STUDY ON CENTRE OF GRAVITY IN LANDING CONDITIONS AFTER SPIKING IN VOLLEYBALL

(Received on: 25 July 2014, Reviewed on: 14 Aug 2014 and Accepted on: 02 Oct 2014)

Mr. Sunil Kumar Singh, Research Scholar,
Department of Physical Education, Visva-Bharati, Santiniketan, W.B.
Dr. Ratnesh Singh, Associate Professor,
Department of Physical Education, GGV Central University, Koni, Bilaspur, Chhattisgarh

Abstract

To compare whole body centre of gravity (CG) height in two distinct landing conditions after spiking in volleyball. Method: Study area: Birbhum district in West Bengal, India. Subject: 10; age ranged 20-26 years. The subjects were taken conveniently and they were the current intervarsity volley ball players who represent Visva-Bharati in the year, 2013. The subjects were right-handed. Criterion measures: Whole body CG height at different conditions in two distinct landing condition. Videography techniques were employed to collect data. Statistics: Mean, Standard Deviation and Independent t-test were used as statistical tool. Level of Significance was set at 0.05. Findings: The t-value of maximal CG height, CG height at horizontal velocity and CG height at vertical velocity of two distinct landing conditions after spiking volleyball were 1.042, 10.985 and 1.408 respectively. Result and Conclusion: It reveals that CG height at horizontal velocity in long landing condition had significantly higher than normal landing condition after spiking volleyball.

Keywords: CG Height, Volleyball Spiking, Landing Condition.

Introduction

The sport of volleyball has continued to increase in participation since its inception over one hundred years ago. Volleyball has become one of the most widely played participant sports in the world with over 200 million players (Aagaard et al., 1997; Briner and Kacmar, 1997). The number of participants rivals the number of soccer participants (250 million) reported by the Federation Internationale de Football Association (Dvorak et al., 2000). Another indication of the worldwide appeal of all forms of volleyball was the inclusion of beach volleyball as an Olympic sport in 1996. Potential reasons for the popularity of volleyball are that the sport requires a minimal amount of equipment and individuals can participate throughout their lives at a variety of skill levels. Successful participation in the sport requires expertise in many physical skills and performance is often dependent on an individual's ability to propel themselves into the air during both offensive and defensive maneuvers. These movements include the jump serve, spike, and block. During the execution of a jump serve or a spike, the player jumps high into the air and strikes the ball at the highest point of their jump in an effort to propel the ball rapidly down towards the opposing side of the net. Defensively, front row players defend against spikes by jumping into the air with their hands raised in an effort to impede the offensive attack. Unlike offensive jumps, defensive jumps are not maximal vertical jump efforts. The landing in volleyball occurs mainly after spiking, blocking, and jump serving, actions necessary for playing at a high level. Nonetheless, landing is often damaging to volleyball players. Briner and Kacmar (1997) found that patellar tendinopathy, known as "jumper's knee", was the most frequent overuse injury in volleyball. There have been many studies on landing with a variety of approaches and focuses. Tillman et al. (2004) used videotape recording to quantify unilateral and bilateral landings during volleyball games.

Objectives of the study

To find out the height of centre of gravity (CG) at different conditions after spiking volleyball.

To compare the whole body centre of gravity (CG) height at two different landing condition after volleyball spiking.

Methodology

Subjects: 10 volleyball player; age ranged 20-26 years. The subjects were taken conveniently and they were the current intervarsity volley ball players who represent Visva-Bharati in the year, 2013. The subjects were right-handed.

Criterion Measures: Three parameters were measured for this study. These were maximal CG height, CG height at horizontal velocity and CG height at vertical velocity. The Videography technique was employed to register the technique of Spike at selected moments. 4 cameras (2 each in sagittal & frontal plane) were used for the purpose of the study. The cameras were placed at a distance of 11 feet at both the planes i.e. Sagittal Plane and Frontal Plane; the height of the camera (lenses) was fixed at a height of 1.07 meter from the ground. For obtaining individual Videography, the subjects were photographed in a controlled condition.

Statistical Technique: To compare the mean differences between normal and long conditions of landing after spiking volleyball on selected parameters, mean, standard deviation (SD), standard error of mean (SEM) and independent t-test was computed by means of SPSS version 17 (Statistical Package for the Social Sciences, version 17.0, SPSS Inc, Chicago, IL, USA).

Findings and Discussion

To find out the mean, standard deviation, standard error of mean and mean difference of different conditions of landing after spiking volleyball on selected parameters descriptive statistics and independent t-test were employed. Findings pertaining to this were presented in table I.

TABLE 1
MEAN DIFFERENCE OF CG AT DIFFERENT CONDITION ON SELECTED PARAMETERS AFTER SPIKING VOLLELYBALL

Parameter	Landing Condition	Mean ± SD	SEM	Mean Difference	Std. Error	t-ratio
Maximal CG Height (m)	Normal	1.82±0.12	0.04	0.058	0.056	1.042
	Long	1.76±0.13	0.04			
CG Horizontal Velocity (m/s)	Normal	1.55±0.22	0.07	0.869	0.079	10.985 *
	Long	2.42±0.13	0.04			
CG Vertical Velocity (m/s)	Normal	3.74±0.19	0.06	0.154	0.109	1.408
	Long	3.89±0.29	0.09			

*Significant at 0.05 level (df = 18)
Legend: SD = Standard Deviation; SEM = Standard Error of mean

Table I shows the mean, standard deviations (SD) and standard error of mean (SEM) of selected parameters namely maximal CG height, CG height at horizontal velocity and CG height at vertical velocity of both normal & long landing conditions after spiking volleyball. The table reveals that maximal CG height at normal and long landing conditions after spiking volleyball had mean 1.82±0.12 & 1.76±0.13 meter; CG height at horizontal velocity had mean 1.55±0.22 & 2.42±0.13 meter and CG height at vertical velocity had mean 3.74±0.19 & 3.89±0.29 meter respectively.

To find out the significance in mean difference of various parameters between two distinct landing conditions after spiking volleyball, independent t-test was employed. Table II shows that the t value of maximal CG height, CG height at horizontal velocity and CG height at vertical velocity of two distinct landing conditions after spiking volleyball were 1.042 (>0.05), 10.985 (<0.05), 1.408 (>0.05) respectively.

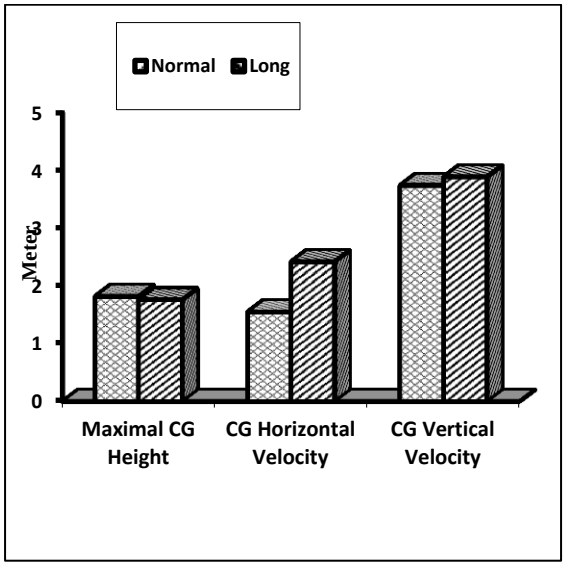

Fig. No. 1: Graphical representation of means of distinct landing conditions after spiking volleyball on selected parameters

The graphical representation of means of two distinct landing conditions after spiking volleyball in relation to selected parameters are depicted in figure 1.

In the matter of whole body centre of gravity parameter it was seen that the maximal gain in the height of centre of gravity was higher in normal jump in comparison to long jump due to higher vertical component.

It was found that in horizontal velocity of centre of gravity at the moment of initial contact with the floor was greater distance in long jump and long landing conditions due to greater application of horizontal component and was found significantly different.

Vertical velocity of centre of gravity at the move of the initial contact with the floor was greater in long jump and landing condition as because of equal applications of vertical and horizontal component following the law of projectile so that the body can reach nearer and higher to the net for spiking the ball above the blocker.

Conclusions

This study concludes that Centre of Gravity (CG) height at horizontal velocity in long landing condition had significantly higher than normal landing condition after spiking volleyball. Centre of Gravity (CG) of body at horizontal and vertical velocities increased in spiking with long jumping spike when compared with normal spiking.

References

Walter Quispe Marquez, Masanao Masumura1 & Michiyoshi Ae (2009). "The Effects of Jumping Distance on the Landing Mechanics after a Volleyball Spike" Sports Biomechanics June; 8(2): 154–166.

Decker, M. J., Torry, M. R., Wyland, D. J., Sterett, W. I., and Steadman, J. R. (2003). Gender differences in lower extremity kinematics, kinetics and energy absorption during landing. Clinical Biomechanics, 18, 662–669.

Devita, P., and Skelly,W. A. (1992). "Effect of landing stiffness on joint kinetics and energetics in the lower extremity." Medicine and Science in Sports and Exercise, 24, 108–115.

Dufek, J. S., and Zhang, S. (1996). Landing models for volleyball players: A longitudinal evaluation. Journal of SportsMedicine and Physical Fitness, 36, 35–42.

Stephens T.M. 2nd, Lawson B.R, DeVoe D.E., Reiser RF 2nd (2007) "Gender and bilateral differences in single-leg countermovement jump performance with comparison to a double-leg jump." J Appl Biomech. Aug;23(3) :190-202.

Hewett T.E, Myer G.D, Ford K.R, Heidt R.S. Jr, Colosimo A.J,McLean S.G, Van Den Bogert A.J, Paterno M.V, Succop (2005) P. "Biomechanical measures of neuromuscular control and valgus loading of the knee predict anterior cruciate ligament injury risk in female athletes: a prospective study"Am J Sports Med. 2005 Apr;33(4):492-501. Epub.

Edwards S, Steele J.R., McGhee D.E. (2010), "Does a drop landing represent a whole skill landing and is this moderated by fatigue?" Scand J Med Sci Sports, Vol. 20 (3):516-23.