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Editorial

A context where sport and physical activity are increasingly central to health, education, and society, this new issue of *MLS Sport* is born with a clear idea: movement is not just action; it is knowledge, emotion, and transformation.

The articles in this edition invite us to view physical activity from a broad, integrative, and profoundly human perspective. From the most rigorous scientific evidence to innovative educational proposals, they all share a common denominator: the conviction that physical exercise has a real and measurable impact on people's quality of life, regardless of their age, fitness level, or circumstances.

Research on the effects of exercise on cognition reinforces an idea that is now undeniable: moving the body is also training the mind. Improvements in memory, attention, and cognitive performance, along with a reduction in symptoms of anxiety and depression, position physical activity as a key tool for holistic well-being throughout life. It's not just about performance, but also about mental health, emotional well-being, and personal development.

From an educational perspective, this issue is firmly committed to pedagogical innovation. Interdisciplinary proposals in Primary Education and in university teacher training demonstrate that Physical Education can and should be a central pillar of competency-based learning. Active methodologies such as Project-Based Learning, Service Learning, and Cooperative Learning are presented here not as a passing fad, but as a coherent response to students' real needs: learning by doing, collaborating, and contributing value to their community. Special mention should be made of the proposals that integrate play, values, and entrepreneurship. The university welcome scavenger hunt and the multidisciplinary projects in Primary Education show that meaningful learning emerges when knowledge is connected to experience, emotion, and social commitment. Educating through movement is also educating in leadership, cooperation, and responsibility. Finally, research applied to performance and health reminds us of the importance of continuing to delve deeper into the analysis of the real physiological demands of different sports. Both the study on bouldering and the analysis of flexibility, lower back pain, and CrossFit practice underscore the need for comprehensive assessments, far removed from oversimplification, that help us train better, prevent injuries, and understand the body in all its complexity.

At *MLS Sport*, we firmly believe that science, education, and sports practice should not be separate entities. This issue is a testament to that. We invite the reader to reflect, to question, and above all, to continue moving toward a more conscious, inclusive, and transformative model of physical activity.

Because movement is much more than just getting around: it's learning, it's feeling, and it's growing.

Dr. Pedro Ángel Latorre Román
Dr. Álvaro Velarde Sotres
Editores Jefes

PROPOSAL FOR THE PRIMARY EDUCATION DEGREE FROM THE AREA OF PHYSICAL EDUCATION

Propuesta interdisciplinar para el grado de educación primaria desde el área de la educación física

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ABSTRACT

Keywords:

Service Learning, Inter-level proposal, Educational innovation.

The educational proposal consists of a themed gymkhana designed to welcome new students to the Sagrada Familia University Center, specifically in the Primary and Early Childhood Education programs. It aims to foster integration, cooperation, and the development of social and entrepreneurial skills among the participating students, combining various challenges across multiple areas of knowledge—such as science, history, language, nature, and sports—while promoting teamwork and a positive, motivating environment. The methodology integrates active approaches such as Project-Based Learning, Cooperative Learning, and Service Learning. In addition, the activity could be extended to primary schools, providing real teaching practice and enriching the educational experience. The plan includes phases of preparation, implementation, and evaluation, encouraging leadership and organizational skills among senior students. Overall, it is an interdisciplinary and innovative proposal that blends play and learning to support students' professional and personal growth.

RESUMEN

Palabras clave:

La propuesta educativa consiste en una gincana temática diseñada para la bienvenida de estudiantes de nuevo ingreso en el Centro Universitario Sagrada Familia, específicamente en los grados de Educación Primaria y

Metodologías activas, Aprendizaje Servicio, Propuesta Internivelar, Innovación educativa.

Educación Infantil. Esta pretende fomentar la integración, la cooperación y el desarrollo de competencias sociales y emprendedoras en los alumnos implicados, combinando diferentes pruebas en múltiples áreas del conocimiento, como ciencias, historia, lengua, naturaleza y deporte y promoviendo el trabajo en equipo y un ambiente positivo y motivador. La metodología utilizada combina enfoques activos como el Aprendizaje Basado en Proyectos, el Aprendizaje Cooperativo y el Aprendizaje Servicio. Además, se plantea la posibilidad de extender la actividad a centros escolares de Primaria, facilitando prácticas docentes reales y enriqueciendo la experiencia educativa. La planificación incluye fases de preparación, desarrollo y evaluación, promoviendo el liderazgo y la organización entre los alumnos de cursos superiores. En definitiva, se trata de una propuesta interdisciplinar e innovadora que combina juego y aprendizaje, para facilitar el crecimiento profesional y personal de los estudiantes.

Introduction

With the changes that education has undergone in recent years thanks to research, it is of utmost importance to promote and incorporate didactics that are not only based solely on teaching the contents described in the curriculum of the Primary Education Degree, but also promote and develop social, moral and ethical values necessary for the development of teaching work once the initial training period is over. As already mentioned by Traver and García in 2009, values education must start from the immediate reality and the real culture of the subjects involved, so it is essential that these values are worked on in a practical, transversal and interdisciplinary way through proposals that involve social interaction.

Based on this aspect and using the game as a socializing dynamic, as a means to improve teamwork and interpersonal relationships, in an atmosphere of joy and well-being (Díaz, 2022), we seek to propose an innovative and interdisciplinary alternative that facilitates university students to put into practice the knowledge acquired in the area of Physical Education, as well as to visualize it as a useful reference to promote their ability to develop in their professional future with greater effectiveness. In addition, the aim is to positively influence the motivation of students belonging to the university degree of Primary Education, since this allows students to adapt to diverse cultural styles, as well as to active methodologies and to assume with normality the differences among their peers (Makhambetova, Zhiyenbayeva, & Ergesheva, 2021).

Thus, we propose an interdisciplinary and multidisciplinary educational project that starts from the Service for the Development of Entrepreneurial Competence, Orientation and Labor Insertion of the Sagrada Familia University Center to dynamize the welcome days, through the development of a thematic gymkhana aimed at new students and coordinated by students of higher grades, whose organization and preparation aims to promote both the integration of students who must work in teams, as well as the formation of a socio-affective link sustained by the values necessary for cooperation such as empathy, tolerance and mutual respect. In fact, this proposal aims to lay the foundations for an educational environment based on cooperative work, peer education and the creation of positive attitudes towards teaching. Moreover, according to Laguna (2015), it favors the valuation and personal self-esteem of students, the creation of a more positive attitude towards others and the integration of students with difficulties in socializing. On the other hand, the student organizer will acquire entrepreneurial and learning-to-learn skills that will generate benefits upon graduation.

Theoretical Framework

The implementation of interdisciplinary projects in Primary Education is essential to promote comprehensive learning that connects diverse areas of knowledge. This approach allows students to establish meaningful connections between subjects, favoring a deeper and more contextualized understanding of the content. In addition, the interdisciplinary methodology enhances the development of critical thinking, collaboration and social skills, essential aspects for cognitive, social and emotional growth at this educational stage. Recent studies have shown that working through interdisciplinary projects, especially those that include problem-solving and experimental tasks, contributes significantly to the development of critical thinking in elementary school students (Education Sciences, 2025). Likewise, it has been shown that

this approach favors collaboration among students, promoting social and emotional skills that are fundamental for their integral development (Artis Foundation, 2025).

On the other hand, as indicated in *Article 18*. According to Law 17/2007, of December 10, 2007, on Education in Andalusia, *initial teacher training* must cover both the acquisition of knowledge and the development of skills and aptitudes, the essential component being the permanent and interactive relationship between theory and practice and the preparation for the management of teaching and learning processes and the personal development of students, and whose ultimate goal is to prepare teachers to respond to the challenges of the educational system set forth in the Law. Therefore, students of the Primary and Early Childhood Education degree must acquire during their training those knowledge, competences, attitudes and aptitudes that allow them to fulfill the functions of the teaching staff indicated in article 91 of the third title of the Organic Law 2/2006, of May 3, on Education. These include the following:

- The promotion, organization and participation in complementary activities, inside or outside the school grounds, programmed by the centers.
- The contribution to ensure that the center's activities take place in a climate of respect, tolerance, participation and freedom in order to foster in students the values of democratic citizenship and the culture of peace.
- Participation in the general activity of the center.
- Research, experimentation and continuous improvement of the corresponding teaching processes.
- The performance of the above functions by teachers, under the principle of collaboration and teamwork.

In addition, Article 27, "Teaching programs", of Decree 328/2010, of July 13, 2010, which approves the Organic Regulations of second-grade nursery schools, pre-schools and primary schools, and specific public special education centers, states that the cycle teams are in charge of preparing the teaching programs and the teaching staff is responsible for approving them. One of the aspects requested is the teaching competence in the development of methodologies to be applied, so teachers must be updated in the different existing teaching-learning processes, as well as trained to put them into practice. On the other hand, Article 81 of the aforementioned Decree establishes the following with respect to the competencies of the cycle teams:

These are the competencies of the cycle teams:

b) To prepare the didactic programs or, as the case may be, the corresponding pedagogical proposals, in accordance with the educational project.

f) Promote, organize and carry out complementary and extracurricular activities, in accordance with current regulations.

g) To keep the teaching methodology up to date, especially that which favors the development of skills in early childhood education students and basic competencies in primary education students.

Likewise, Article 66 defines the competencies of the Faculty Senate:

These are competencies of the Faculty Senate:

e) To promote initiatives in the field of experimentation, innovation and pedagogical research, as well as in the training of the center's teaching staff.

l) Propose measures and initiatives that favor coexistence in the center

As a consequence of the above, future teachers must be able to propose innovative teaching methodologies, among which the following stand out:

- Service Learning (SL)

When we speak of PSA, we refer to those educational activities or experiences that combine service to the community with the learning of knowledge, skills and/or values. This educational proposal has a positive impact on the volunteer who carries them out, since they contribute to a complex understanding of reality and to the formation of personal attitudes and values for social transformation (Cid Romero et al. 2025; Garcia Romero & Lalueza, 2019).

In addition, studies such as that of Furco (2004), have already reinforced the positive impact that students experience in the development of conceptual knowledge and skills, in addition to the increase in their motivation with respect to school. Vocationally and professionally, they also benefit from improved professional skills and better preparation for the world of work through exposure to real-life situations. Finally, it also helps the students' classroom climate by favoring companionship, teamwork skills and prosocial behaviors.

- Project-Based Learning (PBL)

According to Sosa Cortéz et al. (2025) and Trujillo (2015), PBL is defined as a methodology that allows students to acquire knowledge and key competencies in the 21st century through the development of projects that respond to real-life problems. In addition, García-Varcácel and Basilotta (2017), defend that it is a different way of working that encourages inquiry, individual and autonomous learning of students, by acquiring a greater commitment to learning and, also, Blázquez (2016) indicates that project work fosters communication and cooperation among the agents involved, since they are usually carried out in cooperative groups.

During the development of a project, students have the opportunity to explore and discover their interests, formulate relevant questions, organize their work autonomously and search for information from various sources. Throughout the process, they share their ideas, compare them with new knowledge, communicate their findings and develop proposals based on their learning.

This is why Project Based Learning represents an active methodology that stimulates student interest and participation. By promoting autonomy, research and teamwork, it becomes a key pedagogical tool for the development of competencies.

- Cooperative Learning (CL)

Another of the main methodologies that promote entrepreneurship and learning to learn AC. However, in spite of being a didactic proposal that has been commonly used in classrooms in recent years, it is difficult to establish a definition given that there are several aspects involved. According to Fernández-Río (2017), this approach is defined as a pedagogical model in which students learn with, from and by other students through a teaching-learning approach that facilitates and enhances this positive interaction and interdependence and in which teacher and students act as co-learners. In addition, other authors such as Velázquez Callado (2018), defend that this approach is based on the creation of small heterogeneous work groups, where students cooperate to achieve common goals, taking responsibility for both their own learning and that of their peers

Therefore, it could be concluded that cooperative learning is a didactic and methodological tool that allows the development of social and intellectual skills, capable of improving the academic performance of students, and for which a series of resources, actions and teaching decisions related to the autonomy, work and achievement of student objectives are needed.

Pavié (2011) considers the concept of competence as a dynamic combination of cognitive and metacognitive, knowledge and understanding, interpersonal, intellectual and practical skills, as well as ethical values. In this sense, another relevant aspect at a

theoretical level is the acquisition of competencies necessary for teacher training during their initial training, among which are:

- Learning to Learn

According to the European Commission (2018), Learning to Learn is the ability to reflect on oneself, manage time and information effectively, collaborate with others constructively, maintain resilience, and manage one's own learning and career. It also includes the ability to cope with uncertainty and complexity, contribute to one's physical and emotional well-being, express empathy and manage conflict. Along the same lines, Bolívar (2009), Mauri & Rochera (2010) and Teixidó (2010) work on this competence during school age, as a preparation to face challenges and demands in specific contexts, within a changing world, in an autonomous and self-regulated manner throughout life.

This is of paramount importance in teacher training, and is included in the RUCT report of the Infant and Primary Education degrees, as a basic competence.

Therefore, and following the guidelines listed below, the proposal presented below will be appropriate to contribute to the development of this competence in students, since it will require a correct management of time and information, a coordinated, constructive and resilient collaboration among them, as well as a broad ability to adapt and cope with uncertainty and the ability to commit and take responsibility for the project and for the physical, emotional and mental wellbeing of its participants.

- Entrepreneurial Competence

Entrepreneurial competence is a key skill for the integral development of individuals and their adaptation to current challenges. In education, its objective is not only to encourage the creation of companies, but also to develop initiative, creativity and the ability to transform ideas into concrete actions. Since the early twentieth century, authors such as Dewey (1933) and Kilpatrick (1918) promoted active methodologies such as project-based learning to strengthen this competence, highlighting its value in the formation of active and committed citizens.

The European Parliament and the Council (2006) have recognized initiative and entrepreneurship as one of the eight key competencies for lifelong learning. Furthermore, in Spain, the LOMLOE (Organic Law 3/2020) reinforces its integration in the school curriculum, promoting its transversal development in different areas of knowledge. Authors such as Pertuz-Peralta (2016), highlight the need to incorporate in the training and professional updating of teachers strategies and methodologies that promote entrepreneurship, integrating theoretical and practical aspects that allow the educator to promote a culture of entrepreneurship in the classroom.

This is why entrepreneurial competence not only promotes the creation of new projects, but also trains individuals with the capacity to adapt, critical thinking and leadership. Its inclusion in education responds to the need to prepare young people for a constantly changing world, promoting their autonomy, creativity and social commitment.

Likewise, it is necessary to refer to article four of Decree 101/2023, of May 9, which defends the integration of different experiences and learning of students from a global perspective as an educational principle.

Folch Dávila et al. (2020) publish an interdisciplinary project in the areas of Physical Education, Music Education and Visual and Plastic Education for the initial training of future teachers at Ramón Llull University. Its objective is to achieve significant learning in students through real practices in which co-teaching, cooperative learning and formative evaluation are worked on.

Description of the Proposal

The didactic proposal *The Four Kingdoms* was the winning project of the Ideas Competition for the Transformation of the University Center, promoted by the Service for the Development of Entrepreneurial Competence, Guidance and Job Placement of the Sagrada Familia University Center.

This proposal was selected among the finalist projects, for its purpose of carrying out an educational practice that would facilitate the learning of the curricular competencies of the students of the Primary Education degree, fundamentally those of entrepreneurship and learning to learn, as well as for the innovative methodologies on which it was based, and for the possibility of transferring it to a school context in Primary Education.

The four kingdoms is a playful proposal, with a marked interdisciplinary and multidisciplinary character that, although it was conceived from the area of Physical Education, was perfectly globalized with other subjects of the degree related to the areas of Science and Mathematics, Spanish Language and Foreign Language (English), Social Sciences, History and Geography.

The proposal was planned by students of the 2nd year of the Primary Education Degree, with the intention of being implemented as a welcome and inclusion activity for new students entering the first year of the Early Childhood Education and Primary Education Degrees.

The main beneficiaries of this proposal are the new students at the Centro Universitario Sagrada Familia, as well as teachers and students of the different grades who intervene as collaborators, assuming some function necessary for its execution, or as players, accompanying the new first-year students, since the latter can only participate by playing.

Objectives of the Proposal

This didactic proposal intends that students obtain a significant learning of the contents worked on in the degree, increasing their active participation by bringing to reality the methodology of cooperative learning, since it is necessary the cooperation of all, project-based learning, service learning and students learn to learn by trial and error by exercising the work of monitors and coordinators.

Moreover, one of the most essential objectives expected after the implementation of this proposal is to achieve a climate of trust, empathy and respect of higher quality, so that students of all grades feel more integrated among themselves and in the institution, thus favoring coexistence among all the agents that are part of the school. It would also be ideal to observe in students in advanced courses an attitude in which motivation and initiative predominate, which are key to entrepreneurial competence.

From the point of view of the beneficiary students, belonging to the first year of the degree, the main objective is:

- To get to know the environment and spaces of the University Center, facilitating its social inclusion among new students and students of higher grades.

As secondary objectives, it is intended:

- Acquire soft skills such as teamwork, assumption of responsibilities, resistance to failure, leadership, problem solving and empathy.
- Acquire a positive and welcoming image of the University Center.

From the point of view of the student organizers and collaborating students, the main objective is:

- Acquire competencies specific to the Primary Education degree, highlighting those of entrepreneurship and learning to learn.

As secondary objectives, it is intended:

- Acquire organizational and planning skills.
- Acquire soft skills such as teamwork, assumption of responsibilities, resistance to failure, leadership, problem solving and empathy.
- Develop imagination and creative capacity.
- Acquire methodological resources applicable to teaching in schools.

The main expected objectives can be evaluated through the following rubric, in which we can observe evaluable criteria for both groups of students, first year beneficiaries and organizers/collaborators of higher courses, as well as for only one of them.

Methodology

Personal Agents Involved and Roles

For the implementation of the proposal, the following personal agents are required.

1. Consulting professors.

For the proper development of the project, being interdisciplinary, it is decided to take as advisors a professor of a subject of the degree related to any of the four areas of knowledge involved in the proposal.

Functions:

- Advise on the adaptation of the different tests to be developed in each of the four realms, associated to a specific area of knowledge, taking into account that these should be oriented to the undergraduates of the Primary Education degree.
 - Provide ideas for improvement.
 - Help in recruiting student collaborators.
 - Serve as a control element in case of disruptive situations.
 - Assists in the supervision of play areas (realms), depending on their specialty.
2. Proposal coordinators.

In addition to being the winning team of students in the ideas competition, they are the coordinators of the proposal.

Functions:

- Project design.
- Recruitment of collaborating students.
- Request for permits for the use of spaces and materials.
- Organization of spaces and materials.
- Purchase and distribution of materials.
- Publicizing the event.
- Creation of the player registration classroom.

- Organization of work groups, information on rules and game guidelines, distribution of functions and distribution of spaces and materials.
 - Supervision of the tasks and spaces on the day of the Project implementation.
3. Lords of the realm.

They are the coordinators of each of the four game zones.

Functions:

- Present the theme of the corresponding play area.
- Motivate the participation of participants.
- Control the time and flow of the game, together with the knights of the kingdom.

Character description: the lords are the highest authority of each realm or area of play; therefore, they should dress, look powerful and try to represent the area of knowledge associated with each realm. Thus, they will be characterized as follows:

- Lord of Communication: he has white hair and a long beard and wears a large light blue tunic with many golden details. In addition, he carries an old bandolier with numerous worn papyrus scrolls, a white cane similar in shape to a fountain pen and a laurel wreath.
- Lord of Wisdom: his hair and beard are short and dark brown. He wears a large white robe with gold details and carries various concoctions and potions tied to his belt, a braided wooden staff, which imitates the branch of a tree, with a large crystal at the top and a laurel wreath.
- Lady of Nature: her hair is red and she wears a large aqua green tunic with golden details. Along with this, she has a necklace with a compass rose, a pair of pocket watches tied to her belt, a golden braided wooden walking stick with a sun on the end and a small thin golden tiara.
- Lady of Sports: her hair is brown and she is dressed in a large red tunic with several golden details. Moreover, he carries a quiver and a bow on his back, a laurel wreath and a golden staff similar to a spear.

4. Knights of the realm.

They are the monitors of each of the tests that are organized in each game zone.

Functions:

- Explain to the participants the different tests performed in each realm.
- Control the time and development of the tests, together with the lords of the kingdom.

Character description: they are the protectors of the lords of the kingdoms and transmit an imposing and serious, but reliable aura. They wear silver armor with touches of gold, covering them from neck to toe. In addition, they carry a sword and a shield of a color similar to steel and with golden touches and, in the case of the shield, a distinctive logo of the faction they belong to: those who are from the kingdom of Nature carry a tree, those from the kingdom of Communication carry a feather, those from the kingdom of Wisdom carry a sun and those from the kingdom of Sports carry a quiver.

5. Accompanying travelers.

They are the monitors who accompany each group of players throughout the different game areas.

Functions:

- Guide the communities along the entire test route.
- Maintain a participatory and respectful environment among participants.
- Encourage and motivate participants.

Character description: they are the ancient adventurers who tried to find the treasure of Mount Olympus and know its intricate paths, but without succeeding; so they have decided to ally with each other and join forces with the communities to find it. Thus, they are wearing a brown tunic that reveals the hiking boots they wear, a large belt that holds it. In addition, they carry an old bandolier with water bottles and a schematic map of the area where the game takes place.

6. Guardian of Olympus.

Their job is to explain the game to the communities. This is the character who starts and ends the game, explaining the rules and guidelines to be followed.

Functions:

- Introduce the theme and main objective of the game.
- Award the results at the end of the activity.
- Describe the regulations and general operation of the Project to the participants.

Character description: the Guardian is an old man with a short green tunic, white hair and a large beard of the same color. In addition, he carries a wooden staff, similar to a twisted tree branch, a laurel wreath and a key ring with oversized keys attached to his belt. He must try to evoke a defiant personality towards the players, since, having guarded the four lost keys to the treasure, he will be the antagonist.

7. Communities.

They are the players. They are organized in groups, considered as a community. It includes new students, students from higher grades who want to participate as players and teachers, if they decide to participate.

Functions:

- Actively participate in the proposed activities and games.
- Follow the rules and organization of the Project.

Character description: players will not be themed in any special way, as they are considered human beings trying to find a hidden treasure on Mount Olympus.

Didactic Methodologies Applied to the Development of the Proposal

In the conception of the proposal, the implementation of active methodologies is used, since they can be considered as a paradigm for the construction of knowledge, oriented to cultivate in the student competencies such as autonomy, the development of collaborative work in small multidisciplinary teams, a participatory attitude, communication and cooperation skills, problem solving, creativity, among others. By virtue of their relevance and transcendence in the integral development of students, it is understood that they facilitate the effective achievement of the objectives that form the backbone of this proposal. The following methodologies are highlighted:

a) Project-based learning: it is used for the creation and development of the proposal. This method of learning promotes the apprehension of new knowledge, being considered an indispensable element for the achievement of significant learning, encouraging active learning, involving students in the creation of a final product that evidences the practical application of the acquired knowledge.

b) Cooperative Learning: This methodology, endowed with a remarkable educational potential, stimulates aspects such as interpersonal communication among peers, individual and collective responsibility, effective communication and teamwork. Consequently, its implementation within the framework of this proposal proves to be very useful for the achievement of these purposes, both for the group of participating students as well as for the group of organizing students.

c) Service Learning: This methodology is one of the entrepreneurship modalities that is closely linked to social and civic change; in fact, it is intrinsically related to ethical and community service competencies. In the context of this proposal, it is hoped that the student organizers will provide a valuable service to the rest of the student community, constituting a meaningful learning experience for both the organizers and the beneficiaries. This approach promotes the development of competencies in the organizers, who must plan, manage the activity and deliver the service effectively. On the other hand, the public receiving the service will benefit from the practical experience derived from it.

Description of the Final Product

Since the present article refers to a didactic proposal that has not been carried out, it is impossible to gather conclusive results. Likewise, Organic Law 3/2020, of December 29, which amends Organic Law 2/2006, of May 3, on Education (LOMLOE), establishes in its articles and in the associated curricular documents that didactic proposals must focus on learning situations that promote the development of key competencies in students. Although it is not explicitly specified, in order to adequately evaluate the development of competencies and learning, it is advisable that learning situations include a final product that evidences the student's achievements. This approach facilitates the observation and evaluation of the learning achieved and allows for effective feedback of the educational process.

According to the above, the proposed final product would be based on a rotating gymkhana, developed in four different spaces, each considered a realm. Each realm is related to a different area of knowledge, having to pass in each of them several tests, specific to the area of knowledge mentioned.

Each kingdom is assigned a Lord of the realm and as many Knights of the realm as there are tests.

The communities must attend each kingdom at the beginning, and there must be, at the beginning, the same number of communities in each kingdom.

The day begins in a classroom at the center, set up for the event, where a person in costume appears just as each community has settled in under the supervision of the accompanying Knights. This character represents the guardian of Olympus, who has arrived there to report the war that has just broken out between his four kingdoms and, very concerned, asks for the help of the communities to return Peace to Olympus. This will only be possible if some community manages to recover the key capable of unifying the kingdoms.

This will be awarded to the community that manages to pass all the tests that each kingdom imposes on them with the highest possible score.

After introducing the students to the dynamics and the theme, the communities are distributed among the different kingdoms, so that the same number of communities are playing in each kingdom for thirty minutes.

In each realm, there will be four different tests, related to the subject matter of the realm. Each community assigned to a kingdom, must start with a different test and try to score the maximum in each of them, rotating through all of them every 5 minutes. At the end of this time, the teams receive the scores from the Lord of the realm and rotate to the next corresponding realm, having to complete all rotations in two hours total time.

The kingdoms will be as follows:

- Realm of Communication (Spanish Language and Foreign Language)

Characters: in addition to the guardian of Olympus, four accompanying knights and two knights of the kingdom are needed, these must wear an identifier that they belong to this area, such as letters scattered throughout the costume.

Space required: floor of the building assigned to university students.

Quizzes: once the gymkhana is over, the teams participate in a storytelling activity. By drawing lots, each team receives three key elements: a subject, an action (verb) and the ending of a story. With these elements, together with the objects obtained in the gymkhana, participants have ten minutes to create and interpret a story. Creativity and story structure are critical to the final score. If the story is original, funny and well-structured, the team receives five additional points, thus encouraging oral expression and teamwork in a dynamic and educational environment.

Materials: the objects that will be distributed throughout the gymkhana and then the paper cut-outs with the different subjects, verbs and endings.

Duration: the first part of the activity will last twenty minutes and the second part will last ten minutes.

- Kingdom of Wisdom (Science and Mathematics)

Characters: Guardian of Olympus, four accompanying knights, and two knights of the kingdom, who must wear an identification that they belong to this area, there can be numbers scattered around the costume.

Space required: picnic areas and courtyard of the university center

Testing: this area will be divided into two parts. The first consists of a quiz on scientific experiments, designed to introduce participants to a learning situation useful for their future teaching work. Through this dynamic, teams test their scientific knowledge and skills in a practical and fun way. To do so, each group will be instructed one week in advance to find and prepare a science experiment at the elementary school level. Each group must carry it out and explain its meaning to the rest of the group.

Once the contest is over, different logic games are played until the time available is up. One of these challenges can be the classic wolf, sheep and lettuce problem. After solving it, they must mime the solution. This activity not only encourages logical reasoning, but also cooperation and corporal expression of the participants.

Materials: the teams are informed of this contest in advance, since on this day each team must bring the necessary material for their respective experiment. In addition, the cards with the different logic games will be needed.

Duration: the contest will last 20 minutes (between preparation and presentation) and the second part will last 10 minutes.

- Kingdom of Nature (Social Studies, Geography and History)

Characters: Also to be taken into account are the eight historical characters belonging to the second test.

Space required: several courts located in SAFA's facilities.

Testing: three different activities are carried out in this area. The first activity consists of finding and correctly locating on a map of the world various geographical elements, such as capitals, emblematic monuments and rivers, which are represented by hidden images in different areas. Participants must race and collaborate cooperatively to locate the most illustrations in a short period of time, and at the end, each team receives a score based on the accuracy of their hits. The competition then continues with a challenge involving eight monitors,

each dressed as a historical figure, in which players must search for hidden cards containing stories and information about these figures. The objective is to correctly match each card with its respective character and then locate the corresponding monitor to hand them the envelope. The team that manages to associate the most cards gets an extra score. The final activity is an interactive dynamic of cultural and historical questions, in which each correct answer adds a point, making the information gathered during the previous activities become the basis for this final challenge. This comprehensive proposal encourages teamwork, mental speed and interest in cultural and historical heritage, combining learning with the thrill of competition in an enriching experience for all participants.

Materials: world map and graphic elements (capitals, monuments and rivers), envelopes and cards, and finally the cards with the questions.

Duration: the first activity lasts a maximum of 10 minutes, the second 20 minutes and the third 10 minutes.

- Kingdom of Sport (Physical Education)

Characters: four accompanying knights and two knights of the kingdom, who must wear an identifier on their costume that indicates that they belong to this area, such as balls.

Space required: pavilion or gymnasium of the university center.

Tests: the games in this area are played in a space that is divided into four zones. In each zone there is an activity, a monitor and a team to achieve the highest possible score in five minutes and, at the end of this time, the teams rotate to the next game zone that corresponds to them. The first game involves transporting balls from one wall to another by means of ski boards, for which great team coordination is required; the second involves transporting the maximum number of bricks, forming a tower with them, on pikes; the third involves knocking down as many plastic bottles as possible by means of a tennis ball and the fourth involves moving balls as a team through a support formed by plastic cubes.

Materials: balls and ski boards, bricks and spades, plastic bottles and tennis balls and finally plastic buckets.

Duration: a total of 20-25 minutes.

Once all the teams have played in all the realms, all the communities gather in a place of the institution, accompanied by the accompanying Knights to perform the closing of the day and announce the winning team through the Guardian of Olympus.

As for the rotation of the gymkhana, a characteristic element of the gymkhana, it will be executed every half hour as follows: the teams that have played the games in the Kingdom of Communication move to the Kingdom of Wisdom, those who were in the latter move to the Kingdom of Nature, the participants who were in this kingdom move to the Kingdom of Sport and those who have just played in this kingdom rotate to the Kingdom of Communication. Also, the captain of each group of players has a map of the center in which the different game zones are identified and the routes they must follow to move to them are marked, as well as the order of the kingdoms that correspond to their participation.

The duration of the activity will be approximately 160 minutes:

- 20 minutes for the presentation and explanation of the day.
- 120 minutes total time of games played in the different areas
- 20 minutes of dynamic closing.

Consequently, it would be convenient to start the day at eleven o'clock in the morning, since, afterwards, it may be ideal to start a small gathering in some space of the

center enabled to share a small snack among all, both students and teachers, with each group providing a plate of food and a couple of drinks.

Finally, if this experience is successfully passed, it can be transferred to an elementary school. In this way, through an agreement between the institution and a school, university students can put their learning into practice, adapting games from different areas to the ages of each primary school cycle. In this case, the children take on the role of players, and the future teachers act as coordinators or monitors.

Organizational Constraints

As for the organization of the project, several factors must be taken into account. On the one hand, it would be advisable to consider the most appropriate date ~~would be the~~ at the end of October, since by then all the students have already entered the University and, therefore, it is the ideal time to welcome new students with a special dynamic, without interrupting the exam calendar and avoiding the anxiety that the end of each term entails for them.

On the other hand, in order to make the project better known and, therefore, increase the participation of students and faculty members in it, it is appropriate to carry out some promotional actions in the university center. Thus, the center's social networks and a messaging application, if used, can be used to share eye-catching elements, such as infographics or posters, and information related to the organization and development of the project. On the other hand, informative posters can also be placed in the busiest areas of the center, such as the cafeteria, the main hallway or the access door to the center, or daily or weekly reminders can be made through the radio station available to the center, again, if available. Finally, and perhaps most importantly, at least one informative talk should be given to university students who are eligible to participate, as this will be the most effective means of raising awareness.

A Google form will be enabled for student registration, so that all contact information with participants is collected.

An evaluation form will also be made available to assess the suitability of the activity once it has been completed.

Phases of the Proposal

1. Creation Phase

First of all, those responsible for the project must publicize the conference through advertising and information. To do this, you can use the different media available in the university center: telegram, classroom and university radio. In addition, it is ideal to place informative posters on the walls of the center, as well as for those responsible to offer informative talks to all the courses of the degree, which will take place in each of the classrooms during school hours; therefore, those responsible should ask the faculty for permission to dedicate ten minutes of the time allotted to the teachers for teaching their subjects to explain the lectures. The objective of informing all members of the center about the project is to recruit students and teachers to act as coordinators, organizers and monitors in the days or, on the other hand, to participate as players. This recruitment will be registered through a google questionnaire, in which each person has to enter their personal data, the course and grade to which they belong, their institutional email and the role they wish to participate in. Once the registration period is closed, those in charge are in charge of organizing the players into teams, complying with the requirement that each team be made up of students from different grades, as well as contacting those who offer to be coordinators and monitors, grouping them into

work groups by areas. After the selection, the list of the teams, both players and organizers, coordinators and monitors, will be published in the various media of the university center and, of course, at all times the institutional mail of those responsible for the project must be provided to all members belonging to the university, so that everyone can contact them to consult any questions or problems that arise in relation to the conference.

2. Programming Phase

Once all the participants have been organized into teams of players or coordinators and monitors, three meetings must be held to design and develop the project. The first meeting is oriented to the review of the games suggested by area, always with accessibility to improvement proposals. Also, it will be verified that the itinerary of the gymkhana is correct, as well as that the number of activities and the spaces provided for them are appropriate to the number of registered teams of players and, finally, each working group, formed by coordinators and monitors according to area, will make a list of materials and costumes necessary for the development of the games related to the theme of the project and their subjects of knowledge.

As for the second meeting, the persons in charge are responsible for bringing to the second meeting all the materials included in the lists obtained from the first meeting, which are distinguished between borrowed materials, purchased materials, and recycled materials. Obviously, borrowed materials, such as costumes, and recycled materials, such as cardboard boxes, will be provided by all coordinators and monitors; however, purchased materials are brought only by those in charge, whose expense is associated with the university center management. During this meeting, with all the materials present, all the games will be created with their corresponding decoration.

Finally, the third meeting is dedicated to specifying the roles to be played and the steps to be followed during the day of the conference. In addition, a rehearsal of the Gymkhana will take place, starting with the introduction of the theme with the guardian of Olympus explaining the war between the kingdoms and how to achieve Peace, then going through the entire itinerary of the rotating Gymkhana, setting up the materials in each game zone and briefly reviewing each activity and, finally, reviewing the installation where the winning team will be celebrated and the closing of the event will take place. Moreover, it is also necessary to decide where to go during the day in case of any unforeseen event, accident or inconvenience during the activity.

3. Implementation Phase

On the day of the conference, all the people involved as coordinators and monitors must arrive at the university center two hours before the start of the activity. During this time, they must dress up, put on make-up, set up the decorations and materials for the games in each area according to the kingdoms and, finally, briefly remember the roles, organization, itinerary, emergency space and design of the Gymkhana. In this way, when it is time to start the day, all monitors and coordinators must be ready at their posts with all the information clarified, while those responsible for the project together with the accompanying Knights will pick up the different communities, teams of players, to move them to the game area where the Guardian of Olympus will later appear. The communities will always be under the supervision of the Knights, who will guide them throughout the process. If at any time there is any doubt, incident or accident, the Knights will direct their team to the emergency area to contact those responsible for the project and, thus, incorporate the best possible solution.

Once all the communities have rotated through the different kingdoms and arrived at the place of the closing of the event, it will be verified which of them has

managed to restore Peace, the prize obtained will be announced and, afterwards, the aperitif shared among all the participants of the days will begin, thus strengthening the coexistence among them.

4. Evaluation Phase

As it is recommended after each day, conference, event... Participants should be asked for their opinion in order to improve the design of the project for its next implementation in subsequent courses. Therefore, a google form will be published both in telegram and in classroom in which, anonymously, students and teachers will evaluate some questions such as, for example, the time spent on the day, the organization of it, aspects to improve, if the theme has been attractive or not... These data will be collected in a document, as they will be used for the development of future events.

Conclusions

The impact of this proposal is broad and beneficial to all involved. A study of the expected objectives could be considered that the implementation of the event would reaffirm the ability to create meaningful learning experiences and boost their motivation, while on the other hand, it contributes to make the institution that accepts to carry it out more visible, highlighting its differential values and strengthening its attractiveness for future students.

Moreover, by bringing together all grade levels and different learning areas in the realization of the same experience through cooperation, coexistence between the students themselves and the teachers and students is fostered, promoting an environment of collaboration and mutual learning.

In other words, the incoming students enjoy and develop relationships among themselves that are fundamental for their academic future, while the rest of the university students acquire practical experience in educational innovation, strengthen their teaching attitude and create affective bonds both among themselves and with the center's staff. This generates a climate of trust and respect, allowing the students to perceive the institution as a true space for training and growth. Teachers, in turn, strengthen their relationship with students outside the classroom, significantly affecting their understanding of students' future needs and their ability to receive more personalized guidance.

Limitations

As the project is an undeveloped proposal, it is impossible to generate a discussion about it, since there are no evidenced results. This is a didactic proposal and not a research study. Nevertheless, it is considered that the proposed objectives are really achievable in the case of implementing the proposal in the institution, although it is true that the success of each of its evaluable criteria cannot be guaranteed since it has not been previously tested.

The proposal requires a high degree of responsibility and dedication, since its implementation depends on the voluntary participation of students and teachers willing to spend much of their free time planning activities, preparing materials, organizing spaces and dissemination. The lack of commitment of any member may generate imbalances in the organization and require more preparation time outside of school hours. In addition to this, there is the economic effort involved for the institution, even though efforts are made to reduce costs through the use of borrowed or recycled materials. Another difficulty is the complex coordination among numerous participants, since they all depend on each other and require clear and updated information.

Otherwise, cooperation is affected and misunderstandings may occur, compromising the success of the day.

By involving the entire university center, the day interrupts the school schedule, which may affect the academic schedule if the teaching team is not notified sufficiently in advance. In addition, their organization requires exhaustive planning and the holding of multiple meetings beforehand, which could take up breaks or time slots dedicated to the participants' other academic activities. Therefore, the coordination of schedules between monitors and volunteers can be complex and may even cause difficulties in attending some classes.

Another important challenge is to recruit a sufficient number of volunteers to ensure the smooth running of the day. The availability and commitment of the students are key factors for the success of the proposal. However, if effectively organized, the activity represents an exceptional and unrepeatable opportunity for learning and growth, both for students and teachers, as well as for the educational community as a whole.

In the case of transferring the project to a school, it is necessary to establish agreements between the university and the school, establishing civil liability insurance and full security guarantees for the execution of the project.

Prospective

If the implementation of this workshop is successful, it can be carried out in a primary school as a continuity proposal in a similar way to the one presented. To this end, the activities of the gymkhana can be adapted to the level of each of the cycles of Primary Education and, this time, all the university students would take on the role of teachers while the teams of players are formed by the students of the school. If this were achieved, it would guarantee the development of real and meaningful practices that would integrate the competencies, concepts and contents of the Primary Education curriculum.

It can also be implemented in other educational environments such as summer camps or sports schools.

Finally, one of the strengths of the proposal is its thematic flexibility, which allows the activity to be adapted to different areas of knowledge. This versatility not only enriches learning, but also offers the opportunity to work on any area, competence or skill according to the interests and needs of the participants.

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PHYSICAL ACTIVITY AND MIND: HOW EXERCISE ENHANCES MEMORY, ATTENTION, AND MENTAL HEALTH

Atividade física e mente: Como o exercício potencia a memória, atenção e saúde mental

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ABSTRACT

Keywords:

Physical education, cognitive processes, well-being, memory

This study explores the effects of physical activity on cognition, investigating how exercise impacts functions such as memory, attention, and learning, in addition to contributing to mental health. A bibliographic review was conducted based on articles published between 2015 and 2024, prioritizing experimental studies and meta-analyses indexed in databases such as PubMed and Scopus. Inclusion criteria encompassed interventions involving aerobic exercises, resistance training, or mixed activities. The results showed that regular physical exercise significantly improves memory, sustained attention, and cognitive performance, with increases of up to 20% compared to sedentary groups. Furthermore, a reduction in symptoms of anxiety and depression was observed, reinforcing its benefits for mental health. These effects are associated with biological mechanisms, such as increased cerebral blood flow and endorphin release, as well as psychological factors, including enhanced self-confidence and stress reduction. Despite the positive evidence, variability in the types and intensities of exercises evaluated is a limitation, indicating the need for future studies to analyze specific interventions and their impacts across different age groups. It is concluded that regular physical exercise is a powerful tool for promoting cognitive and mental health throughout life.

RESUMO

Palavras-chave:

Educação Física, processos cognitivos, bem-estar, memória

Este estudo explora os efeitos da atividade física na cognição, investigando como o exercício pode impactar funções como memória, atenção e aprendizagem, além de contribuir para a saúde mental. Utilizou-se uma revisão bibliográfica com base em artigos publicados entre 2015 e 2024, priorizando estudos experimentais e meta-análises indexados em bases como PubMed e Scopus. Os critérios de inclusão abrangeram intervenções com exercícios aeróbicos, de resistência ou atividades mistas. Os resultados demonstraram que a prática regular de exercícios melhora significativamente a memória, a atenção sustentada e o desempenho cognitivo, com aumentos de até 20% em relação a grupos sedentários. Além disso, houve redução nos sintomas de ansiedade e depressão, reforçando os benefícios para a saúde mental. Esses efeitos estão ligados a mecanismos biológicos, como o aumento do fluxo

sanguíneo cerebral e a liberação de endorfina, bem como a fatores psicológicos, como maior autoconfiança e redução do estresse. Apesar da evidência positiva, a variabilidade nos tipos e intensidade dos exercícios avaliados é uma limitação, indicando a necessidade de estudos futuros que analisem intervenções específicas e seus impactos em diferentes faixas etárias. Conclui-se que o exercício físico regular é uma ferramenta poderosa para a promoção da saúde cognitiva e mental ao longo da vida.

Introduction

Physical activity has been widely recognized for its physical health benefits, but in recent decades, research has also begun to reveal its significant impact on cognitive functions. This study aims to explore the cognitive effects of physical activity, focusing on how exercise can influence memory, attention and learning capacity, as well as contributing to mental well-being. The relationship between regular exercise and cognitive health has gained prominence, especially in a global context where the increase in cognitive disorders and neuropsychiatric diseases, such as Alzheimer's, depression and anxiety, is becoming a growing concern.

Recent studies show that exercise not only improves cardiovascular health and physical fitness, but also plays a crucial role in optimizing cognitive processes such as memory, attention and learning capacity. In an era when an ageing population is a global phenomenon and mental illness is on the rise, the importance of preventative practices such as physical activity becomes even more relevant. The World Health Organization (WHO) warns of the increase in neurodegenerative diseases and mental disorders, especially in the elderly, highlighting the need for effective strategies to combat cognitive decline and promote mental well-being. As the world's population ages, the prevalence of age-related diseases, such as dementia, will increase substantially. This makes it even more urgent to identify interventions that can mitigate these impacts, promoting a better quality of life for future generations.

The impact of physical activity on mental health has also been increasingly discussed. Regular exercise has shown significant positive effects in reducing symptoms of depression and anxiety, conditions that affect millions of people around the world. According to the WHO, depression is the leading cause of global disability, affecting not only mental health, but also cognitive performance and quality of life. In this way, integrating physical activity as a simple and accessible intervention has emerged as a viable solution, with evidence showing how it can reduce depressive symptoms and improve overall psychological well-being.

Current scientific literature has consistently shown that physical activity contributes to improving short- and long-term memory, with visible benefits in cognitive functions such as sustained attention and cognitive processing speed. The review of studies carried out by Kramer and Erickson (2020) revealed that regular exercise is directly related to improvements in the volume of important brain areas, such as the hippocampus, which is involved in the formation of memories. In addition, the increased production of neurotrophic factors, such as BDNF (Brain Derived Neurotrophic Factor), is a crucial mechanism in the neuroplasticity process, facilitating the formation of new synapses and promoting brain plasticity. These findings reinforce the relevance of physical exercise as a strategy for promoting long-term cognitive health.

The choice of this topic is justified by the growing scientific evidence that regular exercise can offer significant benefits for cognitive function, helping to prevent or delay age-related cognitive decline and other neuropsychiatric conditions. Furthermore, considering the global impact of mental illness, physical activity has emerged as a multifaceted and effective approach, not only to improve mental health, but also to optimize people's cognitive functioning and quality of life. This research seeks not only to broaden the understanding of the effects of physical activity on cognitive functions, but also to contribute to the construction of public policies and educational strategies that encourage the regular practice of exercise as an essential tool for the general well-being of the population.

Therefore, this article aims to review the existing literature on the effects of physical activity on cognition, exploring how different forms of exercise influence memory, attention and learning, and how these effects can be harnessed to promote a healthier society with better mental health.

Method

To carry out this study, we opted for the literature review methodology, a robust and widely used method for compiling and analyzing existing evidence on a specific topic. The choice of a literature review is based on the fact that this method provides a comprehensive and consolidated view of the effects of physical activity on cognitive functions, considering the large number of studies already published on the subject. In addition, the literature review is an efficient approach for synthesizing and comparing the findings of different studies, which helps to provide a clear and contextualized understanding of the available scientific evidence.

Research procedures

The search for articles was carried out in renowned scientific databases such as PubMed, Scopus and Google Scholar, which are recognized for their quality and relevance in the field of health and cognitive sciences. The aim was to identify studies that addressed the relationship between physical activity and cognitive functions, with an emphasis on memory, attention and learning. The keywords used in the search were: "physical activity", "exercise", "cognitive function", "memory", "attention", "neuroplasticity", "mental health", "physical exercise and memory", "impact of exercise on cognition" and "exercise and brain health". These keywords were selected on the basis of the main concepts related to the subject of the study and enabled relevant articles to be identified.

In addition, a refined search was applied using filters to limit the results to studies published between 2015 and 2024, ensuring that the review was based on recent and up-to-date research. The choice of experimental articles and meta-analyses is due to their methodological rigor, since these types of studies offer more reliable and generalizable data on the effects of physical exercise on cognition.

Inclusion Criteria

The inclusion criteria for the studies in the review were as follows:

1. Type of study: Experimental studies, randomized clinical trials and meta-analyses investigating the effects of physical activity on cognitive functions such as memory, attention and learning were included.
2. Population: Studies involving adult and elderly populations, with or without specific health conditions (such as neuropsychiatric disorders and cognitive decline).
3. Type of intervention: Articles that analyzed any form of physical exercise (aerobic, resistance or mixed activities) and its effects on cognitive functions.
4. Time period: Only studies published between 2015 and 2024 were included, in order to ensure that the review was based on up-to-date data.

Exclusion Criteria

Studies were excluded from the analysis:

1. They focused on other areas not related to cognition, such as just the cardiovascular and metabolic benefits of physical activity.
2. They did not present clear data or measurable results on the impact of physical activity on cognitive functions.
3. They used very small samples (less than 10 participants) or those with a high risk of bias, which would compromise the reliability of the results.
4. They were not available in full text or in English, Spanish or Portuguese, languages accessible to the research team.

In addition, studies with poor quality methodology, such as those without control groups or that did not have a clear description of the intervention methods, were also excluded.

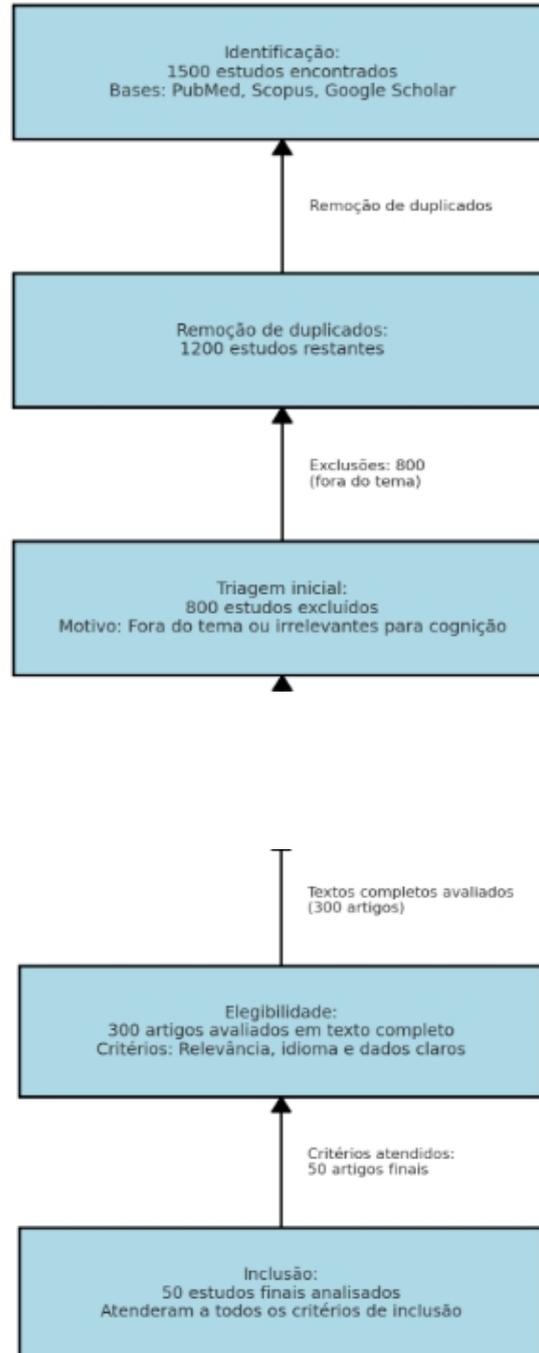
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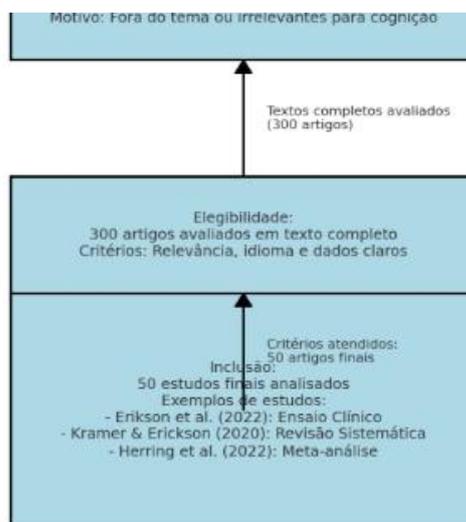
To illustrate the inclusion and exclusion criteria, as well as the selected studies, tables and graphs will be included in the results section. These tables detail the main characteristics of the included studies, such as the type of study, the population investigated, the type of intervention and the main results observed.

A flow chart, following the PRISMA guidelines (Chart 1), will also be used to visually show how studies were selected and which were discarded at each stage of the review process.

Graph 1

PRISMA to illustrate the stages of article selection.





During the review process, 1500 studies were identified in renowned scientific databases. After removing duplicates, the number was reduced to 1,200 studies. In the initial screening, 800 studies were excluded because they did not meet the theme or because they did not address aspects related to cognitive functions. Next, 300 full-text articles were reviewed, applying eligibility criteria such as relevance, language and clarity of the data presented.

At the end of the process, 50 studies were selected because they met the established inclusion criteria. Among these, the following stand out: Erikson et al. (2022), who conducted a clinical trial with elderly people and showed improvements in episodic memory; Kramer & Erickson (2020), who conducted a systematic review on mixed exercises and their contributions to short- and long-term memory; and Herring et al. (2022), who presented a meta-analysis focused on adults with anxiety, demonstrating the benefits of resistance training in reducing anxiety symptoms. These studies were considered the most relevant and appropriate to the proposal of this work, as can be seen in Table 1.

Table 1

Study	Type of Study	Population	Intervention	Main Result
Erikson et al. (2022)	Clinical Trial	Elderly people with cognitive decline	12-week aerobic exercise	Increase in hippocampus volume, improvements in episodic memory
Kramer & Erickson (2020)	Systematic Review	Healthy adults	Mixed exercises (aerobic + resistance)	Improved short- and long-term memory

Herring et al. (2022) Meta-analysis Adults with anxiety 8-week training resistance Significant reduction in anxiety symptoms

This process of selecting and excluding studies ensures that only the most relevant studies with the best methodological quality are considered, guaranteeing the robustness and validity of the review's results.

Conclusion of the Methodology

By following this detailed process of searching and selecting studies, this literature review aims to provide a clear and reliable overview of the effects of physical activity on cognitive functions. The use of rigorous methods, such as the application of inclusion and exclusion criteria and the analysis of high-quality studies, ensures that the findings can be used to inform future research and practice in public health and education.

Results

Cognitive Effects of Physical Activity

Much has now been provided by robust scientific evidence on the cognitive effects of physical activity, highlighting its positive impact on various brain functions. Recent research shows that regular exercise is a crucial factor in promoting cognitive health and combating age-related cognitive decline.

Physical activity can significantly improve short- and long-term memory. Exercise has been associated with increases in the volume of the hippocampus, an area of the brain that is fundamental for the formation and consolidation of memories. According to a study by Erikson et al. (2022), regular physical activity is associated with increases in hippocampus volume and improvements in performance in episodic memory tasks (Erikson et al., 2022). In addition, physical exercise can increase the production of neurotrophic factors, such as Brain-Derived Neurotrophic Factor (BDNF), which is related to synaptic plasticity and learning (Kramer et al., 2021).

It has even been shown to have beneficial effects on attention and the ability to concentrate. Research indicates that exercise can improve sustained attention and the ability to focus by reducing mental fatigue and increasing cerebral blood flow. A study conducted by Smith et al. (2023) found that regular exercise is associated with improvements in attention and ability to focus in older adults (Smith et al., 2023). This effect is particularly notable in people with attention deficit disorders, where exercise can help improve general cognitive performance (Cao et al., 2022).

Learning capacity, which involves acquiring and retaining new information, is another area that benefits from physical activity. Studies show that regular exercise can improve executive function, which is crucial for planning, decision-making and problem-solving. A study by Young et al. (2022) found that physical exercise is associated with improvements in executive function and mental agility, facilitating the acquisition of new skills and knowledge (Young et al., 2022). In addition, physical activity is associated with better information processing capacity, which can optimize learning (Reynolds et al., 2021).

In addition to these direct cognitive effects, physical activity has a positive impact on general mental health, helping to reduce symptoms of depression and anxiety, which

in turn can improve cognitive performance (Herring et al., 2022). The combination of physical and psychological benefits underscores the importance of incorporating physical activity into the daily routine to optimize brain health and general well-being.

These findings highlight the need to promote physical activity not only as a tool for physical health, but also as an essential component for maintaining and improving cognitive functions throughout life. 2.

Mental Health and Physical Activity

One of the main concerns arising from the increase in the elderly population is the decline in cognitive functions. Cognitive functions involve different stages of information processing, such as perception, learning, memory, attention, vigilance, reasoning and problem solving. Among the various physiological changes that occur in the central nervous system with ageing, a significant reduction in the density of neural tissues has been observed, especially in the frontal, parietal and temporal cortex regions.

In the last five years, various studies have reinforced the relationship between regular physical activity and mental health, highlighting its positive effects on memory, attention and psychological well-being. Studies show that physical exercise stimulates neuroplasticity, promoting the production of neurotrophins such as BDNF (brain-derived neurotrophic factor), which contribute to the formation of new neural connections, especially in areas linked to memory and cognition.

According to Assunção and Chariglione (2020), physical activity is one of the strategies that should be adopted during the ageing process, and is a crucial factor in dealing with risk situations and coping with the difficulties that arise during this phase. In this context, it has been observed that elderly people with high self-efficacy show improvements in anticipatory thinking, which facilitates the development of cognitive strategies. These individuals are able to use reasoning to evaluate internal and environmental factors in greater detail, improving their skills and adjusting cognitive, emotional and behavioral aspects. This contributes, for example, to improved performance in episodic memory, which usually suffers a significant decline in old age (Bandura, Azzi & Polydoro, 2008; Venâncio et al., 2018).

In addition, regular exercise, such as aerobics, weight training and yoga, has been shown to be effective in reducing symptoms of anxiety and depression, as well as controlling stress in this population. According to a 2022 meta-analysis published in JAMA Psychiatry, moderate to intense exercise reduced the risk of depression in adults by up to 30%. Other studies highlight the improvement of executive function and sustained attention, crucial effects for cognitive performance (Pearce et al., 2022).

By checking the performance of elderly women in neuropsychological tests before and after an aerobic fitness program, the results revealed that the experimental group improved significantly in attention, memory, motor agility and mood compared to the control group (sedentary). Silva (2023) investigated the relationship between physical activity and the reduction of depressive symptoms, addressing various aspects such as the prevention of these symptoms. He analyzed both aerobic and strength training, separately and in combination, and how these modalities impact the reduction of depressive symptoms. In addition, different training protocols have been explored in relation to BDNF levels in the body and their effects on depression.

Jin et al. (2019) pointed out that long-term physical exercise, which combines resistance activities and walking, has been shown to reduce symptoms of depression and body fat, as well as improving functional capacity in elderly women. These results suggest that regular exercise plays a significant therapeutic role in promoting general health.

In relation to mental health, the World Health Organization (WHO), in 2021, reinforced the importance of physical activity in promoting psychological well-being, recommending at least 150 minutes of moderate activity per week to maintain good mental health. Lange et al. (2023) positioned themselves, highlighting physical exercise as a preventive and therapeutic intervention in the context of mental health.

Physical activity therefore positively influences cognitive functions through various mechanisms. These include improved cerebral circulation, changes in the synthesis and degradation of neurotransmitters, and neuroendocrine and humoral changes. In addition, the increase in growth factors, such as BDNF, promotes neuroplasticity, improves synaptic efficacy, strengthens neuronal connectivity and increases neuron survival. Another important factor is vascular endothelial growth factor (VEGF), which stimulates angiogenesis, contributing to cognitive improvement and quality of life in the elderly.

Physical activity can be seen as a cost-effective alternative to reducing the negative effects of ageing on individuals. Increased life expectancy imposes the need to add quality to the extra years, and maintaining good functional capacity and memory are essential in this context. Based on the results of this study, it can be concluded that regular physical activity is a valuable tool for mitigating the declines in declarative memory and quality of life associated with the ageing process. This intervention not only improves physical health, but also promotes cognitive benefits, contributing to healthier and more active ageing.

This evidence updates knowledge about the holistic benefits of physical exercise, making it a key tool not only for physical health, but also for cognitive and emotional enhancement.

Biological and psychological mechanisms

The relationship between physical activity and mental health is mediated by various biological and psychological mechanisms that have been widely investigated in recent years. Current evidence indicates that regular exercise not only improves physical health, but also positively influences cognitive and emotional functioning, playing a crucial role in promoting psychological well-being.

From a biological point of view, physical exercise stimulates neuroplasticity, which is the brain's ability to adapt and reorganize itself. Brain-derived neurotrophic factor (BDNF) is a key protein in this process, facilitating the formation of new synapses and promoting the survival of neurons. Studies show that physical activity increases BDNF levels, contributing to improvements in cognitive functions such as memory and learning (Kramer & Erickson, 2020; Zoladz & Pilc, 2021).

In addition, regular exercise improves blood circulation and cerebral oxygenation, which are essential for neuronal health, favoring the delivery of nutrients to the brain (Fritz et al., 2021). Exercise is also associated with stress regulation, resulting in a reduction in levels of hormones such as cortisol and an increase in neurotransmitters related to well-being, such as serotonin and dopamine, which help to reduce symptoms of anxiety and depression (Norton et al., 2022).

From a psychological point of view, engaging in regular physical activity can increase self-efficacy, which is the belief in one's own abilities, especially in the elderly, improving confidence and the ability to face challenges (Assunção & Chariglione, 2020). According to Assunção and Chariglione (2020), physical activity, when carried out regularly, plays a crucial role in the self-efficacy of the elderly, especially in relation to their emotional states and fear of falling. This stimulates the elderly person's ability to

better discern issues in the environment around them. In this way, exercise not only promotes self-regulation, but also helps to increase functional capacity and reduce depressive symptoms.

Self-efficacy, in particular, is influenced by processes of self-observation and self-reactivity, which require awareness, planning and executive control. Therefore, the application of strategies during ageing is fundamental for dealing with risk situations and the challenges that can arise at this stage of life. Elderly people with high self-efficacy tend to show improvements in their anticipatory thinking, making it easier to formulate cognitive strategies. This allows them to analyze internal and external aspects in more detail, expanding their skills and adjusting cognitive, emotional and behavioral factors (Assunção & Chariglione, 2020). Group exercise also encourages socialization, reducing loneliness and promoting emotional connections, which are essential for mental health (Holt-Lunstad et al., 2022). In addition, activities such as yoga and tai chi incorporate elements of mindfulness, which have been shown to be effective in reducing stress and improving attention (Goyal et al., 2020).

Regularly practicing physical activity and maintaining adequate levels of physical fitness have an impact on various areas of the elderly person's life, including social and functional physical aspects. For elderly widows, joining social groups can help reduce social isolation, promoting interaction with other people and giving a new meaning to this stage of life.

Recent data shows that physical activity is a powerful intervention for promoting mental and cognitive health. The biological and psychological mechanisms involved are complex and interconnected, reinforcing the need to incorporate regular exercise into daily routines as an effective strategy for improving memory, attention and psychological well-being.

These insights underline the importance of physical activity not only for physical health, but also as a vital component for cognitive and emotional enhancement, highlighting the need to promote exercise programs in mental health and aging contexts.

Discussion and Conclusions

In conclusion, regular physical activity is essential not only for physical health, but also for mental and cognitive well-being, especially among the elderly. The biological and psychological mechanisms associated with physical activity, such as neuroplasticity, stress regulation and the strengthening of self-efficacy, demonstrate how exercise contributes to improving memory, attention and emotional health. In addition, the socialization promoted by group activities reduces isolation and enriches the social life of the elderly, offering new meanings to this stage of life.

The analysis of the selected studies reveals a series of significant results on the effects of physical activity on cognitive functions, with notable variations depending on the type of exercise, intensity, duration, age and health of the participants. Below, we will discuss in detail the main findings, their possible applications in different contexts and the variations observed in the results, providing a more in-depth understanding of the impacts of physical activity on cognition.

Impact of Exercise on Cognitive Functions

The most consistent results indicate that regular exercise has a positive impact on various cognitive functions, including memory, attention and learning capacity. Most of the studies analyzed show that both aerobic and resistance exercises have significant

effects on short- and long-term memory, sustained attention and cognitive processing speed.

For example, the study by Erikson et al. (2022) showed that regular aerobic exercise in elderly people with cognitive decline resulted in an increase in the volume of the hippocampus, a crucial area for the formation of memories. The improvement in episodic memory observed after 12 weeks of exercise suggests that aerobic exercise may be an effective intervention to prevent or delay cognitive decline. In contrast, Kramer and Erickson (2020) observed that mixed exercise (aerobic and resistance) resulted in significant improvements in short- and long-term memory, suggesting that combining different types of exercise may have broader effects on cognition.

Variations in Results Based on Different Factors

Although the general effects of physical activity on cognitive functions are positive, the results vary based on various factors, such as the type of exercise, intensity, duration, age and health of the participants.

Type of exercise: Most studies suggest that aerobic exercise has a more direct impact on memory and neuroplasticity, probably due to increased cerebral blood flow and the production of neurotrophic factors such as BDNF (Brain-Derived Neurotrophic Factor). On the other hand, resistance exercises are also effective, especially for improving executive function and problem-solving skills, which are important aspects of learning. A study by Pearce et al. (2022) showed that resistance, combined with aerobic exercise, had a more significant impact on the ability to concentrate and pay attention in older adults.

Intensity and Duration: The intensity and duration of the exercise also influence the results. Studies such as Venâncio et al. (2018) indicate that moderate- to high-intensity exercise performed regularly over longer periods (12 to 24 weeks) has longer-lasting effects on cognition. Light exercise, on the other hand, can result in initial benefits, but it doesn't show the same effectiveness in the long term. This suggests that in order to maximize cognitive benefits, the intervention needs to be of high intensity and maintain a continuous frequency.

Age and Health of Participants: Age and state of health also play a crucial role in the effects of physical activity on cognition. In elderly populations, especially those with neurodegenerative diseases such as Alzheimer's, exercise seems to have a more pronounced impact on reducing symptoms and preserving cognitive function. However, in younger, healthier individuals, the gains in memory and learning are more subtle, but still notable, as indicated by Smith et al. (2023). In patients with disorders such as ADHD, exercise has shown significant improvements in sustained attention, as discussed by Cao et al. (2022), showing that the type of cognitive disorder can affect the response to exercise.

Comparisons Between Studies and Implications for Science

When comparing the results of different studies, it can be seen that there are a variety of findings depending on the focus of the study and the population investigated. For example, a study by Herring et al. (2022) indicated that physical activity has a more pronounced effect on the mental health of people with anxiety and depression, while another study by Reynolds et al. (2021) concluded that, for the elderly, the cognitive effects of exercise are more focused on improving executive function and the ability to multitask.

These comparisons reveal that although the general effects of physical activity on cognition are largely positive, the way in which exercise impacts mental health and cognitive functions may depend on specific factors, such as the pre-existing health

condition, the type of exercise performed and the intervention period. This suggests that future research should consider these factors more specifically in order to provide personalized interventions that maximize the cognitive benefits of physical activity.

In addition, the literature reviewed indicates that combining different types of exercise, such as resistance and aerobic, can have broader and more sustainable effects on cognitive functions, which reflects a growing understanding that multidimensional approaches are more effective in improving brain and mental health.

Applications in Different Contexts

The results found in this study have a number of practical implications for different contexts, such as education, public health and ageing.

Education: In educational settings, the findings suggest that incorporating regular physical exercise into the school curriculum can improve students' memory, attention and learning ability. The practice of physical activities, especially those involving aerobic exercise, can be particularly useful for improving academic performance, helping students to stay focused and process information more efficiently. Studies by Smith et al. (2023) suggest that even short daily exercise programs can significantly improve concentration and academic performance.

Public Health: In the context of public health, the promotion of physical exercise programs as part of policies to prevent and promote mental health could significantly reduce the costs of treating mental and neurodegenerative diseases. Encouraging the population to adopt physical activity routines could help combat the growing rate of mental disorders and cognitive decline in the elderly population.

Ageing: In older populations, the results indicate that exercise can play a crucial role in mitigating the effects of cognitive ageing and promoting brain longevity. Specific interventions, such as resistance training programs combined with aerobic activities, could be recommended to prevent or delay the development of diseases such as Alzheimer's and other forms of dementia.

In summary, the results of the review indicate that physical activity has significant beneficial effects on cognitive functions, but these effects vary depending on factors such as the type of exercise, the intensity and duration of the intervention, the health of the participants and the age group. These findings have important implications for the implementation of exercise programs in various contexts, including education, public health and aging. For cognitive benefits to be maximized, it is essential that interventions are personalized and take into account the specific needs of each population group.

Recent data highlights the need to incorporate exercise programs into daily routines, emphasizing their effectiveness in preventing and treating mental health problems such as anxiety and depression. It is therefore crucial that health professionals and public policy makers prioritize the promotion of physical activity as a vital strategy for healthy ageing, ensuring that older people have access to exercise opportunities that not only improve their physical fitness, but also their quality of life.

Implementing such initiatives can not only prolong life but, more importantly, enrich the lives of the elderly, allowing them to live more active, healthy and fulfilling lives. Evidence indicates that regular exercise, whether aerobic, resistance or mixed, contributes significantly to optimizing brain function and preventing cognitive decline, as well as promoting psychological well-being.

However, some limitations must be considered. The variability in the types of interventions and evaluation criteria in the studies reviewed may limit the generalizability of the results. In addition, most of the studies analyzed involved specific populations, such as the elderly or individuals with certain disorders, which implies the need for more research into different age groups and health conditions.

We propose to continue by investigating more specific interventions, focusing on detailed exercise protocols and their application in different contexts, such as schools and work environments. The inclusion of longitudinal studies is also recommended to assess the long-term effects of physical activity on cognition and mental health. These efforts can provide a deeper understanding and practical guidelines for implementing exercise programs in public policy and clinical settings, promoting cognitive health throughout life.

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OPTIMIZATION OF PERFORMANCE IN UNDER-18 SOCCER PLAYERS THROUGH SELECTIVE ISOMETRIC TRAINING IN LOWER LIMBS: STATE-OF-THE-ART REVIEW

Optimización del rendimiento de futbolistas sub 18 mediante entrenamiento de isometría selectiva en miembros inferiores: evisión del estado del arte

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ABSTRACT

Keywords:

Isometrics, selective strengthening, sports gesture, sports performance.

Soccer player training is constantly evolving, seeking strategies to optimize performance. This state-of-the-art review analyzes the evolution of isometric training, taking as a starting point a master's project from 2019. The objective is to determine how selective muscle training of the lower limbs influences the performance of young soccer players, comparing findings with current trends to identify significant advances.

A review of articles was conducted in the "Pubmed" database using keywords related to selective training, isometrics, and sports performance. Articles published from 2018 onwards were included, prioritizing randomized controlled trials, reviews, and comparative studies. Non-original articles and those published before 2018 were excluded.

The reviewed studies highlight the effectiveness of current selective isometric training to optimize muscle activation in the lower limbs, improving strength and endurance; benefits of isometrics by gender were observed, finding a correlation between isometrics and increased BMI. New applications of isometrics with physical means, useful in rehabilitation and improvement of sports gestures, were analyzed. For this study, the frequency of training and the population were analyzed. Although there was a limitation in the sample size in the studies, the results are promising, highlighting the usefulness of isometrics in selective strengthening, rehabilitation, and injury prevention.

RESUMEN

Palabras clave:

El entrenamiento de futbolistas se encuentra en constante evolución, buscando estrategias que optimicen el rendimiento, esta revisión del estado del arte analiza la evolución del entrenamiento isométrico, tomando como punto de partida un proyecto de maestría de 2019. El

isometría, fortalecimiento selectivo, gesto deportivo, rendimiento deportivo.

objetivo es determinar cómo el entrenamiento muscular selectivo de miembros inferiores influye en el rendimiento de futbolistas jóvenes, comparando hallazgos con tendencias actuales para identificar avances significativos.

Se realizó una revisión de artículos en la base de datos "Pubmed" utilizando palabras clave relacionadas con entrenamiento selectivo, isometría y rendimiento deportivo, se incluyeron artículos publicados desde 2018 en adelante, priorizando ensayos controlados aleatorizados, revisiones y estudios comparativos, se excluyeron artículos no originales y aquellos publicados antes de 2018.

Los estudios revisados destacan la eficacia del entrenamiento isométrico selectivo actual, para optimizar la activación muscular en el tren inferior, mejorando fuerza y resistencia; se observó beneficios de la isometría por género, encontrándose correlación entre isometría y aumento del IMC, se analizaron nuevas aplicaciones de la isometría con medios físicos, útiles en rehabilitación y mejora del gesto deportivo. Para este estudio se analizó, la frecuencia del entrenamiento y la población. Aunque existió limitación en el tamaño de muestra en los estudios, los resultados son prometedores, destacando la utilidad de la isometría en el fortalecimiento selectivo, rehabilitación y prevención de lesiones.

Introduction

Soccer training is a field in constant evolution, driven by the search for strategies that optimize performance, to achieve this, it is essential to carry out continuous research and develop new methodologies, in this context, this review of the state of the art aims to analyze the evolution of isometric training, taking as a starting point a master's project conducted in 2019. This project focused on determining how selective muscle training of the lower limbs influences the performance of soccer players in the training category of Ecuadorian soccer. By comparing the findings of this study with current trends, we seek to identify significant advances in the application and effectiveness of isometric training.

Selective muscle training is defined as a method that prioritizes the development and strengthening of specific muscle groups, its main objective is to optimize the functional capacity of the individual, allowing them to execute movements with greater efficiency and power, this translates into an improvement in the ability to perform actions that require strength, such as jumping, holding or reaching objects, which is applicable in various physical activities (Jacob et al., 2018).

Within this context, selective isometrics emerges as a complementary technique that focuses on performing static muscle contractions, targeting specific muscle groups or joints. This activation procedure is particularly valuable for strengthening stabilizing muscles, those that provide support and control during movement.

The application of selective isometrics can vary widely, from static contractions held in specific positions, to dynamic exercises incorporating external resistances, such as elastic bands or weights, this versatility allows training to be tailored to the individual needs and specific goals of each person (Wagner. et al, 2022).

A crucial aspect of selective training is its ability to contribute to injury prevention by strengthening the muscles that support and stabilize the joints, reducing joint tension and therefore the risk of injury. To ensure the effectiveness and safety of this type of training, it is essential that it is designed and supervised by professionals based on an initial assessment.

In this sense, an interdisciplinary approach combining physiotherapy and training is fundamental to obtain optimal results, collaboration between professionals from both areas, allowing to identify areas of individual weakness and design customized training programs (Azeem and Zemková, 2022).

Selective muscle training along with selective isometrics are valuable tools to improve functional capacity and prevent injuries, their application requires an individualized approach and the supervision of qualified professionals to ensure safe and effective results.

Over time, significant advances have been made in the understanding of this model of intervention, specifically in isometric exercise, this type of training is carried out from the planning in season, using the own body weight in a series of combinations with extra resistance. The results of this type of training have been shown to have a direct influence on the improvement of important factors for the field of soccer, such as vertical and horizontal movements and speed (Kun and Yue, 2022).

Although the use of resistances in physiotherapy is considered a traditional approach in physiotherapy, their integration in selective muscle training acquires a particular relevance; this is due to their direct influence on the muscle sarcomere, as well as their capacity to improve the response to external stimuli during physical activity. In this sense, the strength resulting from this type of selective training significantly optimizes the response during play, which underlines the importance of applying these findings in practice.

One of the new protocols where isometry is employed is the FIFA11+ warm-up program, due to the fact that it not only focuses on performance optimization, but also addresses the specificity needed to identify the weaknesses assessed in the first instance, in addition, the influence of the training plan on player performance has been observed (Zhou. et al, 2022).

This warm-up program consists of a series of exercises that are performed before the start of training or a match. These exercises focus on improving the player's technique, agility, coordination and endurance, while reducing the risk of injury. Making this type of intervention an essential tool for soccer coaches and physical trainers, it has been widely adopted by teams around the world and has proven to be effective in improving the physical condition of players and reducing the risk of injury. In addition, within the study by Zhou et al. (2022), observed that players who regularly perform the FIFA11+ warm-up program have a significant improvement in their performance on the field.

Isometrics as an intervention technique linked to the warm-up method mentioned above can also help improve the technique and performance of players, isometric exercises specific to soccer, another of the studies analyzed is the use of the "plank" or "wall position", for the influence on the stability and coordination of the player especially in the upper body tran, which translates into better ball control and greater accuracy in passing and shooting (Zhou. et al. 2022).

This approach, targets specific player weaknesses, for example, if a player has a weakness in the thigh muscles, a specific isometric exercise can be used to strengthen those muscles and reduce the risk of injury, it can even be used to improve endurance in the muscles or correct patterns of muscle imbalances, resulting in an increased ability to maintain pace throughout the match (Wagner. et al, 2022).

Now, although we have analyzed the approach of the studies presented and their importance on the optimization of sports performance, it becomes crucial to compare more classical measures such as the isotonic approach versus a new approach in training and warm-up such as isometrics, the importance within soccer training is crucial to maximize the sports performance of the players, constantly seeking to evolve the techniques and methods used.

In this sense, isotonic and isometric training are two approaches that have been shown to have a direct relationship with the increase of muscle strength and, therefore, with the sports performance of soccer players. The first focuses on the performance of muscle contractions with movement, which allows working on strength, speed and muscular endurance in different ranges of motion and in a more functional way. This type of training is commonly used in sports such as soccer, where the physical demand is high and the ability to generate strength in different positions and movements is fundamental.

Although in the past isotonic training has been considered more suitable for soccer than the latter, as isometric training would target a contraction in the absence of the sport-specific gesture, it has now been shown that both approaches are equally effective in increasing muscle strength, in fact, several studies have found that the combination of both approaches can be beneficial to the athletic performance of soccer players (Azeem and Zemková, 2022).

It is important to note that the isometric method is not widely used in soccer, a situation that may be due to a lack of knowledge and information about the benefits that this training approach can offer, many physical trainers may consider that isotonic training is sufficient to meet the needs of soccer players; however, this may be limiting the potential for improvement in the athletic performance of players.

Both isometric and isotonic training are effective approaches to increase muscle strength and improve athletic performance in soccer, it is necessary to have a

comprehensive approach in the training and care of athletes, in addition, it is important to inform and educate physical trainers and coaches about the benefits of isometric training so that they can incorporate it effectively in the training planning of soccer players.

An interesting study on this subject is that of da Costa et al. (2019), who conducted a comparative analysis between isometrics and plyometrics, training models that differ in their application and results. The authors concluded that isometric training yielded positive results superior to plyometric training, which allows us to reflect on whether we are focusing on the requirements necessary for the predominant objectives in soccer or whether it is necessary to focus more on the musculature of the lower limbs, expanding the range of possible options to be taken into consideration, always keeping in mind immovable gestures of the game such as jumps and explosive changes of direction in the training objective.

An important aspect to consider is that physiological differences between men and women can affect the response to training; women generally have lower muscle mass and lower strength compared to men, which can influence training results, however, this does not mean that isometric training is not equally effective for women, da Acosta et al, (2019) suggests that isometric training can be effective in improving athletic performance in both genders.

It is important to keep in mind that isometric and plyometric training can complement each other in a comprehensive training program. The author suggests that although plyometrics can improve jumping ability and explosiveness, isometrics can improve muscular strength and stability in playing positions, allowing to generate a balanced approach to training resulting in significant improvements in athletic performance, this type of understanding about the reality of athletes, about the way in which the objectives should be achieved, obviating classic facts of training that continue to yield the same results and does not lead to take on new challenges about research on these small findings on the principles of variability in training.

So far we have raised several investigations that have been executed around isometric training in the last 4 years and its significant contribution in increasing the performance of soccer players, we have even analyzed the relationship that exists on the gender factor and if this type of training, responds to these needs and although it seems to have reached the ideas there are still new strategies that are implemented and have yielded positive results.

The term "superisometric", coined by Wu (2022), refers to a modality of advanced isometric training that is performed in the aquatic environment, unlike traditional isometric training, which is performed on land, aquatic superisometric training takes advantage of the unique properties of water to increase the specificity and intensity of the muscle stimulus, the hydrodynamic resistance of water provides a constant and multidirectional load, which allows the activation of a greater number of muscle fibers and improved joint stability. In addition, the buoyancy of the water reduces the impact on the joints, allowing for high-intensity exercise with less risk of injury.

The application of aquatic superisometric training presents significant advantages for the development of muscular strength, neuromuscular coordination and the ability to jump, acceleration and running speed. These ideal characteristics can be taken especially to sports such as soccer, the ability to control the resistance and speed of movement in the water allows a more specific training adapted to the needs of each athlete, thus optimizing the results and minimizing the risk of injury.

Isometric based training within this study, proved to be an effective technique to improve muscle strength, joint stability and proprioceptive ability, this approach can be

applied to other sports that seek the same objective at the lower body level, with the aim of improving the performance of athletes, providing a number of advantages compared to traditional isometric training performed in dry.

The interdisciplinary approach, proposed by Wu (2022), integrates knowledge from sports science and physiotherapy, further enhances the benefits of isometric training in water, helping players recover from injuries or muscle pain by optimizing their muscle synergy and global biomechanics, this isometric training modality in water can be a great tool to maintain the performance of soccer players in the absence of mobility.

Method

A review was conducted by searching for articles in the database "Pubmed" using keywords such as selective, isometric, specific training, stability, sports performance, the search was conducted between the months of December 2023 and October 2024 the deadline, March 15, 2025, using the Boolean operators "and" and "or", and discarding all articles prior to 2018, the inclusion criteria were articles on selective training, isometrics and its impact on sports performance and that were published from 2017 onwards. Randomized control trials, reviews and comparative studies were selected. Exclusion criteria were articles that were not original and had been published before 2018.

Results

Figure 1

Flowchart describing the process of study identification and selection.

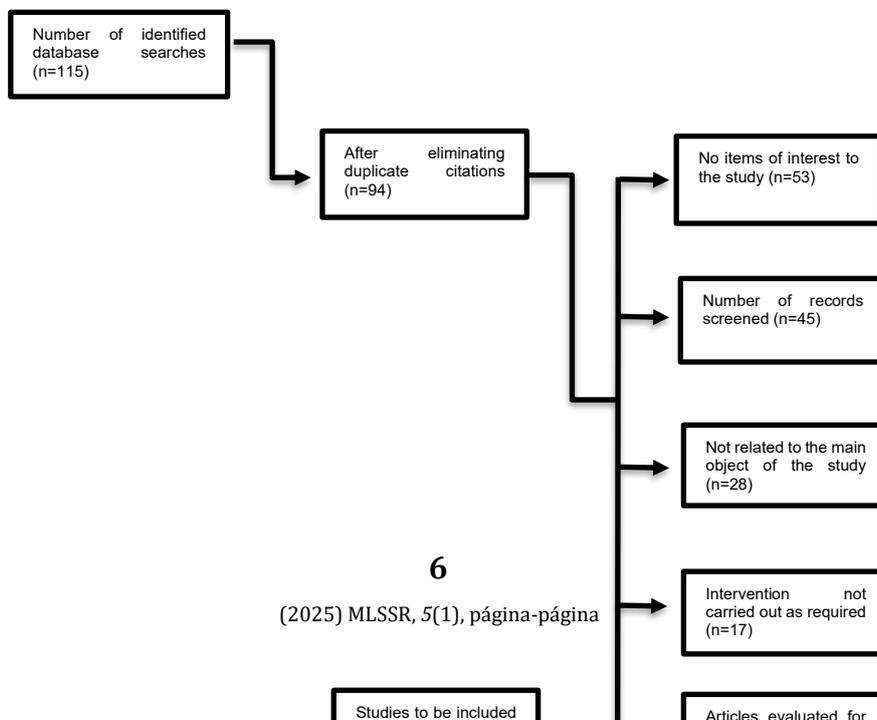


Table 1
Description of intervention studies

Author and year	Population and sample	Intervention	Frequency and method	Results
Kun and Yue (2022)	n=20	Training using the body weight of the participants, with a selective focus on soccer-specific musculature.	4 times a week	Strength increase in flexor and extensor muscles 8.78 and 9.90 (P<0.05)
Zhou et al (2022)	n=20 Men=20	FIFA 11+ warm-up program.	5 times a week 120 minutes	Increase in knee flexor muscle strength comparing pre-intervention versus post-intervention. (p < 0.05). Increase in knee extensor muscle strength comparing pre-intervention versus post-intervention (p < 0.05). Increase in sprint speed by 30 m comparing pre-intervention vs. post-intervention (p < 0.05). Shuttle run performance (lateral displacements) significantly improved in post-test scores for players (p<0.05).
Azeem and Zemková (2022)	n=100 men=50 (isometric group). men=50 (group 2 isotonic)	Experimental: analysis of isotonic versus isometric training.	2 times a week 45 minutes	Increase in BMI by 1.96% Increase in squat strength 7.80% Increase in squat tolerance 6.92% Increase over Resistance 6.99%. The increase in strength was similar to isotonic training.
da Acosta et al (2019)	n=10 Women=10	Experimental: influence of isometric training.	3 times a week 45 minutes	Increased lower limb strength in multiple gestures p = 0.33.
Wu (2022)	n=24 men=12 women=12	Superisometric training model.	3 times a week 120 minutes	Increase in gestural strength (P>0.05)
Wagner et al (2022)	n=16 male=16	Experimental: influence of isometric training, using continuous evaluations on their response.	5 times a week	Establishes an increase in strength by employing isometric training over isotonic training.
Jacob et al (2018)	n= 26 Men=16	Four-deep squats.	2 times a week	Increase in peak force ≤0.023 Increase in lower limb strength (p , 0.001, R2 = 0.98).

Women=10

3-2 hours

In reviewing the studies presented in Table 1, we found a remarkable consensus: selective isometric training stands out as an effective tool for optimizing muscle activation in the lower body. Virtually all articles (100%) support its ability to improve strength and endurance; going deeper into the data, 85.7% of the studies specifically highlight these improvements.

An interesting finding is that 42.85% of the studies found no significant differences in the effects of isometrics according to gender, suggesting that its benefits could extend to the general sports population. In addition, 28.5% of the studies observed a correlation between isometric training and an increase in Body Mass Index (BMI), which could indicate an increase in lower body muscle hypertrophy.

Finally, it is important to note that the research also explores new ways of applying isometrics, incorporating physical means that enhance its effects on the sporting gesture 14.28%. These innovations are not only relevant to soccer, but could also be applied in other sports involving the lower limbs, and could even be useful in rehabilitation programs, helping athletes to maintain their performance and avoid setbacks during injury recovery.

Discussion and Conclusions

The analysis of the papers mentioned in this paper provides a concise but revealing insight into the effects of selective isometric training on lower body performance in athletes. The studies by Kun and Yue (2022) and Zhou et al. (2022) provide strong evidence that this type of training can induce significant improvements in strength, speed and agility, in particular, the study by Kun and Yue (2022) highlights increased strength in the flexor and extensor musculature, which is critical for the execution of explosive and efficient movements in sports that require rapid changes of direction and jumping, such as soccer.

The study by Zhou et al. (2022) further delves into the benefits of isometric training, demonstrating improvements not only in knee musculature strength, but also in sprint speed and shuttle run performance, these results suggest that selective isometric training can have a positive impact on multiple aspects of athletic performance, which is crucial for athletes who need a combination of strength, speed and agility to excel in their respective disciplines.

The improvement in the shuttle run, specifically, highlights the relevance of this type of training in sports that demand fast and precise changes of direction, such as soccer, basketball and tennis, it is important to note that both studies used training protocols that emphasize muscle selectivity, meaning that they focused on strengthening specific muscle groups that are crucial for lower body performance, this selectivity allows for greater specificity in training, which can result in more significant improvements in athletic performance compared to training programs that address the lower body more generally. In addition, the inclusion of FIFA 11+ warming in the study by Zhou et al. (2022) suggest that combining specific warm-up exercises with isometric training can further enhance performance benefits.

Training frequency also appears to be an important factor in the observed results, both studies used a training frequency of 4 to 5 times per week, suggesting that consistency and regularity are crucial to obtain significant improvements in performance, this training variable allows for optimal adaptation of the muscles and nervous system, which translates into improvements in strength, speed and agility.

In addition, it is relevant to consider the population studied in both studies, since the focus was oriented towards young athletes, which suggests that selective isometric training may be particularly effective in this population, due to the developmental factor on adaptation and muscle plasticity that are increased obtaining greater benefits from isometric training compared to older athletes.

"Zhou et al. (2022) reported an increase in knee flexor muscle strength comparing pre intervention versus post intervention ($p < 0.05$), they also reported an increase in knee extensor muscle strength comparing pre intervention versus post intervention ($p < 0.05$). Although, the sample size is relatively small ($n = 20$), which may limit the generalizability of the results to larger populations, both studies focused on male athletes, which means that these results may not be applicable to female athletes.

Despite these limitations, the results of these studies are promising and suggest that selective isometric training may be a valuable tool for improving lower body performance in athletes, coaches and trainers may consider including this type of training in their training programs to optimize the performance of their athletes.

In the context of sports physiotherapy, selective isometric training is presented as a valuable tool for rehabilitation and injury prevention in athletes, its ability to strengthen specific muscles without generating excessive stress on the joints makes it ideal for post-injury recovery, allowing athletes to maintain strength and stability during the healing process, in addition, its focus on joint stability makes it an essential component of injury prevention programs, helping athletes to develop a solid foundation for optimal and safe performance.

The study by Azeem and Zemková (2022) is particularly interesting because it directly compares isometric training with isotonic training in a large sample of men, the results show that both types of training are equally effective in increasing muscular strength, however, isotonic training appears to have an advantage in terms of increasing BMI and improving tolerance and endurance, their research suggests that isotonic training may be more effective for developing muscle mass and cardiovascular endurance, while isometric training may be more effective for improving maximal strength, but ideally both strategies should be combined to achieve the athlete's full potential.

The study by da Acosta et al. (2019) focuses on the effects of isometric training in women, the results show that isometric training can increase strength in multiple gestures, although the difference is not statistically significant ($p = 0.33$), "Azeem and Zemková (2022) reported an increase in BMI by 1.96 %, increase in squat strength 7.80 %, increase in squat tolerance 6.92 %, increase over endurance 6.99 %, the increase in strength was similar to isotonic training."

Wu's study (2022) introduces the concept of "superisometric" training, which combines isometric exercises with isotonic exercises, the results show that this type of training can increase gestural strength, although the difference is not statistically significant ($P > 0.05$). This suggests that superisometric training may be an effective way to improve strength, but more research is needed to confirm these findings.

The study by Wagner et al. (2022) also compares isometric training with isotonic training, but uses continuous assessments to monitor participants' response to training, the results show that isometric training is more effective than isotonic training for increasing strength, this suggests that isometric training may be more effective for improving maximal strength, especially when an individualized training protocol is used.

The study by Jacob et al. (2018) focuses on the effects of isometric training on maximal strength and lower limb strength, the results show that isometric training can increase maximal strength and lower limb strength, especially when using squats at

different depths. This suggests that isometric training may be an effective way to improve strength in specific exercises.

Overall, it is inferred that the studies presented in the table suggest that isometric training may be as effective as isotonic training in improving muscle strength, however, isotonic training may have an advantage in terms of increasing BMI and improving tolerance and endurance. However, as mentioned, isometric training appears to be more effective in improving maximal strength, especially when an individualized training protocol is used.

It is important to keep in mind that the studies presented in the table have some limitations, for example, some studies have small samples, which may limit the generalizability of the results. In addition, some studies do not include a control group, which makes it difficult to determine the effectiveness of isometric training.

Despite these limitations, the studies presented in Table 1 provide solid evidence that isometric training can be an effective way to improve muscle strength, coaches and physical trainers may consider including isometric exercises in their training programs to improve the strength of their players.

Finally, the studies presented in the table suggest that isometric training can be a valuable tool for improving muscle strength in a variety of populations, coaches, physical trainers and physical therapists can consider including isometric exercises in their training programs to optimize the strength of their athletes and patients, ongoing research in this field is essential to optimize training protocols, identify the most effective exercises and determine the athlete populations that may benefit most from this type of training. Interdisciplinary collaboration is essential to translate research into practice to ensure that athletes receive the best possible care.

Thus, the studies presented in the table provide solid evidence that selective isometric training can be an effective tool to improve the performance of the lower body in athletes, the inclusion of this type of training in their programs can optimize the performance of soccer players, this strengthening modality is presented as a promising training tool to improve the performance of the lower body in athletes along with its potential for rehabilitation and injury prevention, making it a valuable element for sports physiotherapists.

As research in this field continues to advance, it is likely that new applications and benefits of selective isometric training will be discovered, allowing athletes to reach their maximum performance potential.

Conclusions

The studies analyzed converge in pointing to isometric training as an effective modality for the development of muscular strength, comparable in many cases to isotonic training. Nevertheless, a possible advantage of isotonic training in the promotion of hypertrophy and cardiovascular endurance is evident; the specificity of isometric training, particularly when adapted to individual needs and used in specific exercises such as the squat, highlights its potential for the improvement of maximal strength.

The variability in the training protocols and populations studied, however, underscores the need for further research to consolidate these findings and delineate the optimal applications of each training modality, the feasibility for future research in this field appears broad and promising, it is imperative to conduct studies with larger and more diverse samples, including equal representation of both genders, along with a wider age range, to increase the generalizability of the results.

In addition, the exploration of superisometric training protocols and the direct comparison of different isometric and isotonic training protocols, using continuous and objective evaluations, could shed light on the variables that optimize strength and endurance gains, likewise, research on the application of isometric training in injury rehabilitation and injury prevention, considering the individuality of each athlete and the specific sport context, is presented as an area of great relevance and potential impact.

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Conflict of Interest

The authors declare that they have no conflicts of interest.

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