

PLYOMETRIC TRAINING PROGRAM TO IMPROVE VERTICAL JUMP IN PRE-JUNIOR VOLLEYBALLISTS IN BARRANQUILLA, COLOMBIA

Yasmine Patricia de León Amaris

Universidad Autónoma del Caribe
Barranquilla, Colombia

<https://orcid.org/0009-0002-0205-3010?lang=en>

Marinella Vargas Altahona

Universidad Autónoma del Caribe
Barranquilla, Colombia

<https://orcid.org/0009-0002-5429-0800>

All content in this magazine is licensed under a Creative Commons Attribution License. Attribution-Non-Commercial-Non-Derivatives 4.0 International (CC BY-NC-ND 4.0).



Abstract: The development of this article revolves around the question: How to improve the vertical jump in volleyball athletes from Colegio Colón de Barranquilla? Taking into account the difficulties identified in a group of pre-youth athletes who, in addition to being athletes, are students of a private institution in the city, in whose practices shortcomings were evident in terms of the execution of serving, blocking and finishing techniques related to jumping. high; Therefore, a review of the factors associated with the problem was carried out, through the application of a quasi-experimental method where a pre-test was applied to the participating groups to know the initial state. After developing the proposal based on plyometric exercises with the control group, a significant advance in the execution of jumps was concluded with the post-test, and as a consequence, better performance during sports events.

Keywords: vertical jump, volleyball, plyometric exercises.

INTRODUCTION

Volleyball is a very popular sport around the world, in court or beach modes. Followers of this discipline recognize in their practice the importance of teamwork and the development of individual capabilities to achieve common goals. The growth and reception that this game of six has had worldwide, who cooperatively act on a field divided by a net, projecting accurate hits to score in the opposite field, and defending their own with skillful strategies (Griboff, 2020). This dynamic has made the game enjoy a high level, which demands professionalism on the part of its athletes, and in this sense, the development of their perceptive abilities and physical conditions is considered relevant, including competition in the vertical jump which It must be with technique, because the higher it is, the better the chances of attacking effectively.

The above results in the requirement that athletes have in their training to meet the minimum levels for the professional practice of this sport, which results in a particular interest in perfecting techniques, achieving marks related to the height of their jumps. ; and in fact, analyze the different problems around the routines that athletes apply to train, the obstacles in achieving the objectives despite the rigor of the practices, and, above all, guidance from professionals in the discipline., which have generated better results.

For this purpose, it seeks to first make a conceptual overview of the discipline, its origins, and the corresponding importance that the high jump has for volleyball players at any level, as it is a “very complex sport due to its technical, tactical demands., physical, psychological and anthropometric factors, making the analysis of small details that generate a difference to achieve better performance more important” (De Alba, Chacón, and Lajud, 2016, p. 4).

The reason for combining this problem of the sports branch with what happens in the majority of scenarios where it is practiced, whether at a secular or school level, is that coaches and especially athletes, seek to improve their technique and contribute one hundred percent the team, whether through intricate defenses or lethal attacks that lead to the success of his sextet. However, in the school context, where it could be said that the first seedbed of talented athletes in any discipline is found, it is the place where qualities are discovered but also shortcomings in the optimal development of athletes, and this is the reason that motivated the investigative deployment of a group of secondary school physical education teachers in the city of Barranquilla, Colombia, who, concerned about the poor performance of some pre-youth volleyball players in terms of the height of their jumps, focused on answering

the following Question: How to improve the vertical jump in volleyball athletes from Colegio Colón de Barranquilla?

The answer to this question could be resolved simply by saying that all athletes can increase their vertical jump by strengthening the key muscles of the lower body through the application of plyometrics, and perfecting the volleyball technique at a general level; But reaching such conclusions without first analyzing the dynamics of the context is to presume that improving performance is an act that can be standardized with an instruction manual. It requires more than just knowing the problem, it is necessary to analyze internal and external factors that could be contributing to the existence of the problem, and even perpetuating it.

To begin with, as Conrado and Grismel (2012) state, “all the technical actions (serves, receipts, passes of the ball, spikes, blocks, field defenses and supports) that the volleyball player executes in the interaction with the ball are distinguished by the shock-absorbing-precision character” (p. 34), which means that the development of these demands a regime of maximum strength in the leg muscles followed by power in the shortest possible time, to ensure that the muscles in extension they exercise a rapid and explosive contraction, a routine that is worked on in a very isolated manner and is not assumed as an exercise that accompanies the permanent training of young athletes in the aforementioned context.

Another aspect is related to poor execution in finishing and blocking, as suggested by Bermejo, et al. (2013), “to achieve a spike, jumpability is essential, the volleyball player must be very explosive and requires a great reaction capacity and fast speed of execution” (p. 3); in such a way that if when finishing both the jumping technique and the punch as such is deficient, there will be few possibilities of obtaining accurate attacks, much less an

effective block when this is the case.

Considering the relevance of the various plays in the practice of volleyball, it is believed necessary to review the difficulties in correctly executing the block technique, an action executed with the arms extended vertically with the objective of intercepting the opponent's attack and the finishing technique, which is the element that culminates the offensive phase of a play (Portuondo, et al., 2020).

Mainly, the junior men's volleyball team of Colegio Colón de Barranquilla presents difficulties in jumping, which leads to poor technical execution in blocking and finishing, which gives rise to errors whose consequence is the loss of points. Therefore, the development of the study was justified where the abilities of athletes to jump vertically are measured through standardized tests, and thus be able to define a work plan with specific exercises that help athletes strengthen strength, speed., explosiveness and speed in the jump.

Therefore, the main objective of the research is to analyze and suggest guidelines based on a program to improve the vertical jump in pre-juvenile volleyball players in a school in Barranquilla, Colombia; Likewise, the specific objective is to evaluate the jump power in athletes, based on the results and initial investigations, to design a training program based on plyometric exercises to improve the vertical jump in athletes, and finally, to assess the effect of said plyometrics training program in the students who participate in it, since in addition to meeting summative purposes, the training must be designed so that young people qualify and later can aspire for a place in high-performance teams to represent the department. or the country in important sporting events.

Well, before focusing on the local problem, a survey was carried out in the different international and national scenarios on the

actions undertaken in relation to the problem of jumpability and execution, which also serves as a basis for the design of a program for the improvement and strengthening of jumping through plyometric exercises, which allows them to be more confident in matches and desire to continue growing as athletes.

In such a way that as a contribution of this work the importance of the emotional aspects in addition to the physical ones is highlighted, and that together they result in an athlete moving away from practices and competitions. For this reason, the importance of accompanying was emphasized not only from the sporting and training level, since poor performance and performance within the game due to the emotional and personal effects also affect collective and individual development as a team.

Thus, to land on the problem that interests this document, already supported by the aforementioned background, an outline is made of the sociocultural context of the educational population where he did his work, namely, the Colon school in Barranquilla, Colombia, specifically the group of pre-youth athletes who are part of the institution's men's volleyball team, a private campus that receives a population of more than 1,000 students between strata 3 and 4 of the city and surrounding municipalities, located on 54th Street #41 -77 between the limits of the Olaya and Lucero neighborhoods, with 84 years of work without interruption, which makes it a traditional institution in the city, characterized by its commitment to social, ethical and spiritual change for the training of leaders who They work to transform processes and contribute to the development of the Industrial and Port District of Barranquilla through the principles of "Order and Study" as stated in their main motto (Blog Colegio Colón, 2019).

To recognize all the dimensions of the

problem under study, the following SWOT matrix is presented where the weaknesses, opportunities, strengths and threats regarding the topic under development are indicated:

<p>Weaknesses: Junior athletes are not giving their greatest potential in volleyball games. The strength printed in the shots, blocks and serves is overshadowed by the low height of the jumps. There is demotivation towards the practice of sport due to the negative results obtained in recent competitions. There is no support or follow-up from the district sports secretary to the process developed in educational institutions.</p>	<p>Opportunities: Athletes have a lot of talent and potential to exploit. There are spaces for the development of practices, training and matches on the educational campus. The teacher leaders of the teams have the preparation and desire for training for the progress of the sports processes.</p>
<p>Strengths The young people have good health and parental support for the execution of the program. The institution offers the necessary support for the development of the program.</p>	<p>Threats: Competition, added to the academic load, can be a stressor for the group of athletes participating in the study due to how extensive the extracurricular days can be.</p>

Table 1: SWOT matrix intervention or research exercise carried out

Source: own elaboration (2023)

THEORETICAL CONSIDERATIONS

To address the issue of the vertical jump in pre-youth volleyball players, it was necessary to investigate research from different approaches, as well as a conceptual theoretical proposal based on the categories under study: vertical jump, volleyball, plyometric method, for which the exercise was necessary. documentary review of articles, books and most pertinent conceptual supports.

This prior investigation led to the analysis of experiences such as that of Barragán (2021), whose objective was to determine the importance of power for the vertical jump in the volleyball area in a group of youth between 16 and 18 years old, whose initial

results served as basis for the design of a strengthening program in the vertical jump, which due to the documentary nature of the study was not applied, but was the starting point to establish recommendations for the improvement of jumpability and other determining aspects of the characteristics of the jump in volleyball. As can be seen, it was a key reference from the bibliographic point of view due to the richness of information with the contributions of research and theoretical summaries related to the topic under study.

In another scenario, this time in Cauca, with the research by Silva and Zúñiga (2022) from ``Corporación Universitaria Autónoma del Cauca`` entitled “effects of a unilateral plyometrics program on the vertical jump in volleyball players aged 18 to 20 years of Atenas Volleyball Club of the city of Popayán”, in which we worked with twelve young people to whom the Counter Movement Jump (CMJ) was applied to measure the explosive force in the vertical jump, and the Abalakov to assess the explosive force of the leg muscles, as well as the OPtoGait, an instrument that was used to record the flight and contact times during the execution of a series of jumps with a precision of 1/1000 sec.

The results of this longitudinal descriptive research with a quasi-experimental quantitative approach showed an improvement of 3.72%, which translated into a significant relationship between the test results before and after the application of the gradual training of Unilateral plyometrics, which undoubtedly represents a positive precedent for the design of this type of proposals and the effectiveness in the conditional abilities of the athletes.

Finally, a reflection is made on the contributions of Lhoeste and Medivil (2020), who addressed the “irrational beliefs in athletes in the youth category of the Atlantic League”, a quantitative study with an analytical empirical paradigm with a non-correlational design.

experimental, which used an intentional sample of 20 young people between 15 and 17 years old, to whom a test of irrational beliefs (corrected and abbreviated version) by Calvete and Cardeñoso (2001) was applied, the results of which showed that the participants

They have no confidence in themselves; There is little motivation, insufficient recreational actions, a lot of tension, little concentration, little self-regulation in sustained attention, which triggers a series of irrational beliefs in relation to events that have already occurred, failures in the processes of self-knowledge that lead to the need for approval by others. others, little ability to face problems (Lhoeste and Medivil, 2020, p. 10).

On the other hand, to begin this dissertation, it is necessary to speak in general terms about volleyball as a team sport widely practiced and recognized worldwide. In more technical terms, as stated by Vilela, et al. (2021), volleyball,

It is an explosive sport with non-cyclical movements that require players to have strong reflexes and speed of execution, in the execution of a game; also defining it as a sport that requires several changes in direction, speed and intensity, with increases in physical effort that can be short or long (p. 34).

According to this definition, there are some specific factors so that an athlete can perform adequately in this discipline. Hence, his physical performance is linked to several aspects, including physical, tactical and technical ability and even his temperament, others such as jump height and resistance constitute important factors in performance.

Other authors, such as García, Sánchez & González (2016), suggest that a training program based exclusively on the use of specific volleyball skills may not be sufficient to improve the shortcomings that athletes in this discipline may present, and that Combining this with a strength training program could

be the most appropriate way to improve your performance, which is an approach specifically addressed in this research.

In this case, the plyometric method is defined by Verkhoshansky (2000) as a particular and specific way of working on the human locomotor system. This author insisted on the importance of this training method with the use of the stretch reflex. While training triple jump athletes, he discovered the great capacity of his athletes to perform impulses with a short contact time and with great muscular tensions. He likewise expressed the importance of the eccentric phase of the impulse (damping phase).

As Parrales (2013) indicates, “plyometric exercises are indicated for anyone with a certain level of physical conditioning” (p. 31). It becomes a technique based on a type of exercises designed to reproduce fast, explosive and powerful movements, which not only improve strength and speed, but also helps the body to obtain maximum strength in the shortest possible time, helping to prevent injuries.

In the sports scenario, biomechanics has studied in depth various sports disciplines such as athletics, volleyball, gymnastics, soccer, swimming, basketball, baseball, etc. But it has also dedicated itself to studying some motor skills such as running, grips, landings, jumping, throwing, pushing, pulling, etc., as Monsalve (2014) explains, “a considerable volume of this research takes us to a complex analysis of “jumpability” (p. 23).

As suggested by Myer, et al, (2016) “coaches, trainers and elite athletes rely on plyometrics to improve quickness, speed, jumping ability, footwork, body control, balance and overall performance” (p. 23). Hence, it is concluded that the plyometric method is a form of training that is used to develop muscular power and the ability to generate explosive force in the muscles. This technique’s main objective is

to improve the muscles’ ability to generate maximum force in the shortest possible time. This is achieved through exercises that involve jumping, throwing, bouncing, and quick, explosive movements that involve stretching followed by muscle contraction.

In this specific case the focus is towards the vertical jump. The jumps executed by volleyball players in the course of preparation and competition exert a considerable influence both on the development of specific muscle groups that perform synergistic and antagonistic actions in the lower extremities, and on the increase in dynamic strength potential (speed- force) in said structure. Therefore, as Blasco, Ormazábal, Armijo, Pávez, Fernández, Hernández & Arcay (2017) indicate,

The height of the vertical jump has been considered by several researchers as a relevant index of sports performance. The vertical jump is probably the most relevant power testing protocol for the volleyball player because it is a crucial skill of the sport (p. 45).

In the context of volleyball, the vertical jump takes on great importance, as it is a fundamental skill for various aspects of the game, such as attacking, blocking and defending. This ability allows players to reach a greater height when making a spike or block, giving them an advantage in overcoming the net and the ability to attack and defend effectively, also providing counterattack opportunities.

Hence, thinking about the development of support to improve jumpability results in many competitive advantages, since they can dominate the aerial game and excel in blocking and attacking situations, which can make the difference in the final result of the match. Therefore, the development and improvement of the vertical jump are key aspects in the training of volleyball players to maximize their performance in the game.

MATERIALS AND METHODS

The methodological framework presents the route starting with the type of research, the techniques and instruments applied, the phases of the research, the population and sample, as well as the techniques to present the information collected. In accordance with the initially defined objectives, quasi-experimental research is proposed as the relevant design because it shares characteristics of both experimental studies and observational studies. Since the contributions of Campbell and Stanley (1966), in quasi-experimental studies, participants are assigned to groups based on variables not manipulated by the researcher, such as their geographical location, their affiliation to a specific institution or their exposure to a certain event.

Another concept was the one issued by Hernández-Sampieri, Fernández-Collado, and Baptista-Lucio, (2014) who mention that:

Two groups are required, one experimental and a control group, with pre- and post-proposal measurement [...], quasi-experimental designs are characterized by the manipulation of at least one independent variable, the measurement of at least one dependent variable, although not it guarantees the homogeneity of the groups, since they are already formed prior to the intervention (p. 13).

In this type of research, for data analysis, this research was based on a descriptive design. The procedure to process, present and analyze the information in this research project, quasi-experimental design, complies with the following actions:

Consistent with the previous figure, the first step consists of organizing and coding the collected data according to the relevant variables of the study. This involves assigning labels or codes to each data unit to facilitate its identification and subsequent analysis. Once the data is organized, it is important to verify and clean it. Statistical techniques and

computer tools can be used to identify and correct any inconsistencies in the data.

Later, the stage of descriptive data analysis begins to obtain an overview of the existing characteristics and patterns. This may include calculations of measures of central tendency, such as the mean and median, as well as measures of dispersion, such as the standard deviation or range.

Some interpretation of the results was also applied. Once the analyzes have been performed, the results are interpreted in relation to the objectives and research questions. The aim is to identify significant patterns, relationships or differences between the variables studied. Finally, the findings were presented to establish the results and the conclusions of the study are presented clearly and concisely in a final report or document.

Regarding the sources and techniques of information, to evaluate the power of jumping in athletes, it was necessary to apply a pretest applied to junior volleyball players, on this instrument “a pretest presents different nomenclatures as the exam would be. A test [...] used as the evaluation instrument par excellence” (Giné and Parcerisa, 2007, p. 14).

Secondly, to design the training program based on plyometric exercises to improve the vertical jump in junior volleyball players, where the use of the plyometric method with students is exposed through a didactic sequence, a series of activities applied in different sessions.

Finally, to assess the effect of said plyometrics training program on pre-youth volleyball players compared to the control group, a post-test type vertical jump test was applied. All of the above applied in a population of 18 players in total, nine randomly assigned to each group, here it is important to note that “in random samples each element of the population has an equal probability, or a quantifiable probability, of being selected”



Figure 1: Information analysis procedure

Source: own elaboration (2023)

(Clark-Carter, 2002, p. 159), a type of sample appropriate to the type of study in question, as there are two groups, one experimental (9 members), and one control (9 members).

RESULTS

This segment contains the detailed and objective presentation of the findings obtained from the analysis of the collected data. The first of them were the results of the vertical jump test using the Sargent test or Salto Sargent. This procedure describes the method used to measure the height of the vertical jump directly, the sample was taken from 18 volleyball students, 9 from the experimental group and 9 from the school control group at the beginning of March 2023. The data was measured in centimeters :

Experimental group	Group of control
Y1 10 cm	Y1 12 cm
Y2 10 cm	Y2 15 cm
Y3 10 cm	Y3 15 cm
Y4 25 cm	Y4 21 cm
Y5 33 cm	Y5 23 cm
Y6 35 cm	Y6 28 cm
Y7 37 cm	Y7 30 cm
Y8 45 cm	Y8 57 cm
Y9 85 cm	Y9 70 cm

Table 2: Pretest results

Source: Sargent test results (pretest)

In the development of this pretest, the athletes of both groups stood sideways to a wall and extended their hand closest to the wall upward, keeping their feet flat on the ground, marking or recording the reach of the

toes of the fingers; after that measurement, which is called standing reach height. The athlete then steps away from the wall and jumps vertically as high as possible using arms and legs to help project the body upward. The jumping technique may or may not use a countermovement, but the athlete must try to touch the wall at the highest point of the jump. The distance difference between the standing reach height and the jump height is the score. The best result of three attempts is recorded. In the experimental group the distances were between 10 and 85 cm, for the control group the marks were between 12 and 80 cm, more or less similar measurements.

Now, in compliance with the second objective, a didactic sequence called training based on the plyometric method to improve the vertical jump in junior volleyball players from Colegio Colón de Barranquilla, applied to the experimental group with the objective of improving the vertical jump of the volleyball players. prejuveniles through the implementation of a training program based on the plyometric method. In total there were six training sessions, where the main resources were sports spaces such as the gym and the volleyball court, the use of training cones, jumping platforms, volleyballs, a stopwatch or clock and mats or padded surface.

Thus, in accordance with the objectives and themes, the activities were developed in each of these meetings based on the plyometric method, such as the evaluation of the initial level of vertical jump, development of strength in the legs, development of muscular power, improvement of the jumping

technique, increased speed and explosiveness, the Integration of specific volleyball exercises, only with the experimental equipment.

Consequently, the results of the training program were presented, and with it the answer to the third objective, through the application of the six training sessions that helped them develop more quickness, agility, speed and, above all, better strength in the train. lower and this way achieve a better jump for blocking and finishing in the sport of volleyball. It is important to clarify that plyometrics were worked on once a week, 3 or 4 sets of 12 repetitions for each exercise only with the experimental group, therefore the results shown below correspond to those obtained thanks to this sequence. The sample was taken from 18 volleyball students, 9 from the experimental group and 9 from the control group of the school at the end of April 2023. The data was measured in centimeters:

Experimental group	Group of control
Y1 22 cm	Y1 12 cm
Y2 35 cm	Y2 15 cm
Y3 40 cm	Y3 15 cm
Y4 45 cm	Y4 21 cm
Y5 50 cm	Y5 23 cm
Y6 50 cm	Y6 28 cm
Y7 63 cm	Y7 30 cm
Y8 68 cm	Y8 57 cm
Y9 100 cm	Y9 70 cm

Table 3 Post-test results

Source: Sargent test results (pretest)

As it was seen in the previous table, after applying the six-week training with a frequency of three times a week and the intensity of two hours of work sessions, some observations can be identified such as an increase in the height of the vertical jump, greater efficiency in jumping technique, greater resistance and repetition capacity in jumps

Based on the post-test, implemented in both groups (experimental and control),

and after implementing the plyometric training program, the junior volleyball players belonging to the experimental group achieved higher vertical jumps compared to their initial measurements, especially when compared to the control group. This indicates an improvement in leg power and explosiveness, when comparing before and after measurements.

In addition to the increase in jump height, the players showed an improvement in jumping technique, which is reflected in more fluid, controlled and coordinated jumps. An efficient jumping technique to maximize performance in game situations. Said plyometric training improved the resistance and the ability to perform repeated jumps in the players who belong to the experimental group with measurements between 15 and 90 cm, who also demonstrated less fatigue and a greater ability to perform multiple jumps throughout a game of volleyball.

These results are comparable to those obtained in the study by Muñoz, Rodríguez, Hernández, Ramos and Sánchez (2023), where a positive impact was also obtained from an explosive strength program of the lower body to improve the vertical jump in players, precisely demonstrating the effectiveness of the plyometric method and the repetitions of the sessions carried out.

CONCLUSIONS

After analyzing the existing literature on experiences similar to the problem addressed, and applying the power of the jump in the athletes of a pretest applied to the junior volleyball players of the Colón School team, resulting in a similarity between both groups, only with minimum differences of centimeters from each other.

In addition, the documentary analysis of related research and the articles consulted were the basis for designing a training program

based on plyometric exercises to improve the vertical jump in junior volleyball players. This six-week program consisted of six sessions applied only to the experimental group, there were two weekly meetings where training was carried out based on plyometric exercises that helped the students develop more quickness, agility, speed and, above all, better strength on the train. lower and this way achieve a better jump for blocking and finishing in the sport of volleyball.

Finally, when analyzing the applied experience of the plyometrics training program in pre-youth volleyball players at a Colón School, the positive effects of this intervention in the experimental group are evident, the records obtained demonstrate a significant increase in the height and power of the vertical jump. after completing the training program. The above proved to be beneficial both for the development of leg strength and for the improvement of jumping technique with an advance of up to 15 centimeters when reviewing the initial data.

Taking into account the above, it is recommended to continue the work started to include a detailed initial evaluation of the level of physical condition of all junior volleyball players before starting the training program with all students, without separating them into groups. This will allow the program to be adapted and personalized according to the individual needs of each player.

It is important to have the supervision and guidance of a coach or professional trained in the plyometric method. It is recommended to contact the sports secretary and the Atlantic volleyball league to continue the process and ensure adequate development of actions to improve performance. of the volleyball players.

For correct execution of the exercises and minimizing the risk of injury, a gradual progression in intensity and training load throughout the program is suggested. As volleyball players gain strength and endurance, more challenging exercises can be introduced to continue to encourage improvement in vertical jump.

It is recommended to combine plyometric training with other components of physical training, such as muscle strengthening and flexibility, to obtain complete and balanced benefits in the physical performance of junior volleyball players.

It is important to periodically track and evaluate volleyball players' progress through vertical jump tests and other performance indicators. This will allow the training program to be adjusted as necessary and ensure continued improvement in the vertical jump.

AUTHORIZATIONS

By submitting the work, the authors are responsible for all the content of the work.

REFERENCES

- Barragán, D. (2021). Importancia de un programa de fortalecimiento del salto vertical en jugadoras de 16-18 años en voleibol. Una revisión. Universidad de Ciencias Aplicadas y Ambientales.
- Bermejo, J., Palao, J. M., & Valadés, D. (2013). Análisis del remate de voleibol en jugadoras de élite [Analysis of volleyball spike in female elite players]. *AGON International Journal of Sport Sciences*, 3(1), 22–32.
- Blasco, H., Ormazábal, V., Armijo, R., Pavez-Adasme, G., Fernandes Da Silva, S., Hernández-Mosqueira, C., & Arcay Montoya, R. (2017). Fuerza de Salto Vertical en jugadores de Voleibol Varones de distinto nivel Competitivo. *Revhorizciencactfis* (8) 1: 1-9.
- Calvete, E., y Cardeñoso, O. (2001). Creencias, resolución de problemas sociales y correlatos psicológicos. *Psicothema*, 13(1), 95-100.
- Campbell, D. T. & Stanley, J. C. (1966). *Experimental and Quasi-experimental Designs for Research*. Nueva York: Rand McNally & Company.
- Clark-Carter, D. (2002), *Investigación cuantitativa en psicología. Del diseño experimental al reporte de investigación*, México, Oxford University Press.
- Colegio Colón de Barranquilla (2019). Manual de Convivencia. Acuerdo 001 de 15 de diciembre 2021, por el cual se adopta el Reglamento Interno o Manual de Convivencia. <https://colcolon.edu.co/wp-content/uploads/2022/05/Manual-de-Convivencia-2022.pdf>
- Colegio Colón de Barranquilla (2019). Manual de Convivencia. Acuerdo 001 de 15 de diciembre 2021, por el cual se adopta el Reglamento Interno o Manual de Convivencia. <https://colcolon.edu.co/wp-content/uploads/2022/05/Manual-de-Convivencia-2022.pdf>
- Conrado, S., y Grismel, B. (2012). La capacidad de salto en voleibol. Universidad de Ciencias de la Cultura Física y el Deporte Facultad de Santiago de Cuba (Cuba). *Lecturas: Educación Física y Deportes, Revista Digital*. Buenos Aires, Año 17, N° 170, Julio de 2012. <http://www.efdeportes.com/efd170/la-capacidad-de-salto-en-el-voleibol.htm>
- De Alba, J., Chacón, P., y Lajud, N. (2016). Asociación entre síntomas depresivos y síndrome metabólico en personas mayores de 45 años. *Atención Familiar*, 30(2), 153-159.
- García, P., Sánchez, G., y González, S. (2016). Adaptaciones a un entrenamiento integrado de fuerza, potencia y propiocepción del tren inferior sobre estabilidad y el salto vertical en baloncesto masculino. <https://repositorio.ucam.edu/bitstream/handle/10952/2124/Tesis.pdf?sequence=1>
- Giné, N., y Parcerisa, A. (2007), *Evaluación en la educación secundaria: Elementos para la reflexión y recursos para la práctica*, Barcelona: GRAO
- Griboff, P. (2020). Análisis descriptivo de diversas variables que descienden al voleibol femenino profesional. Recuperado el, 16.
- Hernández-Sampieri, R., Fernández-Collado, C. y Baptista-Lucio, P. (2014). *Metodología de la investigación* (Sexta Edición). McGraw Hill Education.
- Lhoeste, A., y Mendivil, p. (2020). Creencias irracionales en deportistas De la categoría juvenil de la liga del Atlántico. https://www.researchgate.net/profile/Jose-Sanabria-Navarro/publication/350403820_LA_ACTIVIDAD_FISICA_Y_SUS_CIENCIAS_APLICADAS_III_Escenarios_y_Contextos_para_la_transformacion_personal/links/605ddfa592851cd8ce6bf495/LA-ACTIVIDAD-FISICA-Y-SUS-CIENCIAS-APLICADAS-III-Escenarios-y-Contextos-para-la-transformacion-personal.pdf#page=88
- Monsalve, M. (2014). La divulgación científica en la Web, un panorama latinoamericano. *Comunicación*, (31), 35-41.
- Muñoz, S., Rodríguez, A., Hernández, F., Ramos, J., y Sánchez, A. (2023). Efecto del entrenamiento específico sobre la fuerza y la agilidad de porteros de fútbol. *Journal of Sport and Health Research*, 15(2).

Myer, G. D., Lloyd, R. S., Brent, J. L., & Faigenbaum, A. D. (2013). How young is too young to start training? *ACSM's Health and Fitness Journal*, 17(5), 14–23.

Parrales Moreira, H. O. (2013). El trabajo pliométrico y sus efectos en las deportistas de la selección de baloncesto de tercera categoría del colegio Instituto Tecnológico Superior Iabel de Godín periodo 2011-2012 (Bachelor's thesis, Riobamba: Universidad Nacional de Chimborazo, 2013.).

Portuondo, A., Montero, M., Delgado, Y., Silva, M., Barreto, B., y Rodríguez, I. (2020). Lethality as an influential indicator in the elimination of tuberculosis in Havana. *Revista Habanera de Ciencias Médicas*, 19(6), 1-13.

Silva, J, y Zúñiga, D. (2022). Efectos de un programa de pliometría unilateral en el salto vertical en las jugadoras de voleibol de 18 a 20 años de Atenas Vóley club de la ciudad de Popayán (Doctoral dissertation, Uniautónoma del Cauca. Facultad de Ciencias Sociales y Humanas. Programa de Entrenamiento Deportivo).

Verkhoshansky, Y. (2000). *Teoría y Metodología del Entrenamiento Deportivo*. Barcelona: Paidotribo.

Vilela, G., Vargas, AC, Campillo, RR, Hernández-Mosqueira, C., & da Silva, SF (2021). Efecto del entrenamiento pliométrico en la fuerza explosiva de niñas puberes practicantes de voleibol. *Retos: nuevas tendencias en educación física, deporte y recreación*, (40), 41-46.