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Electromyographical Analysis of Hamstring Muscles during Kicking in Football

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ABSTRACT

Objective: The aim of the study was to investigate the electrical activity of Hamstring Muscles Groups during kicking in Football. **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 Semimembranous, Semitendinous and Biceps femoris. 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. **Statistics:** Descriptive statistics was used to analyze the data. **Results:** Results of this study have shown that, mean value of Semimembranous muscles has the highest activation with Mean (189.3125) followed by Biceps femoris muscles have (189.0000) and Semitendinous muscles have the lowest activation with Mean (163.2375) respectively. **Conclusion:** On the basis of result and finding it may be concluded that while Instep kicking in football Semimembranous muscles and Biceps femoris muscles was highly activates than the Semitendinous muscles and plays an important role while performing instep kick.

Keywords: EMG, Semimembranous, Semitendinous, Biceps femoris and Football.

INTRODUCTION

The first documented experiments dealing with EMG started with Francesco Redi's works in 1666. Redi discovered a highly specialized muscle of the electric ray fish (Electric Eel) generated electricity. By 1773, Walsh had been able to demonstrate that the eel fish's muscle tissue could generate a spark of electricity. In 1792, a publication entitled De Viribus Electricitatis in Motu Musculari Commentarius appeared, written by Luigi Galvani, in which the author demonstrated that electricity could initiate muscle contraction. Six decades later, in 1849, Emil du Bois-Reymond discovered that it was also possible to record electrical activity during a voluntary muscle contraction. The first actual recording of this activity was made by Marey in 1890, who also introduced the term electromyography. In 1922, Gasser and Erlanger used an oscilloscope to show the electrical signals from muscles. Because of the stochastic nature of the myoelectric signal, only rough information could be obtained from its observation. The capability of detecting electromyographic signals improved steadily from the 1930s through the 1950s, and researchers began to use improved electrodes more widely for the study of muscles. Clinical use of surface EMG (EMG) for the treatment of more specific disorders began in the 1960s. Hardyck and his researchers were the first (1966) practitioners to

use EMG. In the early 1980s, Cram and Steger introduced a clinical method for scanning a variety of muscles using an EMG sensing device. (Cram, JR.; Steger, JC. Jun 1983).

Electromyography is the only method of objectively assessing when a muscles is active. It has been used to establish the roles that muscles fulfil both individually and in group actions. The EMG provides information on the timing, or sequencing, of the activity of various muscles in sports movements. By studying the sequencing of muscle activation, the sports bio mechanist can focus on several factors that relate to the skill, such as any overlap of agonist and antagonist activity and the onset of antagonist activity at the end of a movement. It also allows the sports bio mechanist to study changes in muscular activity during skill acquisition and as a result of training. Electromyography can also be used to validate assumptions about muscle activity that are made when calculating the internal forces in the human musculoskeletal system. It should, however, be noted that the EMG cannot necessarily reveal what a muscle is doing, particularly in fast multi-segment movements that predominate in sport. (Roger Bartlett 2007)

The three muscles of the posterior thigh (semitendinosus, semimembranosus, biceps femoris long & short head) flex (bend) the knee, while all but the short head of biceps femoris extend (straighten) the hip. The three 'true' hamstrings cross both the hip and the knee joint and are therefore involved in knee flexion and hip extension. Therefore, the aim of this study was to investigate EMG muscle activity of Hamstring Muscles during Instep kick in Football.

METHODOLOGY

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 their Semimembranous, Semitendinous and Biceps femoris muscles during Instep kick in Football.

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 (μv).

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 towards a football goalpost. Before the actual testing, the subjects were given a complete demonstration of instep kick towards a football goalpost. 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 towards a football goalpost and their readings was recorded in microvolt (μv).

Analysis of data and Results of the study: The obtained data thus collected were statistically analyzed by employing descriptive statistics. The results are depicted with the help of table: 1

TABLE- 1

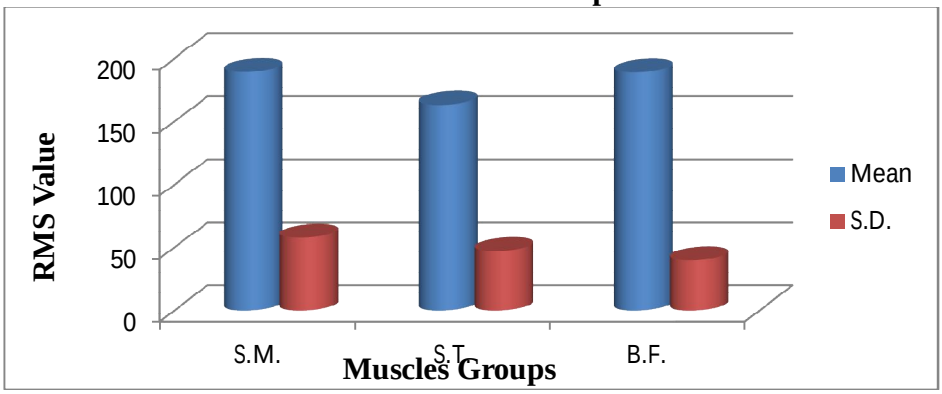
Descriptive Statistics of Hamstring Muscles during Instep kick towards Football Goalpost

S. No.	Semimembranous	Semitendinous	Biceps femoris
N	8	8	8
Mean	189.3125	163.2375	189.0000

Std. Error of Mean	20.42485	16.63073	14.02919
Std. Deviation	57.77020	47.03880	39.68055
Skewness	-.232	-.263	-.049
Std. Error of Skewness	.752	.752	.752
Kurtosis	-1.438	-1.716	-.876
Std. Error of Kurtosis	1.481	1.481	1.481
Range	156.60	119.00	119.80
Minimum	107.90	98.60	128.90
Maximum	264.50	217.60	248.70

It was thus, evident from the table- 1 that, muscular contraction of selected muscles during instep kick in soccer from the penalty spot, the mean and standard deviation of all three muscles were following; Semimembranous muscles have the highest activation with Mean and SD (189.3125) and (57.77020) followed by Biceps femoris muscles have (189.0000) and (39.68055) and Semitendinous muscles have the lowest activation with Mean and SD (163.2375) and (47.03880) respectively.

FIGURE-1
Graphical Representation of Mean Score of Hamstring Muscles during Instep kicks towards Football Goalpost



Discussion of Findings

Semimembranous muscles showed the highest activation level of EMG during execution of instep kick in all selected muscles groups. semimembranosus, so called from its membranous tendon of origin, is situated at the back and medial side of the thigh. Its origin is the superolateral aspect of the ischial tuberosity and it inserts on the medial condyle and nearby margin of tibia; intercondylar fossa of femur and lateral condyle of femur; and the ligament of the popliteal region (at the back of the knee). It arises by a thick tendon from the upper and outer impression on the ischial tuberosity, above and medial to the biceps femoris and semitendinosus. 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 Semimembranous muscles showed 3rd highest activation level of EMG during execution of instep kick in soccer.

Biceps femoris muscles showed the 2nd highest activation level of EMG during execution of instep kick in all selected muscles groups. Biceps femoris has two heads of origin one, the

long head, arises from the lower and inner impression on the back part of the tuberosity of the ischium, by a tendon common to it and the semitendinosus, and from the lower part of the sacrotuberous ligament the other, the *short head*, arises from the lateral lip of the linea aspera, between the adductor magnus and vastus lateralis, extending up almost as high as the insertion of the gluteus maximus. 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 2nd highest activation level of EMG during execution of instep kick in soccer.

Semitendinous muscles function showed lowest activation level of EMG during execution of instep kick in all selected muscles groups. The semitendinosus muscle is one of three hamstring muscles that are located at the back of the thigh. The semitendinosus muscle lies between the other two. These three muscles work collectively to flex the knee and extend the hip. The muscle also 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.

Conclusion

On the basis of result and finding it may be concluded that while Instep kicking in football Semimembranous muscles and Biceps femoris muscles was highly activates than the Semitendinous muscles and plays an important role while performing instep kick.

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