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Analysis of Jumping Ability in Juvenile Female Volleyball Athletes

[Análisis de la saltabilidad en atletas juveniles femeninas de voleibol]

[Análise da capacidade de salto em atletas de voleibol juvenil do sexo feminino]

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ABSTRACT

The optimization of physical training components in high-performance volleyball is a critical link to sports success. The purpose of this research is to analyze the elements associated with the behavior of the jumping ability in juvenile female volleyball players. Several scientific, empirical, and theoretical methods were used, such as documentary review, observation, and measurements, which secured the objectives set. The results showed a series of important data about the individual and collective specifications of



the athletes included in the study, which will offer the coaches significant information to comply with the training program.

Keywords: Juvenile athletes, jumping ability, volleyball.

RESUMEN

El perfeccionamiento de los componentes de la preparación física en los niveles del alto rendimiento para el voleibol, constituye un eslabón fundamental para el éxito deportivo. La investigación que se presenta tiene como objetivo analizar elementos relacionados con el comportamiento de la saltabilidad en atletas juveniles femeninas de voleibol. Para ello, se tuvo en cuenta la utilización de métodos científicos, teóricos y empíricos, como la revisión documental, la observación y medición, que garantizaron el cumplimiento de los objetivos propuestos. Los resultados obtenidos ofrecen una serie de datos importantes sobre las particularidades individuales y colectivas de las atletas estudiadas, que propiciarán una valiosa información a los entrenadores para direccionar el trabajo en el sentido de la programación del entrenamiento.

Palabras clave: Atletas juveniles, saltabilidad; voleibol.

SÍNTESE

A melhoria dos componentes da preparação física em níveis de alto desempenho para o vôlei constitui um elo fundamental para o sucesso esportivo. O objetivo da pesquisa foi analisar elementos relacionados ao comportamento de salto em atletas de voleibol juvenil feminino. Para este fim, foi levado em consideração o uso de métodos científicos, teóricos e empíricos, tais como revisão documental, observação e medição, o que garantiu o cumprimento dos objetivos propostos. Os resultados obtidos ofereceram uma série de dados importantes sobre as particularidades individuais e coletivas das atletas estudadas, que fornecerão informações valiosas para que os treinadores possam orientar o trabalho no sentido da programação do treinamento.



Palavras-chave: Atletas jovens, salto; voleibol.

INTRODUCTION

Portela Y. (2020) said that volleyball constitutes an excellent area for promoting and developing social and personal values in children and the young. Thanks to its different dynamics, this sport can create situations and inclusive educational conditions, since the players must learn ways to take up commitment not only with their teachers, but their peers and learning conditions as well, and make individual and collective decisions. The intention is to have them recognize the different choices offered to them and their contents, seeking appropriate education that leads to social transformation.

Since its establishment of volleyball as a federated sport, women have been able to destroy the myth of the so-called weaker sex. For instance, the accelerated way in which the game is played is increasingly more similar to the men's category, with a predominance of offensive actions over defensive ones.

Upon the triumph of the Cuban revolution, the first official women's team participated in the Nineteenth Central American and Caribbean Games, Jamaica '62, ranking fourth. Then, the participation of women in volleyball practice spread out in several territories of the country, particularly in Havana, where various junior and club championships took place. Several international matches were held at that time too (García, T and Barrera, L.M., 2017).

In this sport, rigid standards for functional parameters are not defined, since physical performance depends largely on the opponent's competitive quality. Therefore, this sport is regarded as one with variable efforts, and as an acyclic sports manifestation characterized by the varying intensity of changes during the attack and counterattack, which alternate in the training sessions and games (Conrado, 2012).



From 1959 on, Cuba designed its own volleyball. The women's team accomplished enormous success in the top events sponsored by the International Volleyball Federation (IVBF) and the International Olympic Committee (IOC). In the Olympics, this team ranked in the first three positions for 16 years. These results were evident thanks to the high physical preparedness, known as power volleyball. A theory based on sports results, though not scientifically demonstrated (Ruiz, 2017).

The coordination of tactical actions demands knowledge of the physical capacity levels that determine the expected possibility of success; quicker ball setting is required to achieve more effective attacks. Otherwise, the opponent will intercept it before it reaches its target; hence, hampering the possibility of successful spiking. Accordingly, coaches must know these actions' technical, tactical, and physical requirements. Methodologically, it is important to know the physical preparedness requirements, the athletes' conditions, what they possess and lack, and if they can achieve it in due time (Castañeda and García, 2020).

In reference to physical preparedness, Cuban volleyball evidenced high development of conditional capacities: strength, velocity, and endurance. Therefore, the jumping ability is above international demands (Herrera, 2016), Herrera (2021).

Castañeda and García (2020), mentioned the possibility of the occurrence of one or several physical conditions to achieve others, depending on the type of game demanded. Then, it is significant that players reach the required performance factors that permit a suitable response at the proper time: age, years of training, years in the game, height, vertical jump with or single jump (varied depending on the sport), span, complex reaction, levels of attention, conditioning and determining physical capacities associated with performance, techniques, tactics, competition experience, and satisfaction with the actions to take.

Today, the levels of these physical capacities have dropped, which can be illustrated by the final positions of the senior teams during the Olympic cycle (2016-2020). Leg



coordination was significantly affected, along with the arm pendulum-like motion, spiking height, flexion angle, propulsive phase, and fall. Besides, the low effectiveness percentages of opposite spikes, having a 224 cm high net, with a propulsive phase reaching between 250 and 280 cm, as reported by the National Junior Games (JNJ).

An exploring study began with a review of the literature, particularly the training plans used in previous cycles. The study corroborated that the volumes planned led to the best results reached by the women's volleyball teams ever. However, the current setting demands changes in the training managing process to improve the outcomes.

Another aspect to be considered in women's volleyball is that the athletes can play for different clubs in international tournaments, which increases their technical-tactical level, keeping their physical performance to meet the requirements of the competition system used by international clubs. Upon their return, the athletes can be part of the national selection in the coming international meetings. This period comprises four-six weeks, with a different competitive system as to the number of consecutive matches, which, according to Herrera (2004), demands high endurance and jumping quality that determines the outcomes.

Since the athlete's height is unchangeable, emphasis should be made on the jumping ability needed to reach for the ball and spike, block, and serve, which increases as the training sessions are more systematic.

Esper (2003) quantified and qualified the types of jumps made by a women's team, and found 78 jumps per set, distributed into 39 blocking jumps, 28 spiking jumps, and 12 other different types. They concluded that knowing these variables for training planning is critical. Today, female players perform 90-100 jumps per game, approximately (five sets), which explains the evolution of the game into a more offensive one.

García, Manso, Navarro & Ruiz, (2000) highlighted the strength of vertical jumps as critical for the game, becoming very useful to beach volleyball players (Castañeda, 2021).

Esper (2003) said,



"We should know the amount and types of jumps made by the volleyball players in a game. The different levels of competition might lead to different physical requirements. Therefore, I believe that, at times, the scientific results of research done to national selections in international competitions should not be put into practice while training a local volleyball team".

The literature reviewed shows several studies associated with the analysis of jumps in volleyball teams (Esper, A.). (2013); Bertorello, A, (2008); Reyes, C., and Portuondo, G. (2012); Luarte, C; González, M., and Aguayo, O. (2014) referred to senior categories or top-ranking teams.

These grounds, plus the experience of over 25 years as a coach of women's teams permitted the study of the jumping effectiveness of volleyball athletes, which shows raised concerns about physical preparedness and its repercussions on the expected outcomes in national and international competitions, especially due to the little effectiveness of technical elements that depend on the jumping ability.

The documentary review and interaction with athletes, coaches, and experts in this area in Cuba evidenced that the studies on the athletes' jumping ability of female volleyball players are few. Most current studies deal with the junior and juvenile categories (aged 16-18).

In keeping with the above, there are shortcomings associated with the stability of jumping ability levels demanded by the current competitive dynamics of volleyball, since the reference values given by the athletes are, by far, distant from the adequate jumping parameters that respond to the situations of the game required by modern volleyball. Accordingly, this paper aims to assess the effectiveness of the jumping ability in juvenile female volleyball athletes.

MATERIALS AND METHODS

The research was started in 2021, and it went through a study on the background and context of the object, and the diagnostic study of the jumping ability state-of-the-art in



the juvenile female volleyball players that took part in the National Juvenile Games (JNJ) in 2022. All the attackers included in the tournament were regarded as the population of the study (Table 1).

Table 1. - *Characterization of the population*

No.	Height	Reach 1 M	Propulsive phase
1	188	246	52
2	180	238	60
3	194	250	59
4	186	249	59
5	192	246	63
6	191	245	64
7	192	251	57
8	179	238	57
9	185	243	55
10	183	240	59
11	188	245	64
12	188	245	60

According to García (2018), it was possible to determine the variable, dimensions, and indicators from the object of study, which enabled a better approximation to this topic (Table 2).

Table 2. - *The practicality of the operational variable*

Operational variable	Dimension	Indicators
Jumping Ability in Juvenile Female Volleyball Athletes	Technique	1.1 Frequency of step coordination 1.2 Length of the last step 1.3 Arm pendulum-like motion 1.4 Propulsive phase and fall
	Physical	2.1 Reach 2.2 Propulsive phase 2.3 Five-jump test



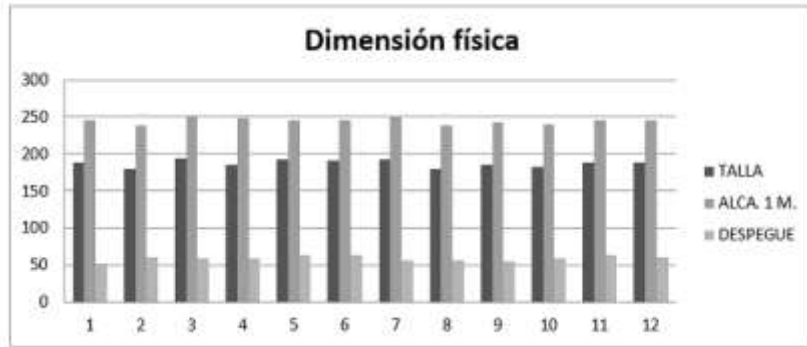
The previous dimensions permitted the assessment of the jumping behavior when attacking from the opposite player, and establish assessing parameters from which the questions in the instruments were made. This research relied on several scientific methods of information collection and its relation to the set dimensions, such as a documentary review of the main volleyball guidelines given by the PIPD, as well as reference papers about this topic. The observation of the competition, the five-jump test consisted of five jumps onto several hanging plates at different heights, in order to record the top jump and the average of the rest. It also aimed to create individual and collective competitive ability, the methodological triangulation to set up regulations of the information given in the query.

RESULTS AND DISCUSSION

The documentary analysis showed shortcomings during the jumping training sessions, mainly due to the lack of stable athlete performance from the pre-competitive to the competitive stages. Flexibility was poorly trained. Moreover, the assessment of pedagogical tests was lacking, thus affecting the proper utilization of methods and procedures for the technical, tactical, and physical work when training. The methods for quickness development were hardly implemented, cutting down the link between explosive strength and jumping ability.

The physical objectives were designed irrationally, with the inadequate distribution of the training loads, and poor breakdown of tasks during the training sessions.

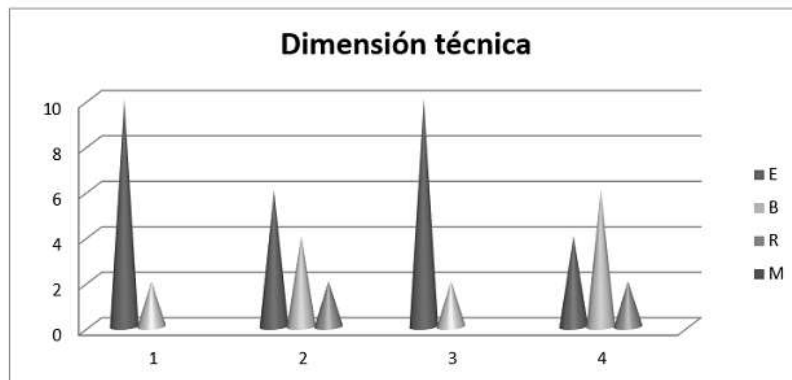
The previous shows the physical condition of the athletes, according to their physical dimension, as shown in graphic 1. The information gathered regarding the reach and propulsive phase showed a mean below the values set up by the Cuban Volleyball Federation (FCVB) (Graphic 1).



Graphic 1. - Behavior of the physical dimension indicators

Meanwhile, the technical dimension and its indicators were affected in the same way, since 25 % of the population, qualified as unsuitable, and 41.6 % as suitable, in general terms. The most commonly affected indicators correspond to the 1.2 Step length, and 1.4 propulsive phase and fall, respectively (Graphic 2).

In this sense, several studies were reviewed, and García (2016) found that the mean reach for female players was 2.24 m. The indicators included only coincided in that this is a lower category, so the values shown and the ones found in this study (2.44 m) do not match.



Graphic 2 - Behavior of the technical dimension indicators



Upon the triangulation of the results from the diagnosis, both dimensions were observed to be affected, and demand a transforming intervention linked to the jumping ability of juvenile female athletes.

Potentialities:

- There is a *Program for Comprehensive Athlete Training* in volleyball, one of the most widely updated in Cuba.
- The staff is reputable and confident, with the ability to transmit their knowledge, skills, and ideas; they share a broad experience in this specialty, and mastery of the national and international context that allows them to perform quality and intentional jobs.

Constraints:

- There are shortcomings in the implementation and orientation of objectives, their determination, formulation, and interrelation of the training process components.
- Poor interdisciplinarity, though the contents facilitate the development of the jumping ability.
- Poor utilization of methods for productive reflection of the volleyball teachers, and inclusion of science and creativity in the area of jumping ability development at the training facilities.
- Little attention to elements that form a whole for the success of jumping ability development in volleyball.

Herrera *et al.* (2021) referred to the need for explosive force development, quick strength, speed of their movements during the attack or block, and unexpected movements by the defense.

Likewise, Ruiz (2017) mentioned that training including the speed athletics ABC in short distances could be the most surely recommended for the training of this motor action. Furthermore, exercises using a ladder or other obstacles would help in this phase, which



is critical for optimized vertical jump, contributing to greater attacking reach, blocking, or serving by jumping.

CONCLUSIONS

The object of this research demonstrates the necessity of establishing a systematic and systemic training process seeking greater jumping ability, so that athletes acquire enhanced performance while attacking from the front positions, thus providing a practical solution to the particular and general problems of the team. The diagnostic to assess the jumping ability of juvenile female athletes through dimensions and parameters, based on certain methods and procedures, permitted characterization of this issue in the juvenile female volleyball players, and to identify their potentialities and constraints.

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Conflict of interest statement

The authors declare no conflicts of interests.

Author contribution statement:

The authors have taken part in the redaction of the manuscript and analysis of the documents.



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