56 - DETERMINING THE HEIGHT OF THE HEEL AND TIME OF CONTACT THROUGH THE TECHIQUE DROP JUMP BEFORE AND AFTER A GAME OF VOLLEYBALL

AMANDA FONSECA COSTA
ISABELA CHAVES FONTENELLE
RENATO VALONY FERREIRA PINTO
CARLOS EDUARDO CAMPOS
Centro Universitário de Belo Horizonte - Uni - BH
Belo Horizonte – Minas Gerais
amandinhafons@yahoo.com.br

INTRODUCTION

Volleyball is the sport has been developed quickly after its establishment in 1895 by William G. Morgan; it introduced in Brazil around 1915. Volleyball underwent several modifications in rules and in technical-tactical characteristics with number of extremely fast actions.

The various activities performed by players during a game of volleyball is a combination of eccentric movements followed concentric movements. During a game are carried out various actions to offset, jumps and moves to the upper. The vertical jump can be characterized in three phases: preparatory phase, the propulsive phase and flight phase (Mc GINN 2002). According to Campos & Menzel (2003) the ability to jump is a motor quality much sought in motor in the sport practice and is an important factor for yield in different modalities, both in individual sports and in team games. Players are becoming taller, with a greater physical potential and the technical-tactical actions with more complex requirements. Therefore, these facts create the need to increase both the quality and quantity of training, in order to reach a more efficient technical-tactical, as well as an increased level of motor power capacity, which is an aspect of physical condition for determining the income shares of the athletes. Before the need to efficiently run the vertical jumps in volleyball, Viitasalo (1982) argues that volleyball is a sport where the ability to jump vertically and height of individual players are important variables for performance, since the large number of jumps performed during a match. In view of this importance, several studies have been done trying to explain the variables that determine the "performance" in that motor action.

According to Badillo and Ayestarán (2001), the strength in the field of action sports may be understood as the ability of the neuromuscular system to produce tension or activate. According to Schmidtbleicher (1997), the driving force capacity is presented in two manifestations: rapid strength and strength endurance. The fast power can be defined as the ability of the neuromuscular system to produce the biggest boost possible in the time available. The resistance force characterizes of the neuromuscular system's ability to produce the largest possible sum of pulses under metabolic conditions predominantly anaerobic and conditions of fatigue. In volleyball, the resilience of force is extremely important, because the players execute a large number of dynamic action and a high level of strength and precision. According to Rodacki (1997), the players perform on average 147 jumps per game, and this shows the importance of analyzing the ability to jump. To investigate the ability to jump has been used standardized protocols involving jumps. The techniques of jumps that are commonly performed in these protocols are: Squat Jump (SJ - without countermovement jump), Coutermovement Jump (CMJ - countermovement jump) and Drop Jump (DJ - jump in depth). These techniques can be employed to characterize the ability to jump (KOMI & Bosco, 1978; SALE, 1992); in addition to determining the ability to jump, jump tests SJ, CMJ and DJ, provide information on the activation capability of the system neuromuscular lower limbs. In this research, we used the Technique of jumping DJ.

The research was based on depth jump and plyometric drop jump (DJ), in which the individual performs a fall from a height and with the use of CAE, seeks to achieve the greatest possible height in the heel (Fig. 1).

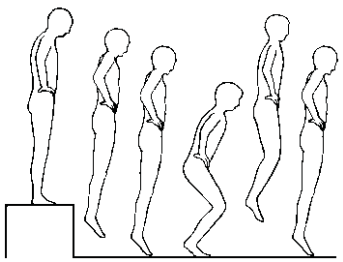

FIGURE 1. Jump technique - Drop Jump

In the heel touching the ground should not exceed 250 ms, due to the characteristics of the EAC. During the execution of a ground contact in the stretch-shortening cycle, is generated a stiffness of small amplitude ("short-range-elastic stiffness") responsible for the decreased initial elongation of the tendon-muscle group during the initial phase contact. Both neural stimuli source reflex increase muscle tension with the result that most of the elastic energy to store in the tendons. This energy is used more efficiently if the time of contact with the ground is less than 250 ms (KOMI 2005).

For purposes of control and direction of jumping ability, it is important to remember that due to the large capacity power transmission stored in the tendon to the contractile system in Drop jump Jump individual has the opportunity to reach greater heights than in CMJ and SJ, but because of the EAC using the pre-activation, it is necessary that the individual has a good coordination of the muscles involved and the integrity of the musculature that is, without the presence of fatigue. The quality training driving force must play an important role in the physical preparation of teams for which they can ensure the performance of athletes during the competitions of various types.

The CAE is present in all movements involving eccentric actions, followed by concentric actions. Thus, the goal is to study how it behaves the ability to jump of volleyball players before and after starting a DJ using the technique.

OBJECTIVE

The aim of this study is to determine the height jump and contact time through the drop-jum technique before and after a match volleyball.

METHODS

SAMPLE

This study had the participation of nine volleyball players, members of a men's national team. This study complied with all rules established by the National Health Board, Resolution No. 196/96 on research involving human subjects, based on the Declaration of Helsinki (1964 and subsequent resolutions).

The volunteers were informed about the objectives and methodological procedures of the study. The volunteers were also informed about the possible risks and discomfort, as well as potential benefits related to participation in the experiments and the possible treatment and compensation for damages. The informed consent for study participation was obtained in writing from each volunteer, after explaining, being all too aware that any moment could, without embarrassment, fail to participate. Were taken every precaution in order to preserve the privacy of volunteers. For this, the experimental conditions and all individual information obtained during the study were classified among the team of researchers and volunteers. Samples variables can be distinguished by anthropometric variables and the vertical jump tests.

PROCEDURES

The anthropometric variables were assessed body weight and height. The measurement of body mass was performed with a balance of Filizola to the nearest 0.1 kg. And the height was measured using a stadiometer-Accurate Height of the mark, with precision of 0.01 meters.

This research used a "carpet of contact" brand "jump test" connected to a computer to determine the flight time. For the DJ it was determined the contact time and flight time. The program used to collect data from the vertical jump tests was the "Jump Test." This equipment has a measuring accuracy of 0.001 s. (MENZEL 2010)

During the procedure of measuring the individual jumping tests started from a standing position, heels on the wooden platform, feet parallel and arms fixed to the waist in the standard

position of the DJ.

The jump tests, using the DJ, are intended to determine the optimum height for plyometric training. These heights vary from 20 to 100 cm. To determine the height of training is required an optimal elevation of the CG, the contact time with soil and drop height.

The preparatory activity ("warm") in volleyball is around 40 minutes before the start of a match. In case the team evaluated, the time of preparatory activity was 42 minutes. Since 11 minutes were used to perform a stretching routine. For activities with balls were used of which 31 minutes, 25 minutes for technical activities of touch, and headline the defense. The remaining six minutes were reserved for "heat" on the network and serve.

The sample was divided into two groups according to the yield of hop DJ. The group with a time of great fall of 50 cm (n = 3) and group 2 with optimum height of 40 cm (n = 6). Immediately after the preparatory activities, the subjects performed two repetitions at their optimum height of fall was computed and the best performance in the DJ. After finishing the game sample groups performed more repetitions in the two respective drop heights being computed the best return.

STATISTICAL ANALYSIS

According to the goals we used the following statistical procedures, from the statistical program SPSS 11.1 for Windows. Descriptive statistics was applied in order to characterize the sample. To check the normality of the test results jump was applied the Kolmogorov-smirnov test.Aiming to compare the means of jump height and contact time before and after a match was made a simple t-test for paired samples. The significance level used in this study was p 0.05.

RESULTS

Table 01 shows the results of descriptive statistics of drop height, contact time with the ground and jump height at the DJ. We determined the optimal two drop heights, 40 cm for group 1 and 50 cm for group 2. The group shows a jump in yields lower (38.56 cm) for income group 2 (44.66 cm).

TABLE 01

Descriptive statistics of falling from great height, contact time and jump height at the DJ.

Group	N	Drop height (cm)	Time of contact (ms) mean ± sd*	Heel heeight (cm) mean± sd*
1	06	40	189,3 ± 19,7	38,6 ± 9,8
2	03	50	183,0 ± 23,6	44,7 ± 4,8

* Sd = standard deviation

The results of vertical jump and the time of contact with the ground the players rated show that the incomes of athletes (38.5-44.5) are within the average achieved by the internacional teams that use the vertical jump.

The table 02 shows the results to income heel DJ as well, the times of contact with the soil before and after a volleyball match.The yield using the t test for paired samples, since the results of Kolmogorov-Smirnov test showed a normal distribution.

TABLE 02

Result of comparison of mean heigts of the jumps and periods of ground contact.

		mean and standard deviation	S
Start 1	H_J_Before	39,8 ± 8,2 cm	,005*
	H_J_After	35,2 ± 6,4 cm	
Start 2	CT1	188,7 ± 20,3 ms	,189
	CT2	195,1 ± 17,1 ms	

* = significant

Legend:S _ start - Start _ start

H_J_Before: Heel height before the game -- H_J_After: Jump height after the game

CT1: contact time 1 -- Ct2: contact time 2

DISCUSSION

The results show a significant difference between the yield on the heel before and after the game (p = 0.005). The fact that the yield of the jumps have decreased after the match, may be related to neuromuscular fatigue of the lower limbs of the players, because fatigue is regarded as an inability to maintain power output or force during repeated muscle contractions. Considering the high demand of volleyball, one can consider that fatigue affects the neuromuscular capacity to generate force on the athlete during the game. However, no significant difference in contact time with soil.

Muscle fatigue results from many factors, each related to the specific requirements of the exercise that produces what can affect its contraction or excitement or both. A reduction

significant observed during prolonged submaximal exercise. This "fatigue from lack of nutrients" occurs even when it has enough oxygen to generate energy through aerobic pathways. Another factor is the intense exercise that leads to the production of large amounts of lactic acid by skeletal muscle contraction. Increased intramuscular concentration of hydrogen ions can affect the performance of exercise in two ways: one, increasing the concentration of hydrogen ions reduces the ability of the muscle cell to produce ATP. The second, hydrogen ions compete with calcium ions for the binding sites of troponin and thereby prevent the contractile process. (McARCLE 2003)

The decrease in incomes of the lower limbs in the execution of bounce DJ can be related to several factors generated by fatigue mechanisms: depletion of energy substrates, lactate production by muscle processes related to neuromuscular propagation, excitation of cross bridges, deficiency of blood flow; sensorimotor adaptations, central nervous system fatigue, fatigue of the peripheral system. The decrease in muscle performance is related to peripheral fatigue, which can be caused by neural factors and / or mechanical factors. The neural factors may be associated with failures in neuromuscular junctions, in the sarcolemma, the sarcoplasmic reticulum, interfering with the release and reuptake of calcium (Ca). The mechanical factors are associated with the arrangement of cross bridges to actin and myosin. For a muscle to fatigue, especially in eccentric exercise does not have a proper conformation and this poor conformation of cross bridges, may cause physical disruption of the sarcomere and thus reduce the ability of muscle to generate tension.

Comparing the times of contact with the soil before and after a match, the results showed no significant differences. To explain this fact is necessary to consider some points regarding the condition of individual and collective sample: the ability to recover individual players may have changed in a positive or negative performance of the jump. Individuals who have a higher aerobic capacity will have increased resistance to stimuli aerobic and those who have greater anaerobic capacity will have increased resistance to stimuli of short duration and high intensity.

TABLE 03
Results of the jumps, contact time before and after a volleyball match and the player positions.

Atlet	Drop height	H_J_B	CT1	H_J_A	CT2	Position
1	50	43,80	216,00	32,60	191,00	Tip
2	50	45,90	180,00	41,10	188,00	Exit
3	50	37,00	166,00	36,10	172,00	Libero
4	40	26,30	158,00	27,00	174,00	Tip
5	40	46,20	187,00	42,00	195,00	Center
6	40	50,80	202,00	42,00	224,00	Center
7	40	31,60	188,00	26,90	198,00	Levator
8	40	217,00	217,00	39,70	216,00	Exit
9	40	32,40	184,00	29,30	198,00	Libero

Another factor that may have influenced the values of contact times was the feature of the game. The game analyzed, even being played with a team of high level of income, was a "friendly" and this may have influenced the performance of the players, because in an official competition players could spend more energy and enhance the neuromuscular fatigue.

The aerobic capacity of players may have influenced performance during the match because the efficiency can be influenced by several factors: (a) rate of work activity, (b) the speed of the movements performed, (c) type fiber that carries out the activity, (d) recovery time between stimuli. These factors are directly linked to the characteristics of both players, as the level of requirement of games played. Changes in total muscle glycogen can influence the performance in exercises involving high intensity of movement. In activities that stimuli are "explosives", the fast twitch fibers are activated to meet increased power demand. This causes, depending on the duration of exercise, an almost total depletion of glycogen stores. Therefore, individuals with higher glycogen stores have provided greater resistance to fatigue in anaerobic stimuli. The reserves of ATP and CP can ensure a higher yield in activities of short duration and high intensity.

The number of samples in the study was small and this may have influenced the survey results. Perhaps a larger sample might yield different results to ours.

CONCLUSION

According to the results of this study it was concluded that there is significant difference between the mean jump height before and after the game for the sample group studied.

There was no significant difference in contact time before and after the game in the jumping test DJ.

REFERENCES

BLUME, G. **Voleibol. Barcelona: Edicíones Matínez Roca.** 1989.

BÜHRLE, M. In: CARL, K.; SCHIFFER, J. **Zur Praxis des Sprungkrafttrainings.** Köln: BISP, 1985 apud CAMPOS, C. E. Aplicação de testes de campo e testes laboratoriais de saltos verticais para o diagnostico da força muscular. 2002. 94 f.

Dissertação (Mestrado em Biomecânica) – Escola de Educação Física, Universidade Federal de Minas Gerais, Belo Horizonte, 2002.

CAMPOS, C. E. **Aplicação de testes de campo e testes laboratoriais de saltos verticais para o diagnostico da força muscular.** 2002. 94 f. Dissertação (Mestrado em Biomecânica) – Escola de Educação Física, Universidade Federal de Minas Gerais, Belo Horizonte, 2002.

CAMPOS, E. C.; MENZEL, H-J. **Aplicação de testes motores e biomecânicos no sistema diagnóstico de saltos.** In: GUIMARÂES, A. C. S. Anais do IX Congresso Brasileiro de Biomecânica. Gramado: Escola de Educação Física de Porto Alegre, v. 2, , p. 17-22, 2001.

CHAGAS, M. H.; CAMPOS, C. E.; MENZEL, H-J. **Treinamento específico da força para jogadores de voleibol.** In: Temas atuais VI em educação física e esportes. Belo Horizonte: Saúde. 2001.

CONFEDERAÇÃO BRASILEIRA DE VOLEIBOL. Atualizações das regras oficiais versão 2002. Disponível em http://www.cbv.com.br/regras. ACESSO EM 10/Março/2004.

KOMI, P. V. **Stretch-shortening cycle. In: KOMI, P.V. Strength and power.** Oxford: Blackwell Scientific publications, cap. 6E, p.169-179, 1992.

MENZEL, Hans Joachim Karl; CHAGAS, Mauro Heleno; SZSMUCHROWSKI Leszek A. ; ARAUJO SILVIA R. ; CAMPOS, Carlos Eduardo ; GIANNETTI, M. R. . **Usefulness of Jump-and-reach test in assessment of vertical jump performance.** Perceptual and Motor Skillsv. 110, p. 150-158, 2010.

McARDLE, W. D.; KATCH, F. I.; KATCH, V. L. **Fisiologia do exercício: energia, nutrição e desempenho humano.** 5. ed. Rio de Janeiro: Guanabara Koogan, 1113 p. 2003.

McGINNIS, P. M. **Biomecânica do esporte e exercício.** 1. ed. Porto Alegre: Artmed, 404 p. 2002.

RODACKI, A. L. F. R. **O Número de Saltos Verticais Realizados Durante Partidas de Voleibol como Indicador da Prescrição do Treinamento.** Revista Treinamento Desportivo. v. 2. n.1 p.31-39. 1997.

SCHMIDTBLEICHER, D. **O treino da força e da potência em atletas de alto rendimento.** Rev. Treinamento Desportivo, v. 2, n. 1, p. 1-39, 1997 apud CHAGAS, M. H.; CAMPOS. C. E.; MENZEL, H-J. K. Treinamento específico da força para jogadores de voleibol. In: Temas atuais VI – Health, 2001.

TRICOLI, V. A.; BARBANTI, V. J.; SHINZATO, G. T. **Potência muscular em jogadores de basquetebol e voleibol: relação entre dinamometria isocinética e salto vertical.** Revista Paulista de Educação Física, v. 8, n. 2, p. 14-17, 1994.

VITASOLO, J. T.; & BOSCO , C. ; **Electroical behaviour of human muscles in vertical jumps.** Eur. J. Appl. Physiol. 48, p.253-261. 1982.

DETERMINING THE HEIGHT OF THE HEEL AND TIME OF CONTACT THROUGH THE TECHNIQUE DROP JUMP BEFORE AND AFTER A GAME OF VOLLEYBALL

ABSTRACT

Volleyball modern features as a sport extremely dynamic. Players are becoming taller, with a greater physical potential and the technical and tactical actions with more complex requirements. Therefore, these facts create the need to increase both the quality and quantity of training, in order to reach a more efficient technical and tactical as well as an increased level of motor skill strength, which is an aspect of physical condition for determining the income shares of the athletes. Besides determining the ability to jump, jump tests provide information about the characteristics of neuromuscular behavior of the lower limbs. The aim of this study is to determine the jump height and contact time through the Drop Jump technique before and after a volleyball match. In the present study, the technique will be used DJ. From this jump can measure the ability to jump from the lower limbs using the Elongation Cycle - Shortening. Since the majority of techniques inherent to volleyball vertical jump involves performing eccentric actions followed by concentric actions, which manifests itself in the CAE. The sample of this research with the participation of nine volleyball players, members of a men's team were divided into two groups according to income heel DJ. The group with a time of great fall of 50 cm (n = 3) and group 2 with optimum height of 40 cm (n = 6). According to the results of this study it was concluded that there is significant difference between the mean jump height before and after the game for the sample group studied. There was no significant difference in contact time before and after the game in the jumping test DJ.

KEYWORDS: Cycle stretch - shortening, Drop Jump and Volleyball.

DETERMINATION DE LA HAUTEUR DU TALON ET HEURE DE CONTACT PAR LE SAUT I DROP TECHNIQUE AVANT ET APRES UN JEU DE VOLLEY-BALL

RÉSUMÉ

Volley-ball caractéristiques modernes comme un sport très dynamique. Les joueurs sont de plus en plus grand, avec un plus grand potentiel physique et les actions techniques et tactiques avec des exigences plus complexes. Par conséquent, ces faits de créer la nécessité d'accroître la qualité et la quantité de la formation, afin de parvenir à une technique plus efficace et tactique ainsi qu'une augmentation du niveau de résistance à l'habileté motrice, qui est un aspect de la condition physique pour déterminer la part du revenu des athlètes. Outre la détermination de la capacité à sauter, sauter tests fournissent des informations sur les caractéristiques du comportement neuromusculaire des membres inférieurs. Le but de cette étude est de déterminer la hauteur du saut et le temps de contact à travers la goutte Aller technique avant et après un match de volley-ball. Dans la présente étude, la technique sera utilisée DJ. De ce saut peut mesurer la capacité de sauter des membres inférieurs en utilisant le cycle d'élongation - Raccourcir. Comme la majorité des techniques inhérentes au volley-ball saut vertical implique la réalisation d'actions excentrique suivie par des actions concentriques, qui se manifeste dans la CAE. L'échantillon de cette recherche avec la participation de neuf joueurs de volley-ball, les membres de l'équipe d'hommes ont été divisés en deux groupes selon le revenu du talon DJ. Le groupe avec un temps de grande chute de 50 cm (n = 3) et le groupe 2 avec une hauteur optimale de 40 cm (n = 6). Selon les résultats de cette étude il a été conclu qu'il ya une différence significative entre la hauteur du saut moyenne avant et après le match pour le groupe échantillon étudié. Il n'y avait pas de différence significative dans le temps de contact avant et après le match dans l'épreuve de saut DJ.

MOTS-CLÉS: étirement du cycle - shortening, Drop Jump et le volleyball.

DETERMINACIÓN DE LA ALTURA DEL TALÓN Y HORA DE CONTACTO A TRAVÉS DE LA TÉCNICA DE SALTO DE LA GOTA ANTES Y DESPUÉS DE UN JUEGO DE VOLEIBOL

RESUMEN

Voleibol características modernas como un deporte muy dinámico. Los jugadores son cada vez más alto, con un mayor potencial físico y las acciones técnicas y tácticas con requisitos más complejos. Por lo tanto, estos hechos crean la necesidad de aumentar tanto la calidad y cantidad de la formación, con el fin de alcanzar una mayor eficiencia técnica y táctica,

así como un mayor nivel de fuerza del motor habilidad, que es un aspecto de la condición física para la determinación las cuotas de ingreso de los atletas. Además de determinar la capacidad de saltar, las pruebas de salto de proporcionar información sobre las características de la conducta neuromuscular de los miembros inferiores. El objetivo de este estudio es determinar la altura del salto y tiempo de contacto a través de la gota Saltar técnica antes y después de un partido de voleibol. En el presente estudio, la técnica se utilizará DJ. A partir de este salto se puede medir la capacidad de saltar de las extremidades inferiores con el ciclo de alargamiento - acortamiento. Dado que la mayoría de las técnicas inherentes al voleibol salto vertical implica la realización de acciones excéntrica seguida de acciones concéntricas, que se manifiesta en el CAE. La muestra de esta investigación con la participación de nueve jugadores de voleibol, los miembros del equipo de hombres se dividieron en dos grupos de acuerdo con el talón de ingresos DJ. El grupo con un tiempo de gran caída de 50 cm (n = 3) y el grupo 2 con la altura óptima de 40 cm (n = 6). De acuerdo con los resultados de este estudio se concluyó que existe diferencia significativa entre la altura del salto decir antes y después del partido para el grupo de muestra estudiada. No hubo diferencias significativas en el tiempo de contacto antes y después del partido en la prueba de salto de DJ.

PALABRAS CLAVE: Ciclo de estiramiento - acortamiento, Drop Salta y Voleibol.

DETERMINAÇÃO DA ALTURA DO SALTO E DO TEMPO DE CONTATO ATRAVÉS DA TÉCNICA DROP JUMP ANTES E APÓS UMA PARTIDA DE VOLEIBOL

RESUMO

O voleibol moderno caracteriza-se como um esporte extremamente dinâmico. Os jogadores estão se tornando mais altos, com um potencial físico maior e as ações técnico-táticas com exigências mais complexas. Conseqüentemente, estes fatos geram a necessidade do aumento tanto da qualidade quanto da quantidade do treinamento, para que se alcance uma maior eficiência técnico-tática, bem como um aumento do nível da capacidade motora força, que é um dos aspectos da condição física determinante para o rendimento das ações dos atletas. Além de determinar a capacidade de saltar, os testes de saltos fornecem informações sobre as características do comportamento neuromuscular dos membros inferiores. O objetivo do presente estudo é determinar a altura do salto e o tempo de contato através da técnica Drop Jump antes e após uma partida de voleibol. No caso deste estudo, será usada a técnica DJ. A partir desse salto pode-se medir a capacidade de saltar de membros inferiores utilizando o Ciclo de Alongamento - Encurtamento. Visto que grande parte das técnicas inerentes ao voleibol envolve saltos verticais que realizam ações excêntricas seguidas de ações concêntricas, nas quais se manifesta o CAE. A amostra dessa pesquisa contou com a participação de 9 jogadores de voleibol, integrantes de uma equipe masculina foram divididos em dois grupos de acordo com o rendimento do salto DJ. O grupo 1 com altura ótima de queda de 50 cm (n=3) e o grupo 2 com altura ótima de 40 cm (n=6). De acordo com os resultados obtidos neste estudo foi possível concluir que existe diferença significativa entre as médias de altura do salto antes e após o jogo para o grupo de amostras estudado. Não houve diferença significativa no tempo de contato antes e após o jogo no teste de salto DJ.

PALAVRAS-CHAVE: Ciclo de alongamento – encurtamento, Drop Jump e Voleibol.