

## THE EFFECTS OF THE TENNIS SLICE BACKHAND WITH DIFFERENT BALL SPEEDS ON THE BOUNCE ANGLE

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### INTRODUCTION

Nowadays, tennis players are looking to try anything to gain a slight edge over an opponent. Tennis coaches and players are continually searching for ways to improve performance. Past review studies have discussed about the angle at which a ball rebounds from the ground on different types of court surfaces. When a ball bounces on the court, its horizontal speed is usually reduced somewhat by its interaction with the court surface. There are only two characteristics of a court surface that influence what the ball does when it bounces. These are the coefficient of restitution (COR) and the coefficient of friction (COF) between the ball and the surface (Brody, 1987). Brody who derived mathematical relationships between the angles and speeds of a ball before and after the bounce had carried out a theoretical analysis of the bounce process earlier. He distinguished two types of bounce – a low angle high speed bounce (such as the service) when the ball slides along the bounce contact without rolling. At higher angles and lower speeds, such as lobs, volleys etc, the ball rolls during the bounce contact with the surface and the characteristics of the bounce are quite different from the sliding bounce. The purpose of this study was to investigate the effects of the slice backhand with different ball speeds on the bounce angle.

### METHODS

Three male tennis players, who rank in the top five domestically, were used as subjects of this study. The court surface was an indoor hard-court with various acrylic types. A ball projector was positioned on the service line. The projector ejected balls without appreciable spin at muzzle speed of 35 miles/ hrs. The high-speed video camera was positioned on the ground and about 6m at a distance from the center of the target area. Three male tennis players were asked to stand on the baseline and strike slice backhand for measurements on two different ball speeds – a fast ball (above 50 miles/ hrs) and a slow ball (below 45 miles/ hrs). From these 40 sliced backhand strikes (20 fast balls and 20 slow balls) were subsequently analyzed. The speed gun captured the maximum speed of the ball after being struck by the tennis racquet and direct reading ball speed. The ball trajectory was recorded on a high-speed video camera to determine the bounce angle. Each ball was filmed with 60 frames per second (fps). The frames of each selected slice backhand were stored using a PC and re-digitized and analyzed with a Peak Performance System. The press mouse button was pressed for marking the ball trajectory and court surface when the frame was displayed. We then, printed out the ball trajectory chart from PC. The incident angle and the rebound angle were calculated using a protractor. Mean, standard deviation as well as ball speed, incident angle, rebound angle and the angle difference were determined.

Statistically relevant differences were assessed using the dependent T-test.

### RESULTS AND DISCUSSION

There is significant difference between the fast ball and slow ball with backspin in incident angle, rebound angle and the angle difference. Both fast ball and slow ball, rebound angle was larger than incident angle. Furthermore, the results showed that there was a significant negative correlation found between the ball speed and incident angle, the ball speed and rebound angle. ( $p < 0.01$ ). It showed that the slice backhand with a faster ball speed had less incident angle, rebound angle. Groppe (1984) showed that, due to frictional factors and the coefficient of restitution between the ball and tennis court, however, the angle of rebound was almost always greater than the approach angle. Bill Murphy and Chet Murphy (1987) indicate that the fast ball with backspin travels in a low trajectory; the ball will skid and remain low as it bounces. As for the slow ball with backspin, High- speed film analyses demonstrate that a soft, lazy ground stroke hit with backspin will cause the shot to sit up and give the opponent a chance for an easy return (Groppe, 1992). Tennis players cannot obtain the ball speed if players hitting the ball without forward motivation. If players chop at the ball, the ball just has spin without forward power (Tony Trabert, 1996). Therefore, a nice slice backhand not only with the fast ball speed but also it has less incident angle and rebound angle.

### CONCLUSIONS

Elite tennis players take advantage of a short ball with a slice backhand and hit the ball deep and advance to the net behind the shot. When a under spin shot is hit with a high speed, its incident angle to the court will be low causing it to skid and remain low after the bounce. This forces the opponent to hit upward on the ball so it will clear the net, thus allowing ample time to reach a good volleying position. According to these results, tennis coaches should integrate special training for forearm action as standard practice.

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