

THE DIFFERENCES OF KICKED BALL KINEMATICS BETWEEN INSTEP KICK AND INFRONT KICK IN SOCCER

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Introduction

Soccer players kick a ball with various methods depending on the situation. The variety of kicked ball kinematics, such as ball velocity and ball spin characteristics, is due to the kicking motion. The ball spin affects the ball trajectories. However there have been few studies that focused on the ball spin. The purpose of this study was to investigate the differences of kicked ball kinematics between two major kicks, namely instep kicks and infront kicks.

Method

Two male soccer players participated in the present study. Subjects were asked to kick the ball 10 times to a goal located at a distance of 18m with maximal instep kicking and maximal infront kicking. A high speed video camera was used to capture the kicked ball kinematics of just after the ball impact using the procedure of Jinji & Sakurai (2006). The local coordinates system of the ball was defined as a right-hand orthogonal reference frame (Z: vertical upward, Y: horizontal toward the center of goal, X: the cross product of the Y and Z axis)

Result & Discussion

Table 1 shows the results of two types of kicks for each participants. The ball velocities of instep kicks were higher than those of infront kicks, while the spin rate was higher for infront kicks compared to instep kicks. Screw spin component was almost zero in instep kicks, which means the ball spin axis was almost perpendicular to the direction of the ball travel. In infront kicks, a certain level of screw spin component was observed. These results suggest that the resultant force imparted to the ball of the instep kick impact was almost parallel to the direction of the ball travel. While the force was applied obliquely at the infront kick impact with the direction of the ball travel.

Table 1. Kinematic parameters of kicked soccer ball (mean \pm SD)

	Instep Kicks		Infront Kicks	
	Sub. A	Sub. B	Sub. A	Sub. B
Ball Velocity (m/s)	29.3 (0.5)	25.7 (1.1)	25.2 (0.54)	23.7 (1.3)
Spin Rate (rps)	3.2 (0.7)	3.3 (1.0)	7.5 (0.9)	7.2 (1.1)
Spin Axis Component				
X (back/top spin)	0.96 (0.05)	0.88 (0.09)	-0.12 (0.07)	-0.27 (0.17)
Y (screw spin)	0.08 (0.09)	-0.11 (0.08)	-0.38 (0.05)	-0.42 (0.05)
Z (side spin)	-0.13 (0.21)	0.40 (0.20)	0.91 (0.02)	0.85 (0.06)

Conclusion

In this study, the difference of ball spin characteristics between instep kicks and infront kicks was investigated. For the instep kicks the ball spin rate was lower and the spin axis were almost perpendicular to the direction of the ball travel. While, in infront kicks the higher spin rate was applied with a certain level of screw spin component.

References:

1. Jinji, T. & Sakurai, S. (2006). Sports Biomechanics, 5, 197-214.