

Relationship of Selected Kinematic Variables with Performance of Service and Accuracy of Service in Tennis

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Abstract

The purpose of the present study was to analyze the relationship of selected kinematic variables with performance of service and service accuracy in tennis. A total of 5 male intervarsity level tennis players were selected from tennis match practice group of Lakshmbai National Institute of Physical Education, Gwalior; by using purposive sampling. The age of the subjects was ranged from 17 to 25 and all were regular players with good level of skill. Videography method was used to biomechanically analysis the moment contact, in technique of service. The selected linear kinematic variables were Height of centre of gravity at the moment contact. In Angular kinematic variables such as angles at Ankle joint, Knee joint, Hip joint, Shoulder joint, Elbow joint and Wrist joint were selected for the present study. Kinovea software was used in order to obtain the values of selected angular kinematic variables. Height of Center of Gravity was calculated by Kinovea software. For the purpose of this study Pearson product moment correlation was used. The level of significance was set at 0.05. Result of this study reveals that one angular kinematic variable that was angle at right shoulder shown significant relationship with the performance of service accuracy and service technique in tennis. Whereas none of the angular and linear kinematic variables showed any significant relationship with the performance of service accuracy and service technique in tennis.

KEYWORDS: Kinematics, tennis, service, execution moment contact.

Introduction

Tennis, original name **lawn tennis**, game in which two opposing players (singles) or pairs of players (doubles) use tautly strung rackets to hit a ball of specified size, weight, and bounce over a net on a rectangular court. Points are awarded to a player or team whenever the opponent fails to correctly return the ball within the prescribed dimensions of the court. Tennis originally was known as lawn tennis, and formally still is in Britain, because it was played on grass courts by Victorian gentlemen and ladies. It is now played on a variety of surfaces. While tennis can be enjoyed by players of practically any level of skill, top competition is a demanding test of both shot making and stamina, rich in stylistic and strategic variety. From its origins as a garden-party game for ladies in whalebone corsets and starched petticoats and men in long white flannels, it has evolved into a physical chess match in which players attack and defend, exploiting angles and technical weaknesses with strokes of widely diverse pace and spin. One of the complex skills that people emphasis greatly to learn and master is the service, while serving the ball into the opposition's court takes a great plethora of strength, power and accuracy skills. So in this study we will

analyze the performance of service and also the accuracy of service, and most importantly the biomechanical and kinematical variables affecting the performance of service along with the accuracy of service will be seen in this study.

Purpose of the study

The purpose of the study is to find out to the relationship between selected kinematic variables to performance of service accuracy and service technique in tennis.

Methods

Selection of the subjects

The subjects for the present study were five (N=05) male tennis players of tennis match practice group from LNIPE, Gwalior. All subjects ranged between the chronological age of 17-25 years who participated in the West-Zone Interservice tournament for LNIPE, Gwalior. As the subjects had been undergoing training for a considerable period, therefore, it is assumed that they possess a good level of technique of service. The purpose of the research was explained to all the subjects and subjects were motivated to put their best during each trial.

Selection of variables

The research scholar familiarized subjects with the testing equipments and procedures. Following were the Kinematic variables which were constituted in the study: The selected kinematical variables were divided in two parts i.e.

(a) Linear Kinematic Variables were:

- i. Height of Center of Gravity at moment contact.

(b) Angular Kinematic Variables were represented by the angles at selected joints i.e.

- i. Ankle joints
- ii. Knee joints
- iii. Hip joints
- iv. Shoulder joints
- v. Elbow joints
- vi. Wrist joint

Criterion Measures

1. Tennis service performance as assessed through Hewitt Tennis Test (1966). The validity of the test is 0.625 to 0.93 and reliability of the test is 0.94.
2. Measuring angle in nearest degree at selected joints at execution phase of service.

Tools

Videography method was used to biomechanically analysis the moment contact in Service. Go Pro Hero 5 with the frequency of 120 frames per second was placed on

the sagittal plane. The moment contact was selected for the analysis. On the basis of sequence photography obtained from the videography, the scholar developed stick figures from which selected kinematic variables were calculated. The stick figures were developed by Kinovea software. The subjects performed the technique ten times and the best trail was used for the analysis. The center of gravity and angular kinematics variables of each subject at the moment of contact during the tennis service was measured by Kinovea software.

Statistical Procedure

Statistical analysis was done with the Statistical Package for Social Science (SPSS) version 20.0. The Pearson's product moment correlation was used in order to find out the relationship between the selected Kinematic variables with the performance of service accuracy and service technique in tennis. For testing the hypothesis, the level of significance was set at 0.05.

Results

Mean and standard deviation of linear and angular kinematic variables of the moment contact in table- 1

TABLE -1
Descriptive statistic of Linear and Angular Kinematic Variables at the moment contact

Variables	Mean	Std. Deviation
Angle at Right Ankle	130.40	12.48
Angle at Right Knee	171.20	11.39
Angle at Right Hip	154.80	6.05
Angle at Right Shoulder	174.40	8.82
Angle at Right Elbow	190.00	11.04
Angle at Right Wrist	156.20	14.97
Center of Gravity	100.19	10.26

Table – 1 shown the value of Means and Standard Deviation for the linear and angular kinematic variables at the time of moment Contact phase of tennis service. These values may be used for further analysis in the study.

Relationship of selected Linear and Angular Kinematic Variables at the moment contact Phase in Table - 2

TABLE -2
Relationships of Selected Linear and Angular Kinematic Variables at the moment Contact Phase

Variables	Performance of Subjects	P-Value
Angle at Right Ankle	.541	.346
Angle at Right Knee	-.705	.183
Angle at Right Hip	.121	.847
Angle at Right Shoulder	.921*	.026
Angle at Right Elbow	-.620	.265

Angle at Right Wrist	.287	.640
Center of Gravity	-.697	.191

Table 2 clearly revealed that the angular kinematic variable at the time of contact phase right shoulder showing significant relationship at 0.05 level of significance. As the p- value of the variable is less than 0.05. Whereas none of the other variables at the time of contact phase not show any significant relationship. As the p- value of the all the variables are greater than 0.05.

Discussions of findings

In kinematical analysis of tennis service selected kinematical variables, right shoulder had shown significant relationship with the performance of service accuracy and service technique in tennis, whereas other selected linear and angular kinematic variables showed insignificant relationship to the performance of service accuracy and service technique in tennis. It may be due to the extension of right shoulder which enables the player to hit the ball with the great height and power.

Conclusions

Based on the analysis and within the limitations of the present study, following were the conclusions drawn:

- 1) At the time of contact phase, the right shoulder showed significant relationship with the performance of service accuracy and service technique in tennis.
- 2) None of the other angular kinematic variables at the time of contact phase showed any significant relationship with the performance of service accuracy and service technique in tennis.
- 3) The selected linear kinematic variable showed insignificant relationship with the performance of service accuracy and service technique in tennis.

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