

## BIOMECHANICAL ANALYSIS OF SPIKING TECHNIQUE IN VOLLEYBALL

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### ABSTRACT

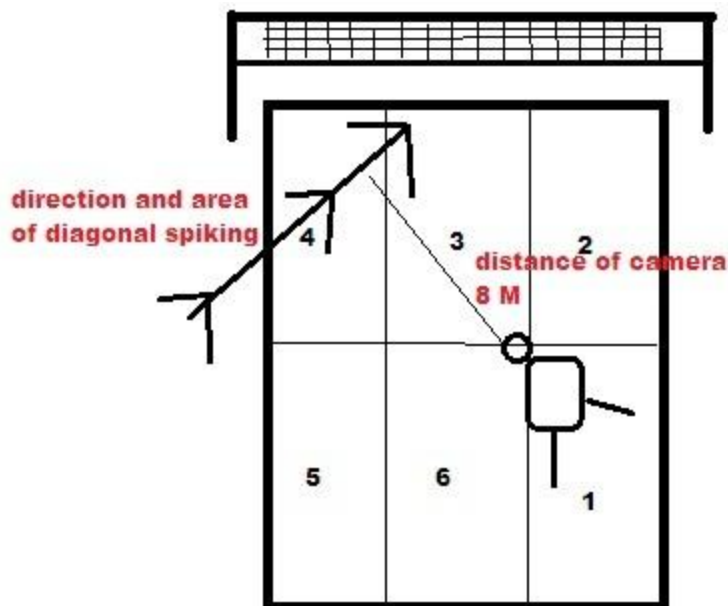
*Volleyball is one of the famous sports in India. Indian volleyball teams are performing well at international level especially in men section. The measurements were carried out on a sports authority of India training centre Mastuana Sahib Sangrur Punjab outdoor volleyball courts. All data is videotaped with Panasonic camera at 50 frames/sec. Study was conducted on single male subject, Ranbir Singh captain youth Indian team, Age 20 years, height 192 cm, weight 80 kg. He had 8 years experience at national level, 2 year experience at international level. selected kinematics variables were Right knee angle, Left knee angle, Right ankle angle, Left ankle angle, Right elbow angle, Left elbow angle, Hitting shoulder angle, Body inclination and Arm swing velocity. On the basis of the result obtained by the biomechanical analysis of diagonal spiking from fourth number zone some of the important parameters have found to define the model of diagonal spiking from the zone number four.*

*Key words : volleyball, diagonal spike, biomechanical.*

### INTRODUCTION:

Many researches have been done at international level on the Biomechanics of the techniques of volleyball players have been studied. Huang(1998) The purpose of the study was to analyze in a quantitative manner the spiking technique Marek Pawel Plawinski(2008) studies the kinematic aspects of the different spike attack arm swings. In India studies by Singh A. and Deol N.S (2011) 2D kinematical analysis of spiking in volleyball, Sidhu A.S (2012) 2D kinematical analysis of arm swing and ball velocity of spikers in volleyball. Spiking is one of the key tactics of scoring in volleyball. Therefore, the researcher has attempted to analyze the technique of diagonal spiking from the biomechanical point of view of Ranbir Singh an Indian youth team captain.

**PROCEDURE AND METHODS:** The measurements were carried out on a sports authority of India training centre Mastuana Sahib Sangrur Punjab outdoor volleyball courts. According to the protocol, subject performed seven trails. From the seven trails best five was chosen according to satisfaction of subject. The cinematography technique was use. All data is videotaped with Panasonic camera at 50 frames/sec. The subject was video graphed continues from approach to landing. Video camera was placed at 8mt distance at  $90^{\circ}$  to spiking position from zone number four. From the Videography stick figures were obtained with the help of motion pro computer software.



**Set-up of cameras**

**SELECTION OF SUBJECT:** Study was conducted on single male subject, Ranbir Singh captain youth Indian team, Age 20 years, height 192 cm, weight 80 kg. He had 8 years experience at national level, 2 year experience at international level.

**CRITERION MEASURES:** The following will be the criterion measures for this study with the help of advanced Motion Pro software. Study was delimited to diagonal spiking from only zone number four on selected kinematics variables:

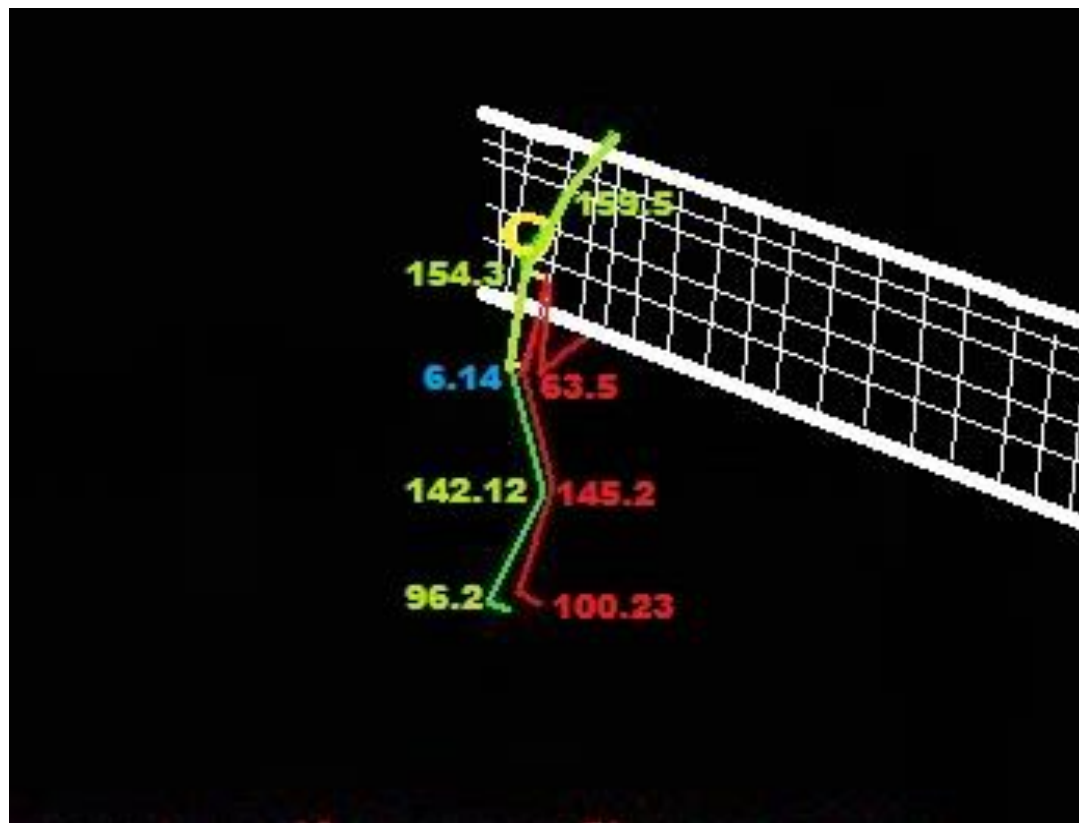
1. Right knee angle

2. Left knee angle
3. Right ankle angle
4. Left ankle angle
5. Right elbow angle
6. Left elbow angle
7. Hitting shoulder angle
8. Body inclination
9. Arm swing velocity

**STATISTICAL ANALYSIS:** The statistical data show the following basic biomechanical characteristics of diagonal spiking of volleyball.

Table 1 Biomechanical parameters of diagonal spiking.

Sr. no.	Parameters	Unit	Result mean value
1.	Right knee angle	$0^0$	142.12
2.	Left knee angle	$0^0$	145.2
3.	Right ankle angle	$0^0$	96.2
4.	Left ankle angle	$0^0$	100.23
5.	Right elbow angle	$0^0$	159.45
6.	Left elbow angle	$0^0$	63.5
7.	Hitting shoulder angle	$0^0$	154.3
8.	Body inclination angle	$0^0$	6.14
9.	Arm swing velocity	$0^0/\text{sec}$	325



Picture 1 stick figure analysis of diagonal spiking from zone no. 4

## DISCUSSION AND FINDING

On the basis of the results in Table 1, the following characteristics of a biomechanical model of the diagonal spiking from the zone number four can be established. Mean value of knee angle at right and left leg was  $142.12^{\circ}$  and  $145.2^{\circ}$  almost similar angle of knee angle at both legs at spiking. For the long flight Ranbir Singh extended his both legs that give him time to generate maximum torque. From bio-mechanically point this allowed them to keep the center of mass at maximum height for a longer time. This also generated a better control during the spiking. It is also supported by Sonia Corrêa, Rafael de Menezes, Ronê Paiano study. The mean value of right and left ankle angle of was  $96.2^{\circ}$  and  $100.23^{\circ}$  at spiking that showed the plantar flexion movement of foot that was sign of body stretch in flight helpful to stable the body in air and it was preparation of landing, for the accurate landing it must be land first on the toe ball of the foot than heel for the smooth landing. In the spiking technique upper body torque was reason behind the force

generated for the spiking with the help of arm swing. Ranbir singh was right hand spiker so that his left arm come forward with  $63.5^{\circ}$  bend at elbow joint and right arm come forward after the rotation of right shoulder with elbow angle of  $159.45^{\circ}$  higher angle of elbow showed that subject extended right arm fully to hit the ball. The mean value of right shoulder angle was  $154.3^{\circ}$  that showed the shoulder was in front body. for the effective spike ball must be hit in the front of body. The mean value of body inclination of ranbir was  $6.14^{\circ}$  at the time of hitting body should bend forward after force generated by abdominal muscles to increase the intensity of hitting the ball. During the diagonal spiking at 4 number zone Ranbir's Arm swing velocity was  $325^{\circ}/\text{sec}$ . arm swing was highly correlated with ball velocity. Studies by Sidhu A.S 2011 co-relation between arm swing and ball velocity is very high. In volleyball Difficulty of defending an attack in the volleyball increases with increasing ball velocity (Forthomme *et al.*, 2005).

### Conclusion:

On the basis of the result obtained by the biomechanical analysis of diagonal spiking from fourth number zone some of the important parameters have found to define the model of diagonal spiking from the zone number four.

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