce a specific result.
- Randomly select a few pairs/groups to present their work to the class.
- Move around the classroom and control the development of the activity.

It must be ensured that the activities are carried out, taking into account various aspects: Author(s); grouping; objectives; materials; methodology to be followed and advice. This point covers practical issues, based on our experience in order to achieve greater efficiency in performing the technique Valdés y Monteagudo, (2018) (Table 4 and Figure 2).



Table 4 - Cooperative activity for physical capacity flexibility. Activity 2

Title: el gran flexible		
Author: Yancel Wilson Valdés	Grouping 3 to 4 participants	Materials: Cards
<p>Objectives: Develop flexibility. Develop group collegiality. Activate the link between theory and practice.</p>		
<p>Methodology to be followed Teams of 3 to 4 participants are formed. The teacher with the cards containing different flexibility exercises for the same or different regions of the human body (coxo femoral, humeral scapula, trunk) each group selects one card. And they have a set time, 10 minutes to explain and execute it. At the end of the time established by the teacher, each team, represented by a student, presents the exercise they had to perform in a time of 5 minutes and that all students must have performed it. Once all the presentations of each team have been completed, all the participants select which of these performances will be classified as the most flexible.</p>		
<p>Tips: They can use means to support the work</p>		



Fig. 2. - Example of cards to work the trunk with different directions: front, side and back



Results four months after the implementation of the proposed activities

Table 5. - Flexibility level achieved

Levels	Students	%
I	9	5,1
II	110	62.8
III	50	28.5
IV	5	2,8

It can be seen that the application of the proposed activities had a favorable impact on the students' levels obtained. There is a positive tendency towards the first levels, very marked in level II. It corresponds with the students' surveys towards the criteria of always and almost always (Table 5).

Results of the proposal evaluation

For the validation of the cooperative activities for flexibility, the evaluation method was applied through the criteria of specialists Mesa, Fleitas y Vidaurreta, (2015).

In order to respond to the assessment and validation of the proposed activities, 7 specialists were selected, who were willing, through their individual consent, to participate and collaborate in the research. Among them were the following

- Four professors of the UCCFD (University of Physical Culture and Sports Sciences) "*Manuel Fajardo*".
- Three sports leaders with long and meritorious professional careers.

Characteristics of the specialists

- They are related to the practice of the profession and, from the scientific point of view, to the object and field of action of the research.
- Their opinions are valid for their level of knowledge, practical experience and research purposes.
- They have sufficient theoretical and practical experience to determine the structure, components and contents of the proposed activities.
- They are trained to assess the justification, feasibility, applicability and viability of the activities.
- They have the knowledge to obtain a consideration that justifies or ascertains whether the proposed activities are appropriate for the current conditions.
- They are critical, willing to cooperate, provide valid and highly reliable opinions for research purposes.
- During the evaluation, they will be able to correct and improve the scientific results of the proposed activities.



- They will approve the questionnaire to make their judgments, the methodology used and the processing of the information.

Objective of the method by specialist criteria

- Theoretical and practical validation of cooperative activities for physical flexibility.

Results of the evaluation of the specialists

For the establishment of the indicators, it was determined in advance that only those selected by the specialists as Very Adequate (VA) and Adequate (A) would be taken into account.

As a final result, the specialists expressed the following evaluations: Of the seven (7) specialists, they consider it Very Adequate (MA) five (5), while Adequate (A) (2) two specialists to the set of cooperative activities to favor the physical capacity flexibility in the young people of the UCCFD.

CONCLUSIONS

By way of conclusion, the referents allowed to deepen the theoretical studies of the physical flexibility capacity in its link with teamwork, in addition, the diagnosis showed the lack of development of the physical flexibility capacity in young people and the little work among peers for the development of this capacity. The proposal of a set of cooperative activities for the physical capacity Flexibility, besides helping the capacity, also allowed the link of professional affinity. The specialist criteria demonstrated the importance and feasibility of the proposal of cooperative activities for the development of the physical flexibility capacity in UCCFD students.

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Conflict of interests:

The authors declare not to have any interest conflicts.

Authors' contribution:

Mercedes Valdés Pedroso: Conception of the idea, literature search and review, instrument making, instrument application, compilation of information resulting from the instruments applied, statistic análisis, preparation of tables, graphs, and images, general advice on the topic addressed, drafting of the original (first version), review and final version of the article, article correction, authorship coordinator, translation of terms or information obtained, review of the application of the applied bibliographic standard.

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