

**BIOMECHANICAL ANALYSIS OF THE HIGH JUMP IN
VOLLEYBALL - STUDY BETWEEN SIMULTANEOUS
BEATING AND ALTERNATIVE ONE -**

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Summary: This article contains a few details about the high – jump, in the game of volleyball. At this moment we know that there are two types of beats in the matter of spiking technique. Those two are: simultaneous and alternative one. Trough our research and by using a specialized program we build a biomechanical analyses in the problem that concerns the spiking in volleyball. At the end of this analyses we conclude that the simultaneous beat, is better and give the players that use it a great advantage.

Introduction: We started from assumption that the beating on two legs in volleyball game give a better detachment, a longer flight and a better precision for spiking the ball.

Our methods used in this experiment are: observation, experimentation, biomechanical analysis and video taping.

The spike, in volleyball is a very complex procedure because many factors interacting in the same time. First factor is the reaction speed, you must to apprehend the trajectory of the ball from the moment she leave the hands of raiser. The second one is the coordinating of movement (steps before beating) then the beating itself and in the last time, synchronizing the arm with ball trajectory.

Very important to succeed in this technical procedure is the beating. This give you the necessary high to spike the ball in the highest point.

Even long time ago we observe that the type of beating is different to players. In last year we started to make some research on this matter and we found very few information in volleyball literature. Even more in all the specialized articles and books the authors define very clear that the correct beating is simultaneous on the both legs.

We were even more surprised to observe in a very high level of contest: World Championship and Olympic Games that more than 90 %

of players don't use the simultaneous beating, using instead alternative one. We search even more and we come to an interesting conclusion, an possible answer to the question "why is used more often this kind of beating if it is not the indicated one?".

An possible answer is the height of players, a great one, over 2,05 meters and the easiness to cross over 2,60 meters with stretched arms when he stand. So in that case they don't look after higher lifting, just speed in spiking the ball and a better timing.

Material method

Technical procedure spiking is composed from five phases:

1. momentum
2. beating
3. flight
4. spiking the ball
5. landing

Momentum is composed of five steps 1-3-5 last greater and more vigorous. The attacker must be synchronized with raiser, then he must to calculate the trajectory of the ball, then the momentum is with a step forward, then there is a preparatory phase followed by a transformation of the race went.

Beating is the contact that you make your feet with the ground for detachment. The last step of momentum is more vigorous, center of gravity moves towards, the forward arms are stretched to the back for better detachment.

Although detachment of the soil is made very quickly it contains three phases:

- heel settlement on the soil surface;
- soles relies entirely on the surface soil, is flexing all joints, the movement begins the transformation of the horizontal speed of the vertical,
- when final impulse, is pushing on the ground on foot peaks, while throwing arm from the bottom up and before.

Flight is achieved by a vigorous stretch of the leg joints and helped by a strong movement of the arms back - before - up over your head slightly flex the elbow joint. Simultaneous arm awkwardly going backward, then there is a twisting trunk to the arm awkwardly. Is essential that the arched trunk in the air, it must operate like a resort, when they reach maximum height the resort must initiate.

Snap the ball runs through active retrodution of the stretched arm over the entire thickness of the median line the ball, moving the arms is

coordinated, the dexterous arm being preceded by the other, the ball must be hit on the momentum direction. Essential is flexible trunk, followed by further arm trajectory after striking the ball adroitly. The ball must always hit when it is before.

Landing is done on vertices, there is a flexible trunk, knee joint to avoid risking an accident and to prevent premature wear of the knee joint.

The second option, used by the vast majority of players is "beating preceded by a step jump" that represents the most efficient jump attack.

Utilization of a player right: the last step of the momentum, running on the left leg, is a pistol-like step jump slightly up and forward to - beating accomplished to slow the momentum with successively on heels alternatively as - left (went to the other), will run on base, top and ascension vertically. Be noted that the first contact with the ground is on the right leg, slightly twisted outwards, with the ankle lock, center of gravity remains in the leg support. With the return of the trunk vertical leg support a flexible running further, taking the whole body weight. Swinging that leg, left, the same flex, exceeds half the sole, or even with a foot sole support, running concurrently with the other, heel - runner - top balancing body weight on both feet and converting speed forwarding horizontal speed into vertical lift, the following components of spiking.

Last momentum on the ground is carried out by the arm opposite the leg snap (slick), showing a rise and a position corresponding to the net and removing a series of unusual movements (twists) of additional trunk executed for striking the ball. Flight, created by the extent a vigorous leg joints is much helped by strong and rapid movement of the arms, rearward - forward - up over your head, gently flex the elbow joints. Further, the striking arm is going more up and back, with the slight extension of the trunk and twisting his arm toward the workmanlike.

During flight, the legs are easy setting of knee joint favors lifting, Ascension whole body vertical and maintaining a favorable balance. When the attacker is the maximum point of the flight, start executing the next component, striking the ball.

Height of the jump depends on the nature of explosive contractions, muscle, increase the maximum oscillation of the arms (from the bottom up and before) to the beginning of lifting and reduce its momentum at the end. A large importance in jump height has position of feet to detachment, that is the natural - with feet parallel. Flight height also depends to a large extent and angle of bending of the knee joint of the leg. Upon termination of ground lifting, the arm must hit the ball

riser, the arm is slightly awkwardly bent elbow joint of the left foot and dextrous arm continuing initial movement.

Arm and shoulder are gone slick little back, legs fold in knee joint and the trunk goes into extension. All these movements create conditions necessary for the scope of most abdominal muscle groups, whose strong contraction part to a strong force when spiking the ball.

Striking the ball is achieved by a sudden and successive contraction of abdominal muscles, chest and hands.

The ball must be hit over the net, making contact with the ball short and fast. Shortly before or almost simultaneously with the ball striking awkwardly arm, flexed by elbow joint (at an angle of 90 - 100 °), running a strong traction from top to bottom and slightly lateral to the body, helping in this way that the twisting motion (return) to the trunk before you make more vigorous and striking force of the ball to rise. In his way to snap the ball (forward and rearward towards the top down), arm slick is stretched or slightly flex the elbow joint. During spike, running a trunk on the flexible vigorous pool, arm palm powerful strikes the ball while the elbow is raised between the two points of the lever formed by the shoulder - the ball. The ball is hit with a large area of the hand with fingers disposed in a flexible easy care in addition to percussion, with various movements of the hammer fist joint or whole arm, it prints the desired direction of flight.

Landing. Contact with the ground is successively: top foot, heel, both feet together, close or slightly ahead. When full contact with the ground, flexing of leg joints is easy, making the landing should be as elastic, while accompanied by a flexible light of the trunk river (hip goes back a little). Arms are relaxed on the stump, the player take, immediately after, the basic fundamental position, entering this way in the game soon.

Results

As we can see in the figure 1 and 2, the analysis of alternative beating, the initial moment of each foot represented by mass B and mass C (right and left foot) there are be some significant differences at the time of impulse, his feet being in the axis ox at a considerable distance, which dissipating energy used for detachment. Values are calculated automatically in the tables in Figure 2 can be traced to deviations of the two axes. Program that analyzed the two beatings are Tracker Video Analysis version 2.73.

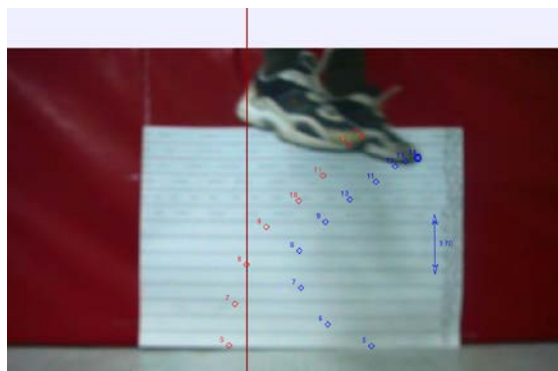


Figure no.1

Comparing the two tips of beating we can observe that of the simultaneous beating from biomechanical point of view presents several advantages such as higher detachment, in-flight stability and higher speed of execution.

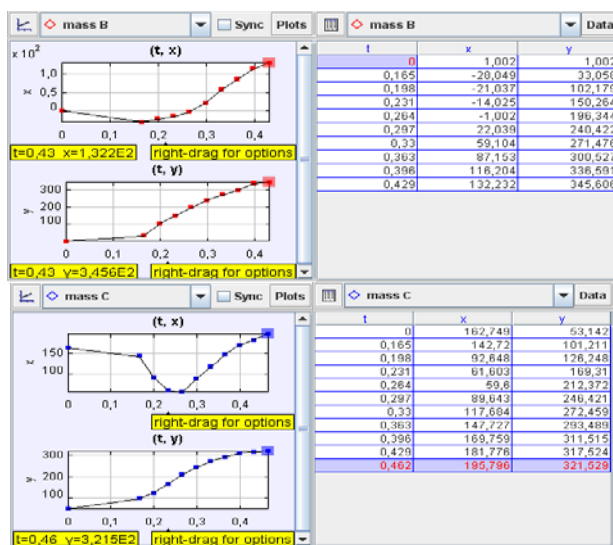
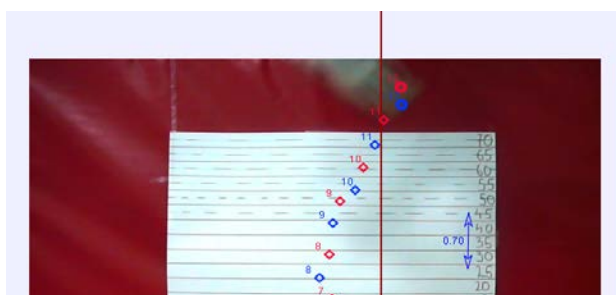


Figure no. 2

As we can see in the figure 3 and 4, the analysis of simultaneous beating, the initial moment of each foot represented by mass D and mass E (right and left foot) there are not significant differences at the time of impulse, his feet being in the axis ox at a same distance, which not dissipating energy used for detachment. Values are calculated



automatically in the tables in Figure 4 can be traced to deviations of the two axes.

Figure no. 3



Figure no. 4

Discussions:

Following the use of a specialized program for biomechanical analysis (Tracker Video Analysis) we concluded that beat simultaneously, although it is less used, gives better results than the alternative pairing. In conclusion, in a game of volleyball can get a return much higher using simultaneous fights in the attack. The detachment using beating alternative is less, but more often used for high

performance players, following their great height. We believe that the issue is not the height of detachment as effective as placing the ball during flight and possibility to reduce the horizontal deviation.

Bibliography:

1. A.V. Ivoilov - Volei, Studii de biomecanica și metodică antrenamentului, Editura Centrului de Cercetări pentru Educație Fizică și Sport, București 1984;
2. Georgescu, M. – Calitățile fizice ale jucătorului de volei, dezvoltarea calităților fizice prin antrenament, revista „Cultură Fizică și Sport” 1954;
3. Ghenadi Vasile, I. Ciuhureanu, F. Grapă, D. Mârza - Model și modelare în voleiul de performanță, Editura Plumb Bacău, 1994;
4. Păcuraru Alexandru – Volei, Editura Universității „Dunărea de Jos” Galați, 2003;
5. Stroie Ștefan - Pregătirea fizică a jucătorului de volei, Editura Sport-Turism, București 1976.

Titlu: Analiza biomecanică a detentei în volei, paralelă între bătaia simultană și cea alternativă

Cuvinte cheie: volei, procedeu tehnic, detentă, lovitură de atac, analiză biomecanică.

Rezumat: Acest articol conține câteva detalii despre atac, în cadrul jocului de volei. În acest moment cunoaștem două tipuri de bătaii: simultană și alternativă. Prin intermediul cercetării noastre, folosind un program specializat în analiza biomecanică în problema atacului în volei, la sfârșitul analizei, am concluzionat că bătaia simultană este mai bună și că aceasta dă jucătorilor un avantaj considerabil.

Titre: L'analyse biomécanique de la détente en volley-ball, parallèle entre la frappe simultanée et celle alternative.

Mots-clé: Voley-ball, procédé technique, détente, frappe d'attaque, analyse biomécanique.

Résumé: Cet article contient quelque détails sur l'attaque dans le jeu de volley-ball. À ce moment on connaît deux types de frappe: simultanée et alternative. Par l'intermède de notre recherche, en utilisant un programme spécialisé dans l'analyse biomécanique sur l'attaque en volley-ball; à la fin de l'analyse on a tiré la conclusion que la frappe simultanée est meilleure et qu'elle donne aux joueurs un avantage considérable.