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ANALYSIS OF VOLLEYBALL SERVE – A KINEMATIC STUDY

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Abstract: The main aim of this investigation was to analyses the biomechanical parameters of main three phases i.e. Toss the ball phase, Contact the ball phase and Execution phase of the overhead serve in men volley ball in which six (06) intervarsity volleyball players were randomly chosen as subject for the study. Their age group ranged from 20 to 24 years. The subject's movements or motions of the service was recorded by using a Canon Legria S-10 video camera in field setting. The selected variables of the study are Height of toss release, Front Knee angle, Angle of Arc, Base of Support, Front Knee angle, Height of toss, Elbow Angle, Angle of Arc, Height of ball release, Angle of release and Ball Velocity. The objective of the study were accomplished by applying Pearson product movements' correlation statistical technique with level of significant 0.05. In the conclusion, it is identified that the Front knee angle, Height of toss, Angle of arc and Angle of release were significant correlated whereas Height of toss release, Angle of arc, Base of support, Front Knee angle, Elbow angle and Height of ball release were found as nonsignificant. The Height of toss represents the positive correlation with the ball velocity rather than the Front knee angle, Angle of arc and Angle of release which displaced the negative correlation. This study will lead to improvise the overhead serve technics in volleyball.

Keywords: ***Volleyball, Biomechanics, Camera, Overhead serve, Ball velocity.***

Introduction

The now days Volleyball sport become a fast and more complex due to obligation of its playing rules and laws which has made the effective and attractive game. In this sport during match every player have to need to rotate clock wise in their court what creates difficulties to gain score. In volleyball, serve is the first weapon in an individual hands to get score lead and build pressure on opponent team and worse their combination and confidence. To perform effective serve there is need to apply the kinetic chain well arranged motion from lower limb where motion gets origin to generate power followed by trunk pass that power and puts handover in to upper limbs and that power utilize on ball to reach in opponent court over the net. All these movements of different body segments accomplished at a time creates some trouble to human eye to observe and analyze systems of kinetic chain. A good knowledge regarding the sequence of movements function is a great measurement for the advancement and improvement of the game performance in volleyball. The movements of volleyball are a complex combination of strength, power, agility, skill and cleverness. This investigation will help to understand the relationship between the ball velocities with the different body kinematic variables. It's important to know proper biomechanics process of volleyball overhead serve. Scarce papers published yet on concerned topic, so there is need to investigate latest biomechanics of overhead serve. The aim of investigation has to detect the impact of upper and lower extremity's movements on overhead serve. The objectives of this study have to examine the volleyball overhead serve actions used by players in top level competition, and also describe the upper and lower body kinematic variables and impact on the ball velocity.

Methodology

Six (06) intervarsity volleyball players were randomly selected as subject for study. The subjects had no injuries at the time of data collection (video recording). Their ages ranged from 20 to 24 years. The nature and purpose of activity informed prior to data collection to the selected subjects. The body weight in kg, height in cm and age in chronological of each player was recorded. The subject's movements or motions were recorded by using one synchronized Canon Legria S-10 video camera in field setting. The camera was placed on rigid tripod at 12 meter distance from trail zone and height of the camera from the ground level was 1.5 meter. The camera was set at sports mode and the sampling rate of the video

camera was sixty (60) field per second. Shutter speed of camera was fixed at fast speed (Hz 2000). Two analysis the video recording Silicon Coach Pro 8.1 and Statistical Package for the Social Science v21.0 (SPSS) software were used.

Result

Table 01: Description of the subjects

Variables	Number of Subjects	Mean	Std. Deviation
Height (cm)	06	174.41	8.45
Weight (KG)	06	66.25	5.96
Age (year)	06	22.17	1.60

The table no. 01, Shows that the mean height of six participants is 174.41 cm, whereas standard deviation (SD) is ± 8.45, the mean Weight of six participants is 66.25 kg whereas SD is ± 5.96 and the mean Age of six participants is 22.17 years old, whereas SD is ± 1.60.

Table 02: Parameters of overhead serve at toss the ball phase in volleyball

Variables	No. of Trail	Mean	Std. Deviation	Minimum	Maximum
HTR	36	156.18	13.64	136.50	195.90
KAT	36	151.47	28.10	111.00	187.00
AAT	36	158.22	12.01	132.00	177.00
BS	36	75.63	10.05	48.70	95.90

HTR = Height of toss release
KAT = Front Knee angle
AAT = Angle of Arc
BS = Base of Support

The table no: 02. Shows the descriptive statistics of the selected kinematic parameters of the six participants at toss the ball phase. In which the means for HTR for 36 numbers of trail is 156.18, whereas SD is ±13.64, the Minimum value for HTR is 136.50 and maximum is 195.90. The means for KAT for 36 numbers of trail is 151.47, whereas SD is ± 28.10, the minimum value for KAT is 111.00 and maximum is 187.00. The means for AAT for 36 numbers of trail is 158.22, whereas SD is ± 12.01, the minimum value for AAT is 132.00 and maximum177.00. The means for BS for 36 numbers of trail is 75.63, whereas SD is ± 10.05, the minimum value for the BS is 48.70 and maximum is 95.90.

Figure 1: Mean and SD of the selected variables during Toss the ball phase.

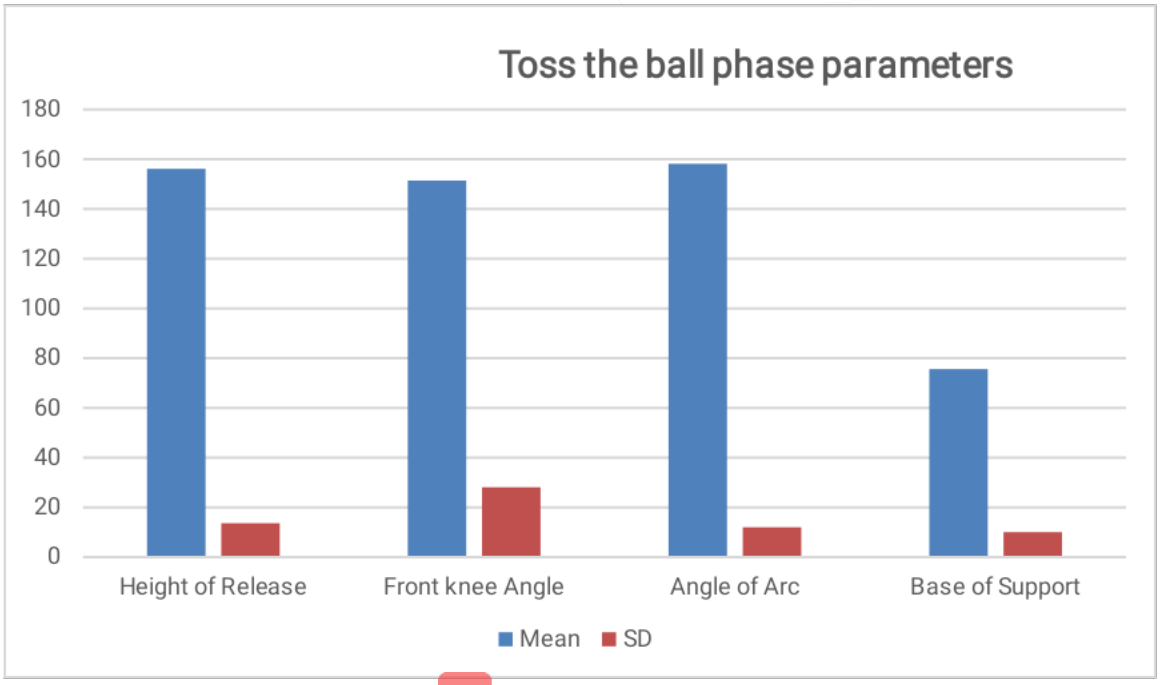

Table 03: Parameters of overhead serve at the contact phase in volleyball.

Variables	No of trails	Mean	Std. Deviation	Minimum	Maximum
KAC	36	170.69	8.04	145.00	185.00
HT	36	208.09	25.96	167.40	246.50
EA	36	144.31	17.23	112.00	171.00
AAC	36	162.11	5.82	151.00	178.00

KAC = Front Knee angle
HT = Height of toss
EA = Elbow angle
AAC = Angle of Arc

The table no: 03. Shows the descriptive statistics of the selected kinematic parameters of the six participants at contact the ball phase. In which the means for KAC for 36 numbers of trail is 170.69, whereas SD is ±18.04, the minimum value for KAC is 145.00 and maximum is 185.00. The means for HT for 36 numbers of trail is 208.09, whereas SD is ± 25.96, the minimum value for HT is 167.40 and maximum is 246.50. The means for EA for 36 numbers of trail is 144.31, whereas SD is ± 17.23, the minimum value for EA is 112.00 and maximum171.00. The means for AAC for 36 numbers of trail is 162.11, whereas SD is ± 5.82, the minimum value for the AAC is 151.00 and maximum is 178.00.

Figure 2: Mean and SD of the selected variables during Contact the ball phase.

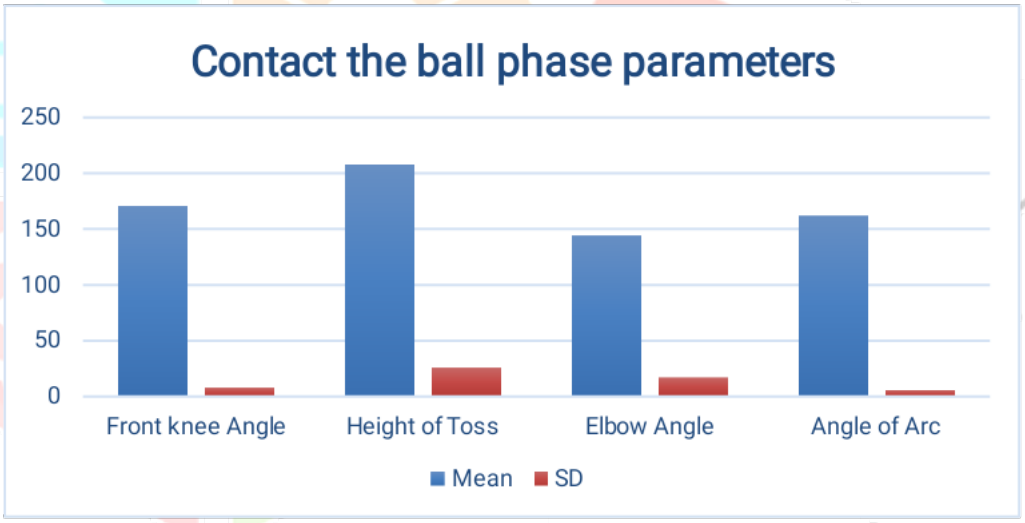

Table 04: Parameters of overhead serve at the execution phase in volleyball

Variables	N	Mean	Std. Deviation	Minimum	Maximum
HBR	36	190.12	18.62	165.20	267.40
AR	36	18.78	6.23	7.00	36.00
BV	36	14.10	2.19	9.21	20.80

HBR = Height of ball release
AR = Angle of release
BV = Ball velocity

The table no: 04. Shows the descriptive statistics of the selected kinematic parameters of the six participants at execution phase. In which the means for HBR for 36 numbers of trail is 190.12, whereas SD is ±18.62, the minimum value for HBR is 165.00 and maximum is 267.40. The means for AR for 36 numbers of trail is 18.78, whereas SD is ± 6.23, the minimum value for AR is 7.00 and maximum is 36.00. The means for BV for 36 numbers of trail is 14.10, whereas SD is ± 2.19, the minimum value for BV is 9.21 and maximum20.80.

Figure 3: Mean and SD of the selected variables during Execution phase.

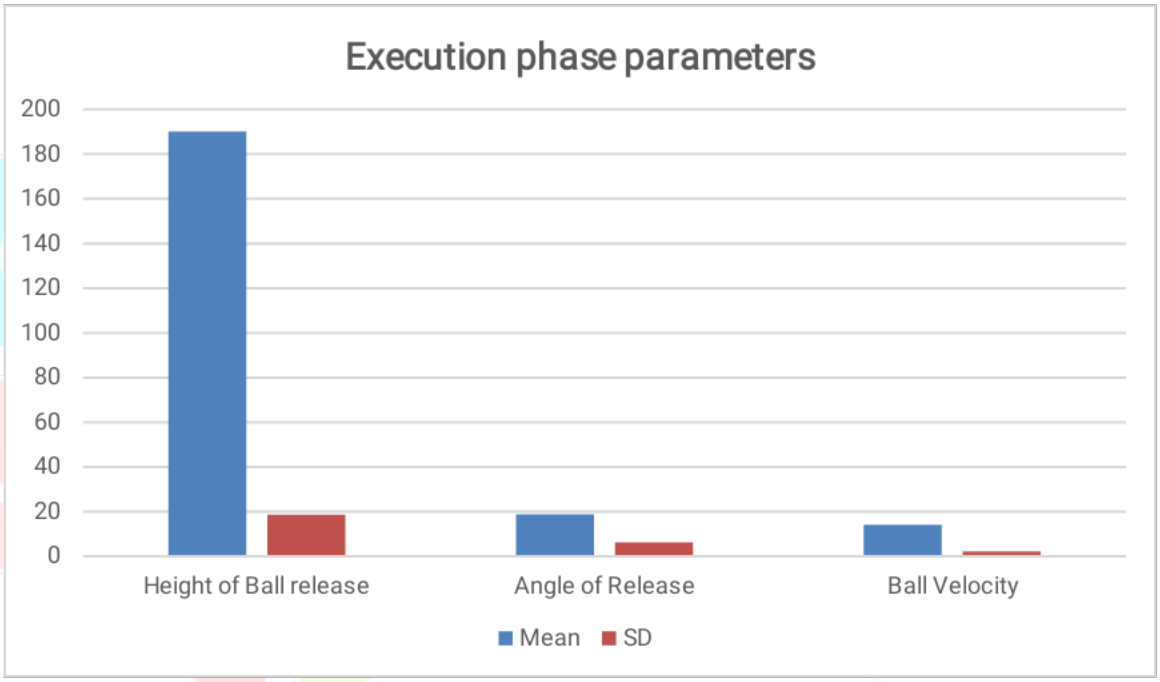

Table 05: Correlation of kinematic parameters with ball velocity

Variables	R
HTR	0.044
KAT	-0.580*
AAT	0.300
BS	-0.001
KAC	-0.146
HT	0.368
EA	0.383
AAC	0.533*
HBR	0.622*

AR	-0.824*

*Significant

Level of Significant 0.05

The table no: 05. Shows the correlation value of the selected kinematic parameters of the six participants with the ball velocity. They are HTR, KAT, AAT, BS, KAC, HT, EA, AAC, HTR & AR. The correlation between HTR and ball velocity is 0.044 which is insignificant effect on ball velocity. The correlation between the KAT and ball velocity is -0.580 which shows a negative meaningful impact on ball velocity. Correlation between AAT and ball velocity is 0.300 it is insignificant effect on ball velocity. The correlation between BS and ball velocity is -0.001 it shows meaningless impact on ball velocity and shows negative correlation. Correlation between KAC and ball velocity is -0.146 which is insignificant effect on ball velocity and it represents the negative correlation. The correlation between HT and ball velocity is 0.368 shows insignificant positive effect on ball velocity. Correlation between EA and ball velocity is 0.383 Considered nonsignificant effect on ball velocity it represents the positive effect. The correlation between AAC and ball velocity is 0.533 which considered as positive meaningful impact on ball velocity. Correlation between HBR and ball velocity is 0.622 significant positive effect on ball velocity. Correlation between AR and ball velocity is -0.824 shows the most negative meaningful impact on ball velocity.

Discussion

This study was aimed to examine selected Biomechanical parameters and has been found that the correlation of HTR is insignificant. Newkirk, 2015 in the art of coaching said that Height of Release should be at appropriate level and avoid bad habits as little dipper, big dipper and Teapot type activities. The correlation of KAT with ball velocity is -0.580 and AAC is 0.533 which are significant and EA, AAT and KAC are nonsignificant Nathial, 2012 Agree with EA, AAT and KAC parameters whereas disagree with KAT and AAC found in his study that Front Knee Angle Elbow angle and Angle of Arc are not significant correlated. The correlation of BS with the ball velocity has detected insignificant as earlier identified by (Khan, et. al. 2019). The correlation of the further selected variables such as AR & HBR with ball velocity has found -0.824 & 0.622 respectively which are significant and HT is not significant. On the basis of theory identified that the greater the Height of Release the greater the distance gained. When serving overhead in volleyball a taller athlete has an advantage over a shorter athlete because they have higher Height of Release, The taller athlete is able to get over the ball and have a lower angle of release in comparison to a shorter athlete. (Johnson & Martin, 2006).

CONCLUSION

The serve is one of the most important fundamental skill in volleyball sport because the game starts. Effective serve enable us to build pressure on opponent and gain score lead. It is concluded that in the volleyball overhead serve the selected kinematic variables like Front Knee Angle, Angle of Arc, Angle of Release and Height of Ball Release are the important parameters which plays a positive influence in gaining a successful clearance of the serve. So there is need to be focus on above said kinematical parameters for the Coaches, Trainers and players in the training and practices to gain the peak performance in the overhead serve during volleyball competitions.

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