International Journal of Sports Science and Performance

https://journal.kannuruniversity.ac.in/ijssp/

Biomechanical Comparison of Lofted Kick in Football between Male and Female Players

Shaybal Chanda* & Prof. Sumanta Kumar Mondal**

*Department of Physical Education and Sports Science, Jashore University of Science and Technology, Bangladesh

**Department of Physical Education and Sport Science, Visva-Bharati University, West Bengal, India

Article Info

Keywords:
Biomechanics, Angular Kinematics, Lofted kick, sagittal and frontal Plane

*Correspondence Author.
Assistant Professor,
Department of Physical Education and Sports Science, Jashore University of Science and Technology, Bangladesh
Email address:
shaybalchanda@yahoo.com

Article Received: 18.05.2021
Article Accepted: 21.08.2021
Article E-Published:24.09.2021

Abstract

In the game of football, giving a pass for a longer distance has immense importance. The skill to pass for the longest distance is called Lofted Kick. Male and female football players are identical in many physical, anatomical, and physiological characteristics and at the same time, they exhibit many morphological differences. Purpose: The purpose of the study was to identify whether there is any difference in angular kinematic parameters of lofted kick at ball contact between male and female players. Result: Differences were found in 'kicking leg knee angle' where male players showed higher angle (M = 154^0) than the female players (M = 130^0), 'non-kicking foot side shoulder angle on sagittal plane' where male players showed lower angle (M = 211^0) than the female player (M = 282^0), and in 'non-kicking foot side shoulder angle on frontal plane' where male players showed higher angle (M = 82^0) than the female players (M = 36^0). Conclusion: Male and female football players perform lofted kicks with almost similar kicking leg kinematics with few exceptions such as 'kicking leg knee angle', 'non-kicking foot side shoulder angle on sagittal plane,' and 'non-kicking foot side shoulder angle on frontal plane'

Introduction

The Lofted Kick also called Lofted Drive is for long-range passing, thus required both height and distance (CAS, 2013). In the game of football lofted kick is the skill that is used to clear a ball from defense, to play for a long-distance pass, and also is used to send the ball quickly close to the opponent's penalty area for an opportunity to score a goal (Bridle, 2011). The lofted kick is also used to make a sudden counterattack. (Budiharjo et. al., 2018). To ensure longer distance in a lofted kick it must be supported with the high level of physical abilities of the player (Budiharjo et al., 2018). To kick a ball for a longer distance explosive power is one of the significant characteristics of the leg muscles of the players (Taheri et al., 2014). Further Hasbi, Mentara, and Hasanuddin (2015) reported that lofted kick is very much influenced by the explosive power of the leg muscles (cited as in Budiharjo et al., 2018). Players gain the height of the ball trajectory keeping the body a bit back of the ball and kicking underneath of the ball at the time of

Cite this article: Chanda, Shaybala & Mondal, Kumar Sumanta. Biomechanical Comparison of Lofted Kick in Football between Male and Female Players. International Journal of Sports Science and Performance 2021; 1:1:19-23
Access this article online: https://journal.kannuruniversity.ac.in/ijssp/

execution of the kick (Kellis & Katis, 2007). A combination of several factors enables the layer to achieve longer distances such as powerful kicking, leg's backswing with a longer follow-through, a long lever, longer angular approach run to the intended flight direction of the ball, and a wider final stride (Ball, 2008). The study on angular kinematics comparing between male and female soccer players of Lofted Kick is limited. Hence researcher felt worthwhile to undertake the study. The purpose of the study was to know that whether male and female players execute Lofted Kick in soccer biomechanically in the similar style or with any differences that may help coaches and physical education teachers in imparting training for acquisition of mastery in skills.

Materials and Methods

Subjects

Five male and five female soccer players were randomly selected from the Bangladesh National Football teams.

Selection of Photographic Equipment and Tools

Following equipment and tools were utilized to collect data. To gather motion three Canon EOS7D cameras were employed. For digitalization of kicking actions in the video clips Kinovea 0.8.25 version pro-trainer standard motion analysis software was employed. For the purpose of kicking, a number of well-inflated footballs were used.

Set-up of Filming Procedure

One camera was fixed at the rear side of the kicker on sagittal plane at a distance of 5 meters from the ball kicking spot and two cameras were placed at a distance of 3.20 meters from the ball kicking spot on the frontal plane at right and left-hand side of the kicker. To record the actions of the kicks, all the cameras remained fixed.

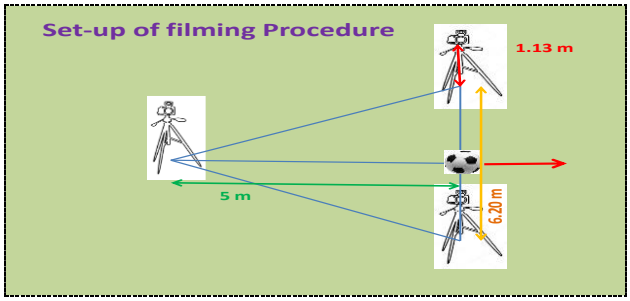

Figure 1: Set-up of Filming Procedure

Recording of Football Kicking Actions

The researchers discussed and made clear the purpose of the recording of kicking actions prior to recording. For better understanding, all possible methods were adapted including discussion, demonstration, and questions & answers. The researcher followed basic principles of photography strictly during the recording of the lofted kick performed by male and female football players.

- Set-up protocols were seriously followed across the recordings periods.
- All the cameras were placed at an optimal distance from the players to reduce obliquity error in video recordings.
- A one-meter square each, 12 (twelve) grids were marked maintaining the ball kicking spot at the middle of grids and this was drawn at the edge of the goal line (corner) of a standard football field. These grids in the captured motion were taken as reference scales for computing and transforming the recorded distance into the real distance.
- Simultaneously all the cameras were kept rolling before the action began.

Design of the Study

Following the same camera setup protocol videos were recorded on both female first and then on male football players and there were five players in number in each group. The players were allowed to take 3 trials to perform lofted kicks with their preferred leg. Players took one minute of pause in between the trials and fifteen minutes for body activation. All the players were free from any major injury for the past six months from the time of data collection day. All the players executed with usual outdoor soccer cleats boots on artificial soccer turf (AstroTurf) surface.

Analysis of Captured Motion

Kinovea 0.8.25 version 2D motion analysis software was used for quantitative analysis of the recorded video actions of lofted kick.

Figure 2: Measurement of Non-Kicking Leg's Knee Joint Angle at Ball Contact

Figure 3: Measurement of Kicking Foot's Ankle Joint Angle at Ball Contact

Figure 4: Measurement of Shoulder Tilt on the Frontal Plane at Ball Contact

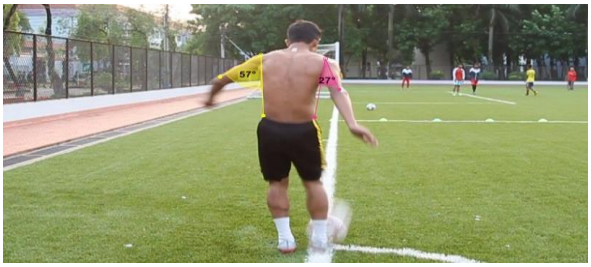

Figure 5: Measurement of Kicking and Non-Kicking Foot's Side Shoulder Joint Angle on the Frontal Plane at Ball Contact

Statistical Tools

For the analysis of collected data Mean and Standard deviation were employed in the Descriptive Statistics, and in the Inferential Statistics, a non-parametric Mann-Whitney U test was used to compare angular kinematic variables of the lofted kick of male and female football players

Result

The result of the present study is exhibited in the table given below and illustrated with identical research finding

Kinematic Parameters	Descriptive Statistics: Mean Height (cm) / Angle & SD (θ^0)		Mann-Whitney U Test: Mean Rank (MR)		U	Z	Sig. (2-tailed)	Re.
	Male	Female	Male	Female				
CG Height Percentage Changed from standing to P2	14; ±9	19; ±17	5.40	5.60	12.00	-0.10	1.00	NS
Kicking Foot Ankle Angle	122; ±14	125; ±6	5.60	5.40	12.00	-0.10	1.00	NS
Kicking Leg Knee Angle	154; ±14	130; ±6	7.60	3.40	2.00	-2.19	0.03	S
Kicking Foot Side Hip Joint Angle	288; ±7	298; ±10	4.80	6.20	9.00	-0.73	0.55	NS
Kicking Foot Side Elbow Angle	172; ±5	166; ±15	5.50	5.50	12.50	0.00	1.00	NS
Kicking Foot Side Shoulder Angle on Sagittal Plane	250; ±64	255; ±59	5.00	6.00	10.00	-0.52	0.69	NS
Kicking Foot Side Shoulder Angle on Frontal Plane	25; ±13	10; ±4	7.40	3.60	3.00	-2.00	0.06	NS
Non-kicking Foot Ankle Angle	90; ±16	88; ±11	5.80	5.20	11.00	-0.31	0.84	NS
Non-kicking Leg Knee Angle	121; ±19	124; ±17	5.00	6.00	10.00	-0.52	0.69	NS
Non-kicking Foot Side Hip Joint Angle	225; ±11	228; ±13	5.20	5.80	11.00	-0.31	0.84	NS
Non-kicking Foot Side Elbow Angle	147; ±30	153; ±11	5.60	5.40	12.00	-0.10	1.00	NS
Non-kicking Foot Side Shoulder Angle on Sagittal Plane	211; ±24	282; ±16	3.50	7.50	2.50	-2.10	0.03	S
Non-kicking Foot Side Shoulder Angle on Frontal Plane	82; ±25	36; ±17	7.80	3.20	1.00	-2.40	0.02	S
Shoulder Tilt Angle on Frontal Plane	21; ±14	7; ±5	7.20	3.80	4.00	-1.78	0.10	NS
Head Tilt Angle on Sagittal Plane	78; ±8	87; ±3	3.60	7.40	3.00	-1.99	0.06	NS

*Required value for being significant is $p \leq 0.05$, N1 = 5, N2 = 5 and $U \leq 2$, $Z = \pm 1.96$, $\alpha = 0.05$.
N.B.: S- Significant; NS- Not Significant; Sig. - Significance Value; Re. - Remark.

Above table describes that there is strong evidence to support difference between the male and female players in the ball contact phase of lofted kick in the following kinematic parameters: 'kicking leg knee angle' in which male players demonstrated higher angle (M = 154^0, SD = $\pm14^0$ & MR = 7.60) than the female players (M = 130^0, SD = $\pm6^0$ & MR = 3.40), 'non-kicking foot side shoulder angle on sagittal plane' in which male players were (M = 211^0, SD = $\pm24^0$ & MR = 5.50) lower than the female players (M = 282^0, SD = $\pm16^0$ & MR = 7.50), and in 'non-kicking foot side shoulder angle on frontal plane' in which male players were higher in angle (M = 82^0, SD = $\pm25^0$ & MR = 7.80) than the female players (M = 36^0, SD = $\pm17^0$ & MR = 3.20). Among rest of the kinematic variables no significant difference was identified such as CG height percentage changed from standing to P2 (U = 12.00, Z = -0.10 & p = 1.00), kicking foot ankle angle (U = 12.00, Z = -0.10 & p = 1.00), kicking foot side hip joint angle (U = 9.00, Z = -0.73 & p = 0.55), kicking foot side elbow angle (U = 12.50, Z = 0.00 & p = 1.00), kicking foot side shoulder angle on sagittal plane (U = 10.00, Z = -0.52 & p = 0.69), kicking foot side shoulder angle on frontal plane (U = 3.00, Z = -2.00 & p = 0.06), non-kicking foot ankle angle (U = 11.00, Z = -0.31 & p = 0.84), non-kicking leg knee angle (U = 10.00, Z = -0.52 & p = 0.69), non-kicking foot side hip joint angle (U = 11.00, Z = -0.31 & p = 0.84), non-kicking foot side elbow angle (U = 12.00, Z = -0.10 & p = 1.00), shoulder tilt angle on frontal plane (U = 4.00, Z = -1.78 & p = 0.10) and head tilt angle on Sagittal Plane (U = 3.00, Z = -1.99 & p = 0.06) as tabulated $U_{0.05}(5,5) = 2.00$, $Z = \pm1.96$, $p \leq 0.05$, 2-tailled.

Discussion

The male and female football players showed a difference in the performance of ball contact phase of a lofted kick in the successive kinematic parameters that are 'kicking leg knee angle' [male players demonstrated higher angle (M = 154^0) than the female players (M = 130^0)], 'non-kicking foot side shoulder angle on sagittal plane' [male players were (M = 211^0) numerically lesser than the female player (M = 282^0)], and in 'non-kicking foot side shoulder angle on frontal plane' [male players were numerically higher in angle (M = 82^0) than the female players (M = 36^0)].

The target of the player while taking a lofted kick is to send the ball to the farthest. Because kickers generally follow angular approaches run in an assumption of a convenient body position so that the medial side of the greater toe and the ball of the foot may come in contact underneath the ball. To transfer maximum velocity to the ball, the player has to bend their kicking leg's knee and the non-kicking side shoulder makes a combined movement of flexion and abduction. The above table displays that the value of the kicking leg knee angle was higher in male players because peak values for the knee flexion and extension torque in the forward swing of male players were probably more than that of female players (Sakamoto et al., 2013).

Additionally, the kicking leg side flexion and flexion of the shoulder joint were found higher in the case of females at ball contact phase might be due to their shorter stature as well as shorter length of the different segments of the body in comparison to the male soccer players. Furthermore, male players' abduction of non-kicking leg side's shoulder joint was significantly higher than that of female players' shoulder joint, which may be probably to comply with the biomechanical theory of linear velocity (v) equals to angular velocity (w) time (*) the radius of rotation (r). Therefore, the higher the radius of rotation, the higher will be the linear velocity for a foreign object having rotatory motion. The findings also exhibit that men players show significantly higher shoulder abduction of the non-kicking side, was to control the detrimental effect of higher kicking leg momentum in the forward and upward direction by virtue of their longer limb length and higher mass of the limb in comparison to their female counterparts.

Conclusion

Male and female football players perform lofted kick with similar kicking leg biomechanics at ball contact in terms of angular kinematic parameters with the exceptions of significant differences in the 'kicking leg knee angle', 'non-kicking foot side shoulder angle on sagittal plane,' and 'non-kicking foot side shoulder angle on frontal plane' where male players are superior to their female counterpart. While training lofted kick technique to both genders, trainers may take a gender-specific distinct approach in the aforementioned angular kinematic parameters for the better outcome of the training.

References

Ball, K. (2008). Biomechanical considerations of distance kicking in Australian Rules football. Sports Biomechanics / International Society of Biomechanics in Sports, 7, 10–23. https://doi.org/10.1080/14763140701683015

Bridle, B. (2011). Essential Soccer Skills (1st ed.). DK Publishing.

Budiharjo, B., Florentinus, T. S., Sugiharto, M., & S, S. K. (2018). The Effectiveness of Power of Leg Muscles and Flexibility of Leg Muscles to Improve Lofted Kick Method. 86–90. https://doi.org/10.2991/iset-18.2018.18

CAS. (2013, August 8). Coaching American Soccer. https://coachingamericansoccer.com/intermediate-soccer-skills/intermediate-passing-the-lofted-drive/

Kellis, E., & Katis, A. (2007). Biomechanical Characteristics and Determinants of Instep Soccer Kick. Journal of Sports Science & Medicine, 6(2), 154–165. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3786235/

Sakamoto, K., Shimizu, Y., Yamada, E., Hong, S., & Asai, T. (2013). Difference in kicking motion between female and male soccer players. Procedia Engineering, 60, 255–261. https://doi.org/10.1016/j.proeng.2013.07.009

Taheri, E., Nikseresht, A., & Khoshnam, E. (2014). The effect of 8 weeks of plyometric and resistance training on agility, speed and explosive power in soccer players. 4.

Wibowo, D. H. (2013). Hubungan daya ledak otot tungkai dan panjang tungkai terhadap hasil tendangan jarak jauh pada pemain sepakbola lipio unnes tahun 2012 [Other, Universitas Negeri Semarang]. http://lib.unnes.ac.id/18896/