



# A Study on the Relationship between Take off Velocity and Ball Velocity in Volleyball Spiking

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**ABSTRACT**

*Introduction:* The present study was designed to analyze the short set and high set volleyball spiking action in the front row and understand the relation between take off velocity and spiked ball velocity.

*Methods:* The action of short and high set ball spiking of eight (08) male intervarsity volleyball players (1.78±0.05m, 65.09±6.83kg, and 22.5±2.0 yrs) was recorded by a digital video camera of East Zone Intervarsity Volleyball Tournament. The take off velocity and ball velocity after spiking were calculated by using appropriate motion analysis software. Mean, standard deviation and Coefficient of correlation were computed to analyze the data.

*Results and Discussion:* Take off velocity and spiked ball velocity were found to be negatively correlated (insignificant) with the value of co-efficient of correlation of -0.30 for short set ball and -0.45 for high set ball. The result of the present study indicated that the take off velocity may have an indirect with the ball velocity.

*Conclusion:* From this study it is found that there was an insignificant negative relationship in between take off velocity and ball velocity for front row spiking in volleyball and the players with greater than the optimum take off velocity may not be able to impart greater velocity to the spiked ball.

**Keywords :** Volleyball Spiking, motion analysis, jump height, ball velocity

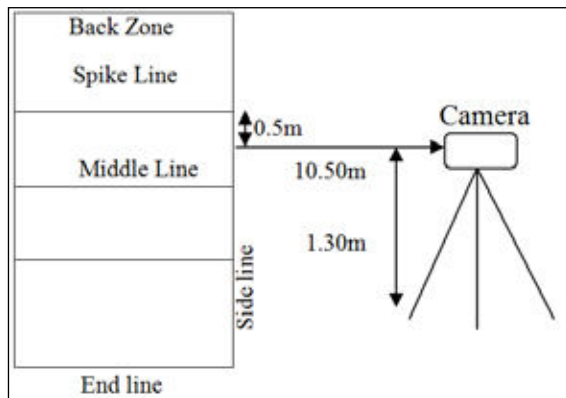
**INTRODUCTION:**

Volleyball has been played around the world for over one hundred years. It involves many participants worldwide making it the most popular participant sport in the world. The volleyball spike is one of the most important offensive weapons in the competition and the most frequently used technique to obtain a point. The athlete is expected to jump and hit a ball with maximum force and accuracy at the approximate peak of the jump. Based on the variety of movements, the analysis of the volleyball spike is a complex approach. The previous researchers (Coleman et al., 1993; Davila et al. 1994) have investigated front spike techniques of ordinary players. Coleman et al. (1993) indicated that the volleyball jump spike can be divided into the following six phases: approach; plant; takeoff; flight; the hitting action; and landing and recovery. They studied on ten male International volleyball players who spiked the ball in the front row at the 1991 World Students Games. They reported that the mean take off velocity was 3.59m/s and post-impact ball velocity was 23.7±2.1m/s. The purpose of the present study was to analyze the 'short set' and 'high set' volleyball spiking action and understand the relation between take off velocity and spiked ball velocity.

**METHODS:**

The subjects of the present study were eight male intervarsity (East Zone Interuniversity Volleyball Tournament) volleyball players, having height, weight and age as 1.78±0.05m, 65.09±6.83kg, and 22.5±2.0 yrs respectively from Visva-Bharati University and University of Kalyani. The action of the front row spike for short and high set ball of the eight spikers was recorded by a digital video camera (24fps). Following a brief warm up and stretching period, an assistant passed the ball to the setter, who set the ball for each subject to perform front row spikes for both short and high set ball. Only the successful spiking action was analyzed to measure the selected kinematic parameters with the help of motion analysis software. After projecting a particular frame the stickman figure was drawn from the frame. The time information was obtained from the frequency of the camera and that was 24fps. Velocity is the rate of motion in a specific direction. In the present

study the take off velocity of the C.G. during take off for executing spiking was considered. The ball velocity was considered as the velocity with which the ball travels after impact (spike) with the hand. A Pearson Product Moment Correlation was used to examine the relationship between take off velocity and ball velocity for front row spiking. Fig 1 represents the filming environment for collecting the data for this study.



**Fig 1 Filming environment**

**RESULTS AND DISCUSSION:**

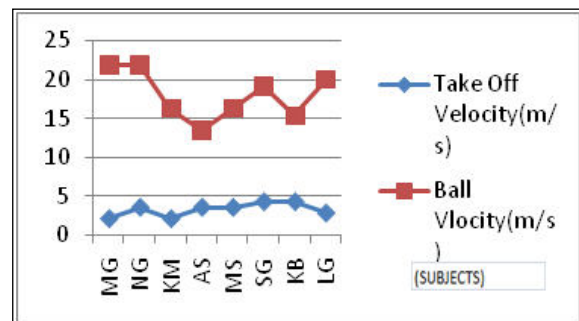
Table 1 presents Pearson correlation between the selected kinematic parameters for front row spiking on 8 players. The high set ball spiking have greater values than the short set ball spiking on take off velocity as well as ball velocity. The mean take off velocity of front row spiking in the present study was 3.49m/s which was very much similar to that of Hu, Lin-Huan. (2005) study "A 3D analysis of the volleyball spike" that used eleven players from the 2001-2002 Taiwan high school volleyball league champions and the mean take off velocity was 3.47m/s. For this study the front row spiking has a smaller ball velocity (18.56m/s) than the Huang et al. (1998) one foot jump spike (20.19m/s). The result of the Pearson Prod-

uct Moment correlation showed that the take off velocity and spiked ball velocity has an insignificant negative correlation with the value of co-efficient of correlation of -0.30 for short set ball and -0.45 for high set ball. Coleman (1997) found that the ball velocity was significantly correlated with hand impact velocity and the jump height was significantly correlated with vertical velocity of Centre of Mass.

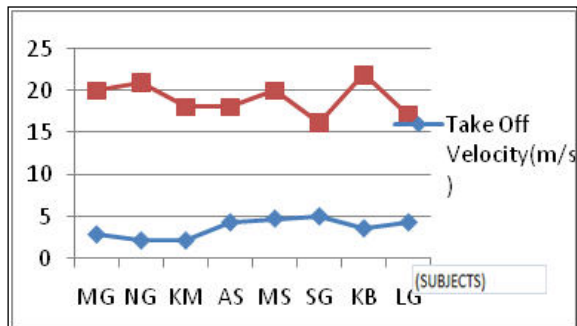
**Table 1: Pearson correlation between selected front row spiking variables**

SHORT SET BALL SPIKING				
	Take off velocity (m/s)	Ball Velocity (m/s)	Coefficient of Correlation "r"	p-value
Mn	3.33	18.02	-0.300	0.469
SD	±0.79	±3.20		
HIGH SET BALL SPIKING				
	Take off velocity (m/s)	Ball Velocity (m/s)	Coefficient of Correlation "r"	p-value
Mn	3.66	19.09	-0.452	0.259
SD	±1.06	±1.97		

The result of the present study indicated that the take off velocity may have an indirect relation with the ball velocity. The values of the take off velocity and spiked ball velocity for front row spiking have been presented graphically in the figure 2 & 3.



**Figure 2 Take Off Velocity and Ball Velocity for Short Set Front Row Spike**



**Figure 3 Take Off Velocity and Ball Velocity for High Set Front Row Spike**

**CONCLUSION:**

This study describes the kinematic characteristics of the male 'short set' and 'high set' ball front row spike. It was noted that high set front row spike had a greater take off velocity and spiked ball velocity than that of the short set front row spike. From the result of the study it may be concluded that there was an insignificant negative relationship in between take off velocity and spiked ball velocity for front row spiking in volleyball and the players with greater than the optimum take off velocity may not be able to impart greater velocity to the spiked ball.

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