



## THIGH MUSCLES ACTIVATION DURING SOCCER INSTEP KICK

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### Abstract:

The aim of the study was to compare Quadriceps group of muscles and Hamstring group of muscles during soccer Instep kick. **Methodology:** The investigator had selected Eight male soccer players of inter University/national level were selected as subjects for the study. Hence, purposive sampling was considered for selection of subjects. The age of subjects ranged from 18-25 years. All the subjects were selected from Banaras District. These players had represented inter University/national level and had no lower extremity injuries or any bone joint disparities in the past years. By reviewing the literature and in consultation with the expert, the research scholar carried out an intensive study and selected major muscles such as Rectus femories, Vastus lateralis and Vastus medialis from quadriceps group and Biceps femoris, Semimembranous and Semitendinous from hamstring group of muscles. The criterion measure adopted for this study was measured by Neuro track Myoplus 2/4 channel. After a brief warm-up, and electrode placement, participants performed the instep kick. Descriptive statistics and One way Analysis of Variance (ANOVA) was used to analyze the data. **Results:** Results of this study have shown that, mean value of Vastus Lateralis muscles have the highest activation with Mean (196.8) and insignificant difference found among the selected muscles i.e. Vastus Lateralis, Rectus femoris, Semimembranous, Biceps femoris, Vastus Medialis and Semitendinous during instep kick from penalty spot in soccer. Where calculated F (0.706) is less than Tabulated F (2.44). **Conclusion:** On the basis of result and finding it may be concluded that while Instep kicking in football Vastus Lateralis shows the highest activation. Comparison between all selected muscles contraction in lower limb of thigh muscles were found insignificant during the instep kick in soccer, this insignificant was found because the functioning of all the selected muscles are working together in reciprocal way.

**Keywords:** EMG, quadriceps group, hamstring group and soccer

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## 1. Introduction

Today in the current competitive sports every sportsman and woman is in race to excel others and competition has become a fundamental mode of human expression. Competitive sports are one of the very important means by which national and international recognition and prestige are gained. (Harold M. Barroe & Rose Many Mc Ghee, 1979)

The game of soccer is one of the most accepted team sports worldwide. Soccer kick is the main offensive action during the game and the team with more kicks on target has better chances to score and win a game. For this reason, improvement of soccer instep kick technique is one of the most important aims of training programs in young players (Weineck, 1997). The single most important kicking skill in soccer is the instep drive, also known as the instep kick. The instep drive uses the quadriceps muscles of the thigh to supply the most powerful kick available in the game, forcing the top of the foot (instep) to propel (drive) the soccer ball forward. Further, mastery of the instep drive forms the basis for any number of other kicks, including execution, goal kicks, corner kicks, chips, long passes, clearances, volleys, half-volleys and more. Accordingly, the basic concepts of the instep drive must be well understood by coaches and taught properly to beginning players.

The quadriceps femoris also called simply the quadriceps, quadriceps extensor, or quads, is a large muscle group that includes the four prevailing muscles on the front of the thigh. It is the great extensor muscle of the knee, forming a large fleshy mass which covers the front and sides of the femur. The hamstring tendons make up the borders of the space behind the knee; the muscles are involved in knee flexion and hip extension. In [quadrupeds](#), the hamstring is the single large tendon found behind the knee or comparable area. Therefore, the aim of the study was to compare Quadriceps group of muscles and Hamstring group of muscles during soccer Instep kick.

## 2. Methodology

### 2.1 Subjects

For the purpose of this study Eight male football player were selected. All the subjects selected were represented inter University/national level football tournament. The age of subjects ranged from 18-25 years. All the subjects were selected from Banaras District. EMG analysis of the subjects was evaluated for Rectus femories, Vastus lateralis and Vastus medialis from quadriceps group and Biceps femoris, Semimembranous and Semitendinous from hamstring group of muscles during Instep kick in Soccer.

### 2.2 Tools

For the reason of testing EMG Analysis in this study Neuro track Myoplus 2/4 channel instrument was used. The data was recorded in micro volt ( $\mu\text{v}$ ).

### 2.3 Procedure

The data for the selected muscles were obtained with the help of the instrument Neuro track Myoplus 2/4, operated by the investigator during the execution of instep kick. Before the actual testing, the subjects were given a complete demonstration of instep kick. After the demonstration and explanation, electrode points was marked in the presence of specialized persons and physiotherapist, and then subjects were allowed to take practice trials in order to get familiar with the test. The data was collected only for right leg instep kick from penalty spot at football ground (Amphitheater) of Banaras Hindu University, Varanasi. After making all entries of the subject pertaining to his profile on the software, the subject were performed the instep kick and their readings was recorded in microvolt ( $\mu\text{V}$ ).

### 3. Analysis of data and results of the study

The obtained data thus collected were statistically analyzed by employing descriptive statistics. Further, Analysis of Variance (ANOVA) technique was used to determine significant difference among the selected muscles i.e. Rectus femories, Vastus lateralis, Vastus medialis, Biceps femoris, Semi membranous and Semitendinous during instep kick from penalty spot in soccer. The level of significance was set at 0.05 levels.

The results are depicted with the help of table:

**Table 1:** Descriptive Statistics of the Muscular Contraction of Selected Muscles

Muscles	Mean	Std. Deviation	Std. Error	Minimum	Maximum
Semimembranous (SM)	189.3125	57.77020	20.42485	107.90	264.50
Semitendinous (ST)	163.2375	47.03880	16.63073	98.60	217.60
Biceps Femoris (BF)	189.0000	39.68055	14.02919	128.90	248.70
Vastus Medialis (VM)	176.2375	27.32534	9.66097	125.90	217.40
Vastus Lateralis (VL)	196.8000	37.87212	13.38981	154.90	248.30
Rectus Femoris (RF)	192.0500	34.57381	12.22369	134.60	230.60
<b>Total</b>	<b>184.4396</b>	<b>41.17495</b>	<b>5.94309</b>	<b>98.60</b>	<b>264.50</b>

The table 1 reveals that the muscular contraction of selected muscles during instep kick in soccer from the penalty spot, the mean and standard deviation of all six muscles were following; Vastus Lateralis muscles have the highest activation with Mean and SD (196.8000) and (37.87212) followed by Rectus femoris muscles have Mean and SD (192.0500) and (34.57381) Semi membranous muscles have (189.3125) and (57.77020) Biceps femoris muscles have (189.0000) and (39.68055) Vastus Medialis muscles have (176.2375) and (27.32534) Semitendinous muscles have the lowest activation with Mean and SD (163.2375) and (47.03880) respectively.

**Table 2:** Analysis Of Variance of Muscular Contraction of Selected Muscles during Execution of the Instep Kick

Source of Variance	Sum of Squares	Degree of Freedom	Mean Square	F-value	P-value
Between Groups	6176.349	5	1235.270	0.706	0.622
Within Groups	73506.366	42	1750.152		

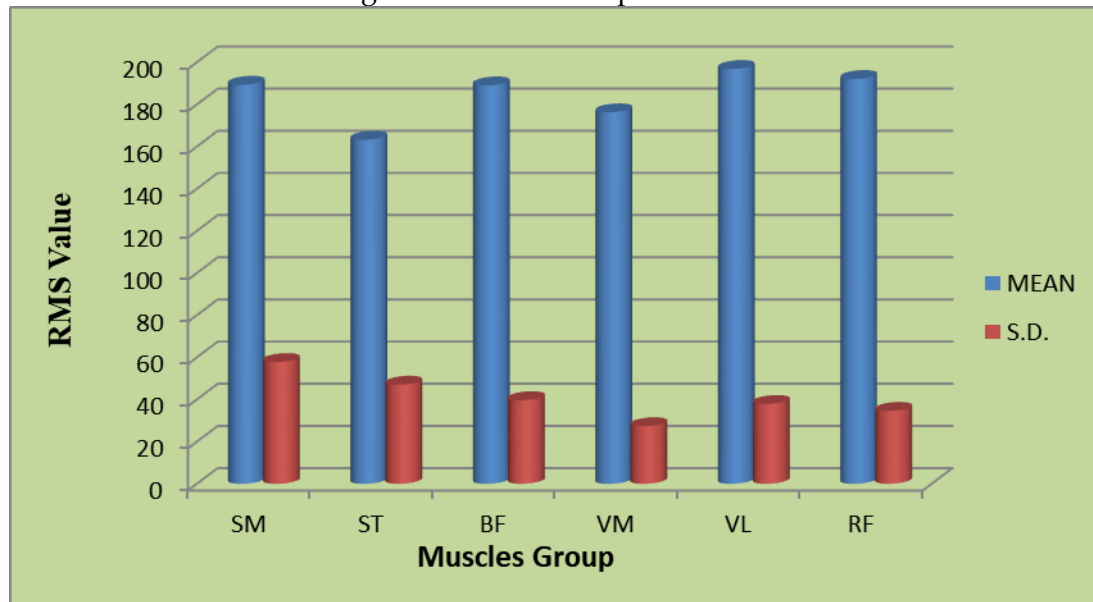
\*Significant at 0.05 level.

Tab  $F_{.05} = 2.44$

Here Calculated F- value < Tabulated F- Value 0.05

The table 2 reveals that there is insignificant difference found among the selected muscles i.e. Vastus Lateralis, Rectus femoris, Semimembranosus, Biceps femoris, Vastus Medialis and Semitendinosus during instep kick from penalty spot in soccer. Where calculated F (0.706) is less than Tabulated F (2.44).

**Graph 1:** Graphical Representation of Electromyographical Activity of Muscles during Execution of Instep Kick in Soccer



Root mean square value of Vastus Lateralis muscles shows the highest activation during instep kick in soccer.

#### 4. Discussion of findings

The finding of the study clearly indicate that activity of various muscles during execution of instep kick in soccer like Vastus Lateralis muscles showed the highest activation level of EMG during execution of instep kick in all selected muscles groups. This higher muscular activity is occurred due to the forcefully right leg movement, when executing the instep kick. The major action of Vastus Lateralis is extension and stabilize knee, the vastus lateralis also called the "vastus externus" is the largest and most powerful part of the quadriceps femoris, a muscle in the thigh. It arises from a

series of flat, broad tendons attached to the femur, and attaches to the outer border of the patella.

Rectus femoris muscles showed the 2<sup>nd</sup> highest activation level of EMG during execution of instep kick in all selected muscles groups. Its functions are to flex the thigh at the hip joint and to extend the leg at the knee joint. The rectus femoris, sartorius, and iliopsoas are the flexors of the thigh at the hip. The rectus femoris is a weaker hip flexor when the knee is extended because it is already shortened and thus suffers from active insufficiency. Similarly, the rectus femoris is not dominant in knee extension when the hip is flexed since it is already shortened and thus suffers from active insufficiency. In essence: the action of extending the knee from a seated position is primarily driven by the vastus lateralis, vastus medialis, and vastus intermedius, and less by the rectus femoris. Because of this rectus femoris muscles showed 2<sup>nd</sup> highest activation level of EMG during execution of instep kick in soccer.

Semimembranous muscles showed the 3<sup>rd</sup> highest activation level of EMG during execution of instep kick in all selected muscles groups. Semimembranosus helps to extend (straighten) the hip joint and flex (bend) the knee joint. It also helps to medially rotate the knee: the tibia medially rotates on the femur when the knee is flexed. It medially rotates the femur when the hip is extended. The muscle can also aid in counteracting the forward bending at the hip joint. Because of this Semi membranous muscles showed 3<sup>rd</sup> highest activation level of EMG during execution of instep kick in soccer.

Biceps femoris muscles showed the 4<sup>th</sup> highest activation level of EMG during execution of instep kick in all selected muscles groups. The long head of the biceps femoris is a weaker knee flexor when the hip is extended (because of active insufficiency). For the same reason the long head is a weaker hip extender when the knee is flexed. Because of this Biceps femoris muscles showed 4<sup>th</sup> highest activation level of EMG during execution of instep kick in soccer.

Vastus Medialis muscles showed the 5<sup>th</sup> highest activation level of EMG during execution of instep kick in all selected muscles groups. It is involved in knee extension, vastus medialis also contributes to correct tracking of the patella. The vastus medialis muscle is a common center of weakness because it will not become fully strengthened unless the leg is regularly extended fully. The vastus medialis can be strengthened by performing exercises such as knee extensions, leg presses, and squats. The muscle is more fully activated when the knee is at a greater angle, especially when the leg is completely extended. Because of maintaining patella position and common center of weakness due to which it will not become fully strengthened unless the leg is regularly extended fully Vastus Medialis muscles showed the 5<sup>th</sup> highest activation level of EMG during execution of instep kick in all selected muscles groups.

Semitendinous muscles function showed lowest activation level of EMG during execution of instep kick in all selected muscles groups. Muscle helps to medially rotate the tibia on the femur when the knee is flexed and medially rotate the femur when the hip is extended. It counteracts forward bending at the hips as well. Because of forward

bending at the hip and flexion of the knee during execution and acceleration phase of instep kick semitendinous muscles showed lowest activation of EMG.

The finding of the study also clearly indicated that the comparison between all selected muscles contraction in lower limb of thigh muscles were found insignificant during the instep kick in soccer, this insignificant was found because the functioning of all the selected muscles are working together in reciprocal way. When hamstring muscles are shortening contraction (Concentric) the same time in quadriceps muscles lengthening contraction (Eccentric) takes place. The instep drive uses the quadriceps muscles of the thigh to provide the most powerful kick available in the game, forcing the top of the foot (instep) to propel (drive) the soccer ball forward. Power is derived for the kick from the flexion and then the rapid extension of the upper leg at the hip and the lower leg at the knee. The quadriceps femoris also called simply the quadriceps, quadriceps extensor, or quads, is a large muscle group that includes the four prevailing muscles on the front of the thigh. It is the great extensor muscle of the knee, forming a large fleshy mass which covers the front and sides of the femur.

A result of one way Analysis of Variance (ANOVA) in relation to all the six muscles shows insignificance difference.

## 5. Conclusion

According to finding the study, during the execution or acceleration phase, Vastus Lateralis muscles showed the greatest contribution. It helps to generate peak lower limb internal rotation and knee extension during kicking the ball. Insignificant difference was found among the selected muscles group in relation to the muscular contraction during execution of instep kick from penalty spot.

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