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RELATIONSHIP OF SELECTED KINEMATIC VARIABLES OF SQUARE STANCE IN TENNIS BACKHAND DRIVE WITH THE SPEED OF THE BALL

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ABSTRACT:
The main aim of the study was to check the relationship of selected kinematic variables of square stance in Tennis backhand drive with the speed of the ball after the contact. To achieve this purpose 30 Tennis Players were chosen, their age ranged between 12 to 14 years old from the different academies of Gwalior. Pearson's product moment correlation was applied to determine the relationship between selected kinematic variables of square stance of double-handed backhand drive with the speed of the ball. The analysis of data revealed that a significant relationship existed between the angles at shoulder joints, angle at left elbow joint, angle at right knee joint, COG (center of gravity) at back swing phase, COG at moment of contact phase, COG at follow-through phase, horizontal Speed of the racquet and the Speed of the ball after the contact in square stance. The analysis of the data also revealed that insignificant relationship exist between angle at right elbow joint, at right hip joint , angle at left hip joint, angle at left knee joint with the Speed of the ball.
The speed of the ball depends on the angles at shoulder joint, angle at left elbow joint, angle at right knee joint COG at backswing phase, moment of contact phase, follow through phase and horizontal speed of the racket in square stance of backhand drive.

KEYWORDS: *square stance, Tennis backhand drive, Racket,*

INTRODUCTION:

Tennis is a very different kind of game and mostly tennis players have different style of tennis shots. Every player hits their ground-strokes in different way and they should not aim to play same way. When go through the technique of advance tennis players with slow motion video, various interesting facts about tennis technique can be seen.

The two- handed backhand drive comes under the one of the most difficult shots of tennis. The backhand drive consists of many phases in the shot which make it one of the hardest strokes to learn, but it's necessary to gain mastery over the two-handed backhand drive nowadays in tennis. Earlier tennis was a game of less fitness but nowadays it developed into a power game. In present, having an excellent two- handed backhand drive means being able to play the ball hard with topspin.

For tennis players backhand drive starts on non dominance side of their body, racket moves forward as contact is made with the ball then it move across the body, and it ends on the dominance side of player's body. It is played with one hand or with double hand and it is considered to be difficult to master as compared to the forehand.

While performing square stance, the players leading foot should be placed diagonally to the net. When the player standing at the baseline near the centre mark , the player have to place his leading foot(for right handed player left side of the body and vice versa for left hander player) slightly forward

to play the ball. After contact, return to ready position and be prepared for the next ball. The square is very useful for baseline players. Stance is "square to the line of play", in square stance the players feet should be pointing in the direction you are oncoming ball.

METHODOLOGY

Selection of subjects: - A total of thirty male tennis players were purposely selected from the following academies of the Gwalior.

1. Gwalior Chambal Tennis Association (GCTA)
2. Jiwaji Club
3. Sports Seed Pro IPS College

Selection of variables:- To find out the relationship between speed of the ball and square stance in Two-handed backhand drive following variables were selected:

A. Linear kinematic variables

- COG at backswing phase.
- COG at moment of contact.
- COG at follow-through.
- Speed of the ball after the contact.
- Horizontal speed of the racquet.

B. Angular kinematic variables

- Angle at right and left shoulder joint
- Angle at right and left elbow joint
- Angle at right and left knee joint
- Angle at right and left hip joint

Criterion measures: -The execution of double handed backhand stroke of each selected subject was taken as criterion measure for the present study. The execution of the backhand drive was recorded with the help of high speed camera; this was evaluated by Hewitt Double Handed Backhand Drive Test and speed of the ball was measured by speed gun.

Statistical technique employed in study:- Pearson's product moment correlation was applied to determine the relationship between selected kinematic variables of square stance in Tennis backhand drive with the speed of the ball and level of significance was set at 0.05.

Results

Table 1

Correlation table of selected kinematic variables of square stance and the speed of the ball

.N.	Variables	Speed of the ball	
		r-value	p-value
	Angle at right shoulder joint	.909**	.000
	Angle at left shoulder joint	.890**	.000
	Angle at right elbow joint	.282	.131
	Angle at left elbow joint	.490**	.000

			6	
	Angle at right hip joint	.255	4	.17
	Angle at left hip joint	.101	5	.59
	Angle at right knee joint	.378*	9	.03
	Angle at left knee joint	.320	4	.08
	COG at back swing phase	.638**	0	.00
0	COG at moment of contact phase	.658**	0	.00
1	COG at follow-through phase	.711**	0	.00
2	Horizontal Speed of the racket	.791**	0	.00

Table 1 reveals the statistical significance of the coefficients of relationship between specific kinematic variables of square stance and speed of ball after the contact in tennis two-handed backhand drive.

The coefficient of correlation required to be significant for 28 D.f. at 0.01 level is (0.463) and 0.05 level is (0.361). Table 1 clearly indicates that angle at right shoulder joint (0.909), angle at left shoulder joint (0.890), angle at left elbow joint (0.490), angle at right knee joint (.378), COG (center of gravity) at back swing phase (0.638), COG at moment of contact phase (0.658), COG at follow-through phase (0.711) and horizontal Speed of the racket (0.79) were significantly correlated to the Speed of the ball after the contact as the values obtained were greater than the tabulated value. Whereas, the obtained coefficient of correlation for angle at right elbow joint (0.282), angle at right hip joint (.255), angle at left hip joint (0.101) and angle at left knee joint(.320) were found insignificant as the obtained values were lesser than the required tabulated value.

DISCUSSION

The analysis of data revealed that a significant positive relationship existed between the angle of right & left shoulder joint, angle at left elbow joint and angle at right knee joint, COG (center of gravity) at back swing phase, COG at moment of contact phase, COG at follow-through, horizontal Speed of the racquet and the Speed of the ball after the contact. This significant value of correlation may be substantiated by many factors, such as rotation of the shoulder joints and angle helps to produce more power, if players hit the ball near to the body they cannot hit the shot with proper power. In the double handed backhand drive for right handed players left hand is a main supporting hand, if it is not at proper angle there might be chances of missing the hitting zone. Right knee angle shows the significant relationship because knee loading helps to generate more power with the extension and it also helps in transfer the momentum of the body. Horizontal Speed of racket exhibit significant because ball Speed after the contact depends on, racket Speed with upcoming ball Speed. It works on the basis of Newton's third law motion.

Above findings of the study is also in partial consonant with findings of (Pratap & Pandey, 2017). Conducted study on kinematic analysis of backhand drive in tennis, result showed that the subjects who keep the elbow away from the body hit the ball with good linear Speed and also center of gravity falls within the base for maintain the balance.

The analysis of the data also revealed that insignificant relationship exist between angle at right elbow joint, angle at right hip joint, angle at left hip joint and angle at left knee joint with the Speed of the ball. This insignificant relationship could have been caused due to lack of involvement if these angles and there might be some other regions.

CONCLUSIONS

Based on the analysis and within the limitations of the present study, it was concluded that:-

1. A square stance recruits more of the large muscle groups to initiate the kinetic chain of power, which makes it more efficient, but it also means we have to take an extra step to the ball, so we have to run a little harder to get there in the first place.
2. The speed of the ball depends on the angles at shoulder joint, angle at left elbow joint, angle at right knee joint COG at backswing phase, moment of contact phase, follow through phase and horizontal speed of the racket in square stance of backhand drive.
3. In square stance there was better weight transfer and energy transfer who provide more power behind the shot and less impact on shoulder joint.

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