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Original article

Study of the behavior of the jump in junior athletes of beach volleyball

Estudio del comportamiento del salto en atletas juveniles de voleibol de playa

Estudo do comportamento do salto em atletas juniores de voleibol de praia

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ABSTRACT

In the search for relevance in the context of improving the components of physical preparation at high performance levels for beach volleyball, this research is undertaken to analyse elements related to jumping behaviour in young beach volleyball athletes at the Eide in Pinar del Río. For this purpose, the use of scientific, theoretical and empirical methods was taken into account, such as document review and measurement, which guaranteed the fulfilment of the proposed objectives. The results obtained provide a series of important data on the individual and collective particularities of the athletes studied, which will provide valuable information to the coaches that will allow them to direct the work in the sense of training programming.

Keywords: Youth athletes; Competitive performance; Jumps; Beach volley.

RESUMEN

En la búsqueda de una pertinencia en el contexto del perfeccionamiento de los componentes de la preparación física en los niveles del alto rendimiento para el volley de playa, es que se emprende esta investigación, que tiene como objetivo analizar elementos relacionados con el comportamiento del salto en los atletas juveniles de voleibol de playa de la Eide de Pinar del Río. Para ello, se tuvo en cuenta la utilización de métodos científicos, teóricos y empíricos, como la revisión documental y la 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 los atletas estudiados, que propiciarán una valiosa información a los entrenadores que les permitirá direccionar el trabajo en el sentido de la programación del entrenamiento.



Palabras clave: Atletas juveniles; Rendimiento competitivo; Saltos; Voleibol de playa.

RESUMO

Na busca de uma pertinência no contexto do aperfeiçoamento dos componentes da preparação física nos níveis do alto rendimento para o voleibol de praia, es que se empreende esta investigação, que tiene como objectivo analisar elementos relacionados com o comportamento do salto nas atletas juvenis de vôlei de praia de la Eide de Pinar del Río. Para além disso, é necessário ter em conta a utilização de métodos científicos, teóricos e empíricos, como a revisão documental e a meditação, que garantem o cumprimento dos objectivos de proteção do amianto. Os resultados obtidos permitiram a obtenção de uma série de dados importantes sobre as particularidades individuais e coletivas dos atletas estudados, que propiciará uma valiosa informação aos participantes que permitirão direccionar o trabajo no sentido do programa de entrada.

Palabras clave: Atletas juvenis; Rendimiento competitivo; Saltos; Voleibol de praia.

INTRODUCTION

Beach volleyball has reached a dizzying development in recent years, given the increase in the number of federations affiliated to the FIVB (International Volleyball Federation) and the large number of competitions by region and at the world level, which have their maximum expression in their inclusion in the Olympic Games, since the Atlanta 1996 edition. This has led to a boom in the discipline in recent years, constituting a spectacle that welcomes millions of fans around the world, with a large number of world circuits throughout the year.

This has made possible that a great number of teams (duo), constantly compete at the highest level of performance in both sexes, which has brought as a consequence that different levels are formed, according to the results obtained and the score in the world ranking, establishing a relation of greater or lesser performance or result. This constitutes the direct cause of the tendencies, towards where this passionate and spectacular sport with balls is directed.

In this sport it is important to know that each type of game (2x0 and 2x1) contains and expresses different values in its structure and dynamics, governed mainly by the regulations in force and the constant and diverse actions of the players and teams, even taking into account the weather conditions, type of texture of the sand and time of year.

For this reason, the development and practice of this sport at present requires, like the other sports disciplines, a scientific-technical revolution that allows to face and solve the increasing demands of the preparation of the athletes and teams to achieve greater and better results. Volleyball is an explosive sport in which acyclic actions are performed that require from the player a great capacity of reaction and speed of execution (Vargas, 1980).

The final performance of a volleyball player depends on many factors. Among them, size, technical and tactical ability, temperament and physical performance. Maximum height in a single jump and jump resistance are two very important aspects of a player's performance. A medium height player can have the same range as a taller player if he jumps higher. It is also difficult to consider certain playing tactics if the



duo does not have a certain physical performance or if the opponent is much physically superior [Esper, \(2002a\)](#). In the collective game, a certain number of players take part and face their opponents, using all the resources they have in their hands, to get the maximum performance from all the options that are developed in the game. These resources must be extracted from the dynamics that originate in the training. Here the importance of getting each training proposal the most adequate to obtain the desired benefit.

When trying to coordinate a tactical action, it is elementary to know the levels of physical ability that determine the possibility of success being pursued; faster passes are necessary to make effective attacks. If the pass is not fast enough, the opposite will intercept it before it reaches its destination, therefore, the attack could be carried out, but not with the same conditions.

It is necessary then that the coach knows the requirements in the technical, tactical and physical order that such action entails. From the methodological order, what is needed of the physical preparation, in what conditions are the athletes, what do they have and what do they need, if they can achieve it in a prudent time.

It may take one or more physical conditions to achieve another more fluid one that responds to the required play. It is significant then that the players reach those decisive factors of performance necessary to be able to offer an appropriate response at the right time: age, years of training, years in the function of play, size, vertical range without and with career (with its variants according to the sport), span, complex reaction, levels of attention, conditioning physical capacities and determinants of performance, technique, tactics, competitive experience, satisfaction with the activity to be performed.

Volleyball has been influenced by numerous studies aimed at evaluating athletes in their jumping ability for diagnostic purposes, training planning and to verify the effectiveness of training methods aimed at improving jumping ability, as reported by [Reyes and Portuondo \(2012\)](#).

Jumping is a multiarticular action that demands levels of strength in accordance with good motor control, intramuscular coordination and correct intermuscular coordination. Likewise, [Esper \(2003\)](#), raises the need to know the amount and types of jumps that volleyball players perform during a match. Different levels of competition can lead to different physical demands. Therefore, sometimes it may not be appropriate to transfer the research done with national teams in international competitions when training a national or regional level team.

In the literature reviewed, several studies related to the analysis of jumps in volleyball teams have been found, among them those of [Esper \(2002b\)](#), [\(2003\)](#) and [\(2013\)](#); [Bertorello \(2008\)](#); [Reyes and Portuondo \(2012\)](#) and [Luarte, González and Aguayo \(2014\)](#), they allude to superior categories or elite teams.

These arguments, plus the experience of more than 20 years of work as a coach have allowed studying the jumping behavior of beach volleyball athletes in Pinar del Río, which reveals a great concern about physical preparation and its incidence to reach the forecasts projected in national events. This is mainly given by the little effectiveness in the technical elements, where the use of jumping is determinant, the maintenance of the performance levels in the jump for having to play sometimes up to three games in a day and for fissures in the methodological treatment directed, specifically in the muscles that intervene in the jump for this.



From the responsibility assumed by the author as the main coach of beach volleyball in Pinar del Río and attending the 16-18 years old category, the first steps are taken in the analysis of the athlete's preparation, presented by the group of coaches, where the main problems would be solved from the field of physical preparation.

What has been presented so far stimulates us to undertake the present study, which aims at analyzing elements related to the behavior of jumping in the juvenile beach volleyball athletes from the EIDE of Pinar del Río.

MATERIAL AND METHODS

Context and participants

The team being studied is integrated by four athletes from the Eide of Pinar del Río, two duplicates, one female and one male, with ages between 16 and 18 years old, which shows a certain physiological and sports maturity to face the training loads to which they are systematically submitted.

Methodology

Theoretical and empirical methods were applied in the development of the research. It is applied the observation method with the use of a registration sheet used by the Cuban Volleyball Federation, which allows the registration of the influential variables of the volleyball player's technical-tactical performance, recording the established symbols to evaluate, as appropriate, the actions of volleyball's technical-tactical foundations.

In this same order, it was applied the measurement method that with the use of the Lewis Test and other pedagogical tests proper of the sport, it was possible to corroborate the state of the alactic anaerobic power in the studied athletes.

RESULTS AND DISCUSSION

The characteristics of the beach volleyball sport require that short game actions are alternated by longer pause periods, during a time that can be extended between 55 and 105 minutes.

Generally, the actions of game are of average to high intensity followed by incomplete, complete and totally recovering pauses. These indicators force to think about how to face in a rational and planned way the preparation of the youth volleyball players to guarantee their quality of life and at the same time the sport success.

When referring to the regulations established in the Olympic cycle of Cuban beach volleyball, the women in this sport category (juvenile) should be in the range of 1.79-1.90 meters of height, however, as it is appreciated in table 1, the duo that is studied does not surpass the 1.75 meters, evaluated indicator of deficient and that deserves a special attention, because as the only one can reach success in competitions, it is developing the level of jumping, to solve the situations presented during the game.

In this same order is the male duo, whose sizes are 1.81 and 1.92 meters and the requirements of the national commission is in the range of 1.83-2.00 meters in size.



The range is established between 2.20-2.43 meters for the female and 2.44-2.66 meters for the male, and it can be seen in the table itself that of the athletes studied only the number four is within the range (Table 1).

Table 1. - Characterization of the juvenile beach volleyball team of Pinar del Río

Athletes	SL/si	Sv	Size	Reach	Take-off (m)	Speed (m/s)	10 contactos	Flexibility
1	1.95	2.78	1.70	226	52	5,2	5,38	8
2	2.05	2.91	1.75	232	59	5,03	5,27	15
3	2.70	3.27	1.81	237	90	4,3	5,03	9
4	2.67	3.45	1.92	259	86	4,36	5,1	12

It is important to point out that there is no updated Program for the **Integral Preparation of the Athlete (PIPD) (2007)** for this modality, and that the data found in an isolated way do not respond exactly to the trends of the present Olympic cycle. Therefore, the study that is presented has as reference data in its majority the pre-test and post-test studies carried out on the studied duplicates.

Hence, according to **Herrera's (2004)** criteria, when he states that at present the game of volleyball can be classified as a return of the ball, which requires that players, according to their function, position, physical conditions, psychological state and anthropometric measurements, have the need to appropriate different motor skills that allow them to perform the technical-tactical complex that this game requires, this argument is taken for this research since beach volleyball is a modality of.

Physical preparation and sports performance are elements that will hardly be dissociated, in this sense, physical capacities support technical-tactical skills; the development of these in the players must be increasingly specific, as a response to the nature, structure and modifications of the game's regulations.

That is why a study of the behavior of the jump is made, attending to the technical elements: serve in suspension, shot and block, in the competitive context.

Table 2 shows the number of jumps made by the players in the last two games of the national championship final (Table 2).

Table 2. - Jumping behavior by athletes in the performance of suspension serves, spikes and blocks

Athletes	Suspention serves	Spikes	Blocks	Positions
1	59	58	4	Defender (woman player)
2	45	52	47	Blocker (woman player)
3	52	57	11	Defender (man player)
4	47	45	65	Blocker (man player)
Mean	50,75	53,00	31,75	////////
Dev. típ	6,238	5,944	29,090	////////



It can be seen that the defending players execute more jumps than the blockers in terms of serves and spikes (226 against 189). The highest average values are found in the spike (53.00), however, very close to the result are the values of the suspended serve, which becomes a powerful offensive weapon for the team, being able to score the direct point.

With respect to the relevance of the jumps in volleyball, **Esper (2003)**, quantified the number and types of jumps of an adult female volleyball team, finding that 78 jumps are made per set, divided into 39 block jumps, 28 spike jumps, and 12 jumps of other types, concluding about the importance of the knowledge of these variables for the planning of the training, this author has pointed out that the force of vertical jump is crucial for the volleyball game, although at this moment it is a reference of great importance its utility in the beach volleyball players, it becomes necessary to make studies taking care of the context that is being studied.

It is important to know how many jumps each player could perform without a significant decrease in the height of their jump, as well as in the synchronization of the motor action, which leads to planning how much load and how much the athletes can recover.

In total agreement with **Esper (2002a)**, it can be stated that the volume per training is a function of the volume that each player performs per set. That is, if the training lasts 1 hour (not including the warm-up), it could be compared to a 3-set match. The same as, if a player jumps 15 times per set, in that training his 100% will be 45 jumps (15 jumps x 3 sets).

Taking into account the number of jumps that can be performed in a match and their totality in a championship, the alactic anaerobic power (muscle power in the lower limbs) was also analyzed, with the application of the Lewis test, where the quantitative result of the test, expressed in kg/s, is revealed (Table 3).

Table 3. - Test results: Lewis

<i>Athlete</i>	<i>Weight (Kg)</i>	<i>Height (m)</i>	<i>Results kg/s</i>
1	70	52	131.040
2	56	59	118.944
3	62	90	200.880
4	83	86	256.968

As can be seen, the most significant results are in the range of (118,944-256,968). These values point out the need to increase the work to the anaerobic resistance that guarantees the necessary power work, not only to face the training attacks, but the competitive result to achieve, taking into account the characteristics of this sport discipline, such as the duration of the match.

It is necessary to know that the energy released by the lactic anaerobic and alactic anaerobic way is limited, the oxidative metabolism has to serve the requirements of anaerobic resistance and help in the recovery of the anaerobic efforts. The analysis considers the age of the athletes and the sport experience, but even so they must increase the demands in the anaerobic resistance training, since the power determines how the explosive actions are performed, we are talking about the jumps



and continuous movements that are executed here, the sudden changes of direction and the speed and fluidity of the execution movements.

To make it easier to understand, we must clarify that when we talk about power, we refer to the amount of energy generated per unit of time and we seek to improve this aspect in an athlete, working a certain complex of exercises to run them in the shortest time possible, and likewise when we talk about capacity, we refer to the total amount of energy reserves that the athlete has, so to increase this value, the activity is extended over time.

Both systems are given as follows:

- Anaerobic power: from 0 to 8 seconds, it delivers a limited amount of energy very quickly supplied by ATP. It is essential in work of speed, maximum force and power (90 % - 100 % approximately). Always with complete recovery breaks, from three minutes.
- Anaerobic capacity: from eight seconds to 90 seconds, it delivers a little more energy, but at a lower speed supplied by ATP. It is important in speed resistance work (80 % - 90 % approximately) and with not so high rests, two minutes approximately.

Bosco (1996), when analyzing volleyball in detail, establishes that this type of activity is conditioned by an unusual variability of movements that can last between 120-150 minutes. Short intervals of rest are combined with an accentuated activity of jumps and of fast displacements anterior-posterior and lateral. Continuous repetitions of activities carried out in the form of explosive ballistic force, such as punching and blocking, have a great influence on the neuromuscular system and at the same time can cause changes in the cardiovascular and respiratory systems.

In this same order, **Esper (2001)** states that,

"volleyball is a sport that is characterized by short and intense playing actions, alternated by short periods of rest. The total playing time of a match ranges from one to two hours. While in beach volleyball it ranges from 0.55 to 0.90 minutes."

When analyzing beach volleyball, it is important to take into account such reflections and also to consider the environmental conditions (air, sand, sun), the scenario where it is played, the passages of the game, the number of players, the responses to the stimulus, to name a few.

Great importance is given in this sport to the work of the physical capacities that are present in the preparation of the beach volleyball player to guarantee jumpability, such as explosive strength, coordination, flexibility and special resistance. This last one is of vital importance because in multiple occasions the players must develop up to three games in the day. In addition, in the beach volleyball game, a player jumps on average once every 45 seconds during the game and when he is in the net, he does it every 15 seconds.

The explosive characteristics of beach volleyball allow for acyclical actions that require a great capacity for reaction and speed of execution on the part of the player. Within these actions, the vertical jump is considered the most frequently executed, which constitutes a decisive factor in the performance of this sport and therefore requires great attention.



The best results point towards the blockers, however, if the response to each of these is positive, the training of the applied force, speed and tactics will have the basis for an effective development. If not, every game played is pointing to limiting automatism and difficult reconversion in the future of the player and the duo.

The study made it possible to define the characteristics of the Pinar del Río beach volleyball youth team and where to direct the sense of the training programming, emphasizing the necessary indicators for the development of the jumpability and thus solving the beach volleyball results in the territory, assuring the individual particularities of the athletes.

It is revealed the low levels of jumping that the investigated beach volleyball athletes possess, for what it is essential to look for explosiveness in the technical capacity and to guarantee a greater jumpability in the athletes, since the size they possess does not correspond to the characteristics and demands of Cuban volleyball player.

Likewise, it is emphasized that from the early preparation of the athletes, the necessary physical bases for a correct development of jumpability must be created, without affecting the physiological development of the athlete and the success of his career.

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The authors declare not to have any interest conflicts.

Authors' contribution:

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



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