CHAPTER-V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS
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The origin of football is vague. Games revolving around the kicking of a ball have been played in many countries throughout history. According to Federation de International Football Association (FIFA) the “very earlier from the game for which there is scientific evidence was an exercise of precisely this skillful technique dating back to the 2\textsuperscript{nd} and 3\textsuperscript{rd} centuries BC in China (the game of Cuju)”. In addition, the Roman game Harpastum may be a distant ancestor of football. Many other variants of the game was played in different part of medieval Europe though rules varied greatly both by period and location.

In India the game is also very popular, played and followed across length and breadth of the country. The Britishers introduced this game during the colonial period and it soon caught the fancy of the native masses and Bengal become its strong foothold Durand Cup, the third oldest football tournament in the world was started in 1898 in Shimla by the foreign secretary, Sir Mortimer Durand. Soon the number of tournaments and the spread of game both increased leading to the formation of All India Football Federation (A.I.F.A.) in 1937.
The performances of soccer players for the developed nations of the world have advanced their research in motor action for the game of soccer. The player tries to exhibit different levels of speed and trajectories of the ball, all with high levels of precision in execution of their skills. The only way to reach these chosen objectives is by controlling the mechanical variables, the dynamics and motor coordination of various joints and body segments especially of lower limbs. Approaching and analysing soccer phenomena in an objective manner pose no mean challenge to both professionals in soccer business and to sports science researchers.

Many studies (Asami et al., 1968; Barfield et al.; 2002, Isokawa and Lees 1988; Kellis and Katis, 2007; Nunome and Ikegami 2006.) have been done to understand fundamental soccer skills, and some have especially focused on kicking. The instep kick is the most powerful kick in the sports of soccer. Instep kicking is one of the most fundamental and frequently used skills. Players often use instep kick more effective for maximum force and distance i.e. a long pass or a shot at goal. The soccer instep kick and inside instep kick has received very little attention in the scientific literature till date, although it is the most frequently used during the game. Almost 60 percent of techniques used in a soccer game were instep kicks.

In India, no researches have been undertaken till date in sports biomechanics. In the computer era, the motion analysis software and
programming made biomechanical research especially in kinematics, possible to read the sports motion. Hence, I have taken up this study to find out the resultant velocity of the ball in relation to kinematics variables of different level players.

Purpose of the present study was to describe the kinematics of instep and inside instep soccer kick, determine those kinematical variables that closely related to resultant ball velocity, gain a better understanding of mechanics of the instep and inside instep kick in soccer, identify the kinematic aspects of instep and inside instep soccer kick and to understand its different mechanics and the effects of soccer kick at different joint of different level players.

In order to achieve these purposes, ninety-nine skilled soccer players were randomly selected for the study from different levels (i.e. high, medium and low). All the selected players had readily agreed and volunteered to act as subject for the study.

The researcher collect data of national and inter-university level players designated as high level players; state competition and inter-college tournament players for medium level players; and representing play in district competition as low level players. In order to maintain homogeneity only right-footed kickers were selected for the study. The selection of subjects of each level was done by random method, the selected subjects were initiated through concerned coaches, and later
direct contacts were made. The coaches provided names of the potential players who were free of any type of injury in the lower extremities.

The subject's anthropometric measurements, the body weight of each subject were measured in kilogram using a simple weighing machine. Height was measured by a vertical ruler and segmental length as lower leg length, thigh length, foot length, were measured with the help of measuring tape in centimeters.

The subject's kicking motion were recorded using VLC Hard Disk video cameras in a field setting. The cameras were set-up on a rigid tripod and secured to the floor in the location. In order to obtain maximum accuracy in the reconstruction of the two-dimensional coordinates, the location of the cameras were chosen in such a way that the optical axes of the cameras intersected perpendicularly on both planes namely sagittal plane and frontal plane.

One camera was positioned perpendicular to the sagittal plane and parallel to the mediolateral axis (camera optical axes perpendicular on the sagittal plane) as their kicking leg giving approximately a 90° between their respective optical axes.

Other camera was positioned five meter behind five meter behind the stationary ball position with the camera's optical axis perpendicular to the frontal plane for measuring the leg motion of players during instep and inside instep soccer kick.
The cameras were elevated 95 cms. from the ground and tilted in order to get the image of the subject as large as possible while all points of interest remained totally within movement. The camera was operated by the researcher assistant. Once the signal was given, the subject began to execute the whole range of kicking motion.

The vediographic data were collected from time to time according to the competition schedules. The data of high-level players were collected during the inter-university competition at Pantnagar. The data of medium level players were collected during the open state competition at Bijnor stadium and the low-level players data were collected from district level competition held at Aligarh stadium. After the video recording sessions were over, the video recording was loaded into the researcher’s personal computer (PC) for trail identification. The identified trail were played with the help of Hero Video of Hero Super Player 3000 software to make separate clips of each player for separat kicking skills. The separate clips were then opened on to the Motion Analysis Tool (MAT) software. This software provides to identify the angles, displacement, time and number of frames.

For identification of the subject in the video graph, each subject was given a code/number as to distinguish them in the data recorded. For identification purposes of a best kick, the trails were viewed on the computer system with expert on the subject (football) to demarcated the
trail for the data acquisition. The best trail kicks were spotted and edited for analysis.

To identify the frame of soccer kick movements for analysis has been divided into three components namely initial, contact and follow through phase. The start of the kick is defined as swing of the kicking leg until the point of hip hyperextension and maximum knee flexion. In addition, the finish of the initial phase is defined as the instant immediately before the foot makes contact with the ball. The contact phase defines as the ball contact with the kicking foot or the point of the maximum knee extension until the contact with ball. The follow through phase is explained as the point just after the ball contact until the kicking leg reach up to its maximum height or maximum hip flexion.

To data analyse, Motion Analysis Tools, CoralDRAW, HeroVideo of Hero Super Player, Windows Picture and Fax Viewer and SPSS softwares were used. Coral draw was used to measure angles between different phases of different body segments with the help of freehand tools of the software. Windows Picture and Fax Viewer used for selection of initial, contact and final position frame of the subject. Hero video of hero super player was used for constructing the best-performed kick’s clips (Instep and Inside Instep) and their frames. SPSS Software used for to calculate Analysis of Variance (ANOVA) with Least Significant Difference (LSD) post hoc test to determine the means.
significant difference between different level players during soccer kicks.

**Instep kick**

**Ball velocity**

The result of the study indicated for ball velocity of different level players showed significant mean difference during instep soccer kick. However, high and medium and high and low level players showed significant mean difference in their ball velocity, whereas a medium and low level player does not differ significantly of ball velocity during instep soccer kick.

**Joint Angle**

The result of the study indicated for joint angles of instep kick at initial phase for different level male soccer players that ankle and knee joint angles showed significant difference. However, hip joint angle showed insignificant mean differences among different levels of player. Further the LSD post hoc revealed that at ankle joint angle- high and medium; high and low level players showed significant mean difference, whereas medium and low level players showed insignificant mean difference. For the knee joint angle- high and low level players showed significant mean difference, whereas high and medium; medium and low level players showed insignificant mean difference.
The result of the study indicated for joint angles of instep kick at contact phase for different level male soccer players that ankle and knee joint angles showed significant difference. However, hip joint angle showed insignificant mean differences among different levels of player. Further the LSD post hoc revealed that at ankle joint angle- high and medium level players showed significant mean difference, whereas high and low; medium and low level players showed insignificant mean difference. For the knee joint angle- high and medium; high and low level players showed significant mean difference, whereas medium and low level players showed insignificant mean difference.

The result of the study indicated for joint angles of instep kick at follow through phase for different level male soccer players that ankle and hip joint angles showed significant difference. However, knee joint angle showed insignificant mean differences among different levels of player. Further the LSD post hoc revealed that at ankle joint angle- high and medium; and high and low level players showed significant mean difference, whereas medium and low level players showed insignificant mean difference. For the hip joint angle- high and medium and high and low level players showed significant mean difference, whereas medium and low level players showed insignificant mean difference.
**Displacement**

The result of the study indicated for at various joints axis of different level players at initial to contact phase of instep kick that ankle and hip joint axis showed significant difference in displacement. However, knee joint axis displacement showed insignificant mean differences among different levels of player. Further the LSD post hoc revealed that high and medium; high and low level players for ankle joint axis; and high and low level players for hip joint axis showed significant mean difference in displacement. However; medium and low level players for ankle joint axis; high and low; medium and low level players for hip joint axis showed insignificant mean difference in displacement.

The result of the study indicated for displacement at various joints axis of different level players at contact to follow through phase of instep kick that all the joint (ankle, knee and hip) axis displacement showed significant difference in displacement. Further the LSD post hoc revealed that high and medium levels; high and low levels for ankle joint axis; high and medium levels; high and low levels player for knee joint and high and medium level soccer players for hip joint axis displacement showed significant mean difference. Whereas the medium and low level players for ankle joint; medium and low level for knee joint axis; medium and low level and high and low levels player for hip
joint axis showed insignificant mean difference for displacement from contact to follow through phases during instep soccer kick.

**Angular Velocity**

The result of the study indicated for angular velocity of ankle, knee and hip joint showed no significant difference during soccer among different level (high, medium and low) male soccer players.

**Linear Velocity**

The result of the study indicated for velocity at various joints of different level players of instep kick that velocity of ankle, knee and hip joints showed significant mean difference. However, high and medium level and high and low level players at ankle and knee joint and high and medium level player at hip joint showed significant mean difference. Whereas medium and low level at ankle, knee and hip joints and high and low level players at hip joint does not differ significantly in joint’s linear velocity during instep soccer kick.

**Inside-Instep kick**

**Ball velocity**

The result of the study indicated for ball velocity of different level players and also among high, medium and low level players showed significant mean difference during inside instep soccer kick.
Joint Angle

The result of the study indicated for joint angles of inside instep kick at initial phase for different level male soccer players that ankle and knee joint angles showed significant difference. However, hip joint angle showed insignificant mean differences among different levels of player. Further the LSD post hoc revealed that different level (high, medium and low) players showed significant mean difference among them in ankle joint angle. For the knee joint angle- high and medium; and high and low level players showed significant mean difference, whereas medium and low level players showed insignificant mean difference.

The result of the study indicated for joint angles of inside instep kick at contact phase for different level male soccer players that ankle and knee joint angles showed significant difference. However, hip joint angle showed insignificant mean differences among different levels of player. Further the LSD post hoc revealed that at ankle joint angle- high and medium; high and low level players showed significant mean difference, whereas medium and low level players showed insignificant mean difference. For the knee joint angle- high and medium; high and low level players showed significant mean difference, whereas medium and low level players showed insignificant mean difference.
The result of the study indicated for joint angles of inside instep kick at follow through phase for different level male soccer players that ankle and hip joint angles showed significant difference. However, knee joint angle showed insignificant mean differences among different levels of player. Further the LSD post hoc revealed that at ankle joint angle- high and medium; and high and low level players showed significant mean difference, whereas medium and low level players showed insignificant mean difference. For the hip joint angle- high and medium level players showed significant mean difference, whereas high and low; medium and low level players showed insignificant mean difference.

**Displacement**

The result of the study indicated for displacement at various joints axis of different level players at initial to contact phase of inside instep kick that knee joint axis showed significant difference in displacement. However, ankle and hip joint axis displacement showed insignificant mean differences among different levels of player. Further it revealed that high and low level players for knee joint axis showed significant mean difference in displacement. However; high and medium, and medium and low level players showed insignificantly in joint axis displacement during initial to contact phases of inside soccer kick. Whereas, for the ankle and hip joints revealed that there were no
significant mean differences between the different level (high, medium and low) players.

The result of the study indicated for displacement at various joints axis of different level players at contact to follow through phase of inside instep kick that ankle and knee joint axis displacement showed significant difference in displacement. However, hip joint axis displacement showed insignificant mean differences among different levels of player. Further it revealed that high, medium and low level players showed significant mean difference among them for ankle and knee joints axis displacement. Whereas hip joint axis displacement showed insignificant mean difference among different level players (high, medium and low) during contact to follow through phase of inside soccer kick.

**Angular Velocity**

The result of the study indicated for angular velocity at various joints of different level players of inside instep kick that velocity of ankle and knee joints showed significant mean difference. But, angular velocity of hip joint showed insignificant mean differences among different levels. However, high and medium level; and high and low level players for ankle and knee joint showed significant mean difference, whereas medium and low level player showed insignificant mean difference.
Linear Velocity

The result of the study indicated for linear velocity of ankle, knee and hip joint showed no significant difference, during soccer inside instep kick among different level (high, medium and low) male soccer players.

Ball velocity between Instep and Inside-Instep kick

High level

The result of the study reveals that the comparison of means of ball velocity of high level soccer players during instep and inside instep kick has shown \(|t|_{cal.} = \text{Value (5.63)}\) is greater than the \(t_{0.05,32}\) value (2.00) at 5 % level. This statistical finding exhibit that the ball velocity among high level soccer players during instep and inside instep kick differs significantly.

Medium level

The result of the study reveals that the comparison of means of ball velocity of medium level soccer players during instep and inside instep kick has shown \(|t|_{cal.} = \text{Value (8.18)}\) is greater than the \(t_{0.05,32}\) value (2.00) at 5 % level. This statistical finding exhibits that the ball velocity
among medium level soccer players during instep and inside instep kick differs significantly.

**Low level**

The result of the study reveals that the comparison of means of ball velocity of low level soccer players during instep and inside instep kick has shown $|t|_{cal.} = \text{Value (6.33)}$ is greater than the $t_{0.05,32}$ value (2.00) at 5 % level. This statistical finding exhibit that the ball velocity among low level soccer players during instep and inside instep kick differs significantly.