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## Mechanical analysis of instep kick of preferred and non-preferred leg in relation to distance of the kick

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### Abstract

The instep place kick is one of the most analyzed kicking actions in soccer. Biomechanical techniques are crucial tools for many sport disciplines, but, in sports like soccer, they are particularly useful for improving mechanical effectiveness in executing, defining the characteristics of skills and identifying factors that influence successful performance influence by the skill. Therefore, the aim of this study was to identify the significant difference on kicking distance and selected kinematic parameters during instep kick by soccer players between preferred and non-preferred leg. The subject consisted of ten U-18 soccer players of Shillong Lajong FC (North East, India). One camera was used for the purpose of data collection and the variables selected for the study were kicking distance, angular hip velocity and angular knee velocity. The data were analyzed using paired t-test to identify the significant difference in the selected variables. The results revealed that hip angular velocity and kicking distance has exhibited significant difference between preferred and non-preferred leg.

**Keywords:** kinematics, angular hip velocity, angular knee velocity

### Introduction

Soccer is a team sport played by a team of eleven players against another team of eleven players on a field, with ten outfield players and one designated goalkeeper with no restrictions inside the penalty area in terms of handling the ball. Soccer is played by over 250 million people in more than 200 countries and is one of the world's most popular sports. With the advancement of technology and by the grace of technological innovation, football has constantly evolved over time. The technology started to make its entry into the football world, with video analysis. The introduction of video analysis helps the coaches and players to watch their performance/matches and analyze them later on. Sports Biomechanics has played a crucial role to enhance the performance of a player. It is focused on analyzing the kinetic and kinematic mechanics of human movement. The analysis of how forces interact and its effects these forces have on body. Applying and understanding biomechanics is the foundation for good technique in all sports. In a nutshell, with support from biomechanics, a player can get stronger and faster while reducing injuries.

### Methodology

#### Subject

Ten male U-18 of Shillong Lajong FC players were selected as the subjects for the study. The U-18 Shillong Lajong FC who play their trade in the U-18 youth League were under training for a considerable period of time and possessed a high level of technical abilities.

#### Evaluation criteria

Distances were measured in metre and the angles were measured in degree using an open source 2D video analysis software (Kinovea 0.8.24). To measure the distance of the kick Warner (1950) kicking for Distance Right Foot and Left Foot was used.

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### Filming protocol

The videography technique was employed to capture the technique of instep kick of preferred and non-preferred leg. One Nikon camera namely p510 was used for the study. The camera was placed at a distance of 10 meters from the spot of kick and the height of the camera was fixed at 1.50 meters from the ground.

**Table 1:** Mean and standard deviation of knee angular velocity, hip angular velocity and kicking distance

Variable	Leg	Mean	Std. Deviation	N
Knee Angular Velocity	Preferred leg	126.58	1.51	10
	Non-preferred leg	125.03	1.53	
Hip Angular Velocity	Preferred leg	154.64	3.03	10
	Non-preferred leg	152.65	3.64	
Kicking distance	Preferred leg	45.73	7.97	10
	Non-preferred leg	39.98	7.97	

**Table 2:** The paired difference of preferred and non-preferred Hip Angular velocity

Variables	Mean $\pm$ SD (Paired difference)	t-value	Df	p-value
Knee Angular velocity	-1.55 $\pm$ 2.48	-1.98	9	0.08
Hip Angular velocity	-1.98 $\pm$ 2.58	-2.43	9	0.04
Kicking Distance	-5.75 $\pm$ 6.53	-2.78	9	0.02



**Fig 1:** The paired difference of preferred and non-preferred Kicking distance

### Result

Paired t-test was used to find out the significant difference between preferred and non-preferred leg kick in Knee Angular Velocity, Hip Angular Velocity and Kicking Distance. Mean and Standard Deviation of Knee Angular velocity of preferred and Non preferred Leg is  $126.58 \pm 1.51, 125.03 \pm 1.53$  (Table 1), Hip Angular velocity of preferred and Non preferred leg is  $154.64 \pm 3.03$  and  $152.65 \pm 3.64$  (Table 1) and Kicking Distance of preferred and Non preferred leg is  $45.73 \pm 7.97, 39.98 \pm 7.97$ .

The paired difference of preferred and non-preferred Knee Angular velocity is  $-1.55 \pm 2.48$ , t-value  $-1.98$  and p-value  $0.08$  (Table 2).

The paired difference of preferred and non-preferred Hip Angular velocity is  $-1.98 \pm 2.58$ , t-value  $-2.43$  and p-value  $0.04$  (Table 2).

The paired difference of preferred and non-preferred Kicking distance is  $-5.75 \pm 6.53$ , t-value  $-2.78$  and p-value  $0.02$  (Table 2).

### Discussion

The aim of this study was to find the difference in linear kinematic variables during kicks (preferred *versus* non-preferred) aimed at maximum distance. The results of the analysis suggests that the selected kinematics of hip angular velocity has a significant difference between preferred and non-preferred leg when performing distance kicks in soccer and kicking distance between preferred and non-preferred leg. But as per the authors own understanding, this trend does not mean that other kinematics does not play any important role while kicking for distance. A significant result may also be obtained by increasing the sample size or by using sophisticated equipment for videography.

### Conclusion

The conclusion is based on the significant difference observed between kinematic parameters and the kicking distance of the ball. Therefore, for a young soccer player to successfully adopt this kicking distance he/she must pay equal attention and training of both the preferred and non-preferred leg. Future research should include players in all soccer categories and to strengthen the significance of the research.

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