Monten. J. Sports Sci. Med. 2 (2013) 1: 5–10
Original scientific paper
UDC 796.265:796.332

Comparison of Instep Kicking Between Preferred and Non-Preferred Leg in Young Football Players

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A B S T R A C T

This research was aimed at gaining relevant knowledge about important differences with respect to compare accuracy of instep kicking between preferred and non-preferred leg depending on the different intensity (optimal and maximal) in a resting state, and in a state of fatigue. The sample included 20 respondents whose characteristics were age (yrs) 16.7±0.47, height (cm) 178.91±4.26, and body weight (kg) 71.52±5.13. The sample of variables contained eight measures that defined accuracy of instep kicking by preferred and non-preferred leg in various occasions: with optimal and maximal intensities and in a resting state and a state of fatigue respectively. The results of the measuring were analyzed by means of a statistical procedure labeled a significance test of two arithmetic means conducted on independent samples or popularly known a t-test. In comparison of accuracy between preferred and non-preferred leg in a resting state with optimal and maximal intensity, as it was expected there were significant differences as well as in a state of fatigue with optimal intensity, all in favor of preferred leg. While the football instep kicking significant differences between preferred and non-preferred leg in a state of fatigue with maximal intensity were not noticable. The current findings clearly demonstrated that the young football players have much more uniformed legs at the expense of accuracy when fatigued and kick the ball with the maximal intensity. It means a state of fatigue can affect the tested accuracy of instep kicking with the maximal intensity.

Key words: *laterality, soccer, intensity, resting state, state of fatigue.*

Introduction

Football players use the preferred leg to manipulate the ball and lead an action such as the kicking[1]. However, the frequent use of the preferred leg often gives rise to musculoskeletal asymmetry and footedness[2]. According to Grace and his collaborators, asymmetry exists in the cases if there is more than 10% difference for a specific quality between the legs, such as muscle girth, force or power[3]. Furthermore, Sadeghi and his collaborators have concluded that this fact has an impact on the overall laterality of the most athletes that use one side of their body much more than other one[1]. The same authors have underlined that football player usually displays laterality toward the preferred kicking leg, because of the dominance of one leg over the other one during the specific tasks in the game. The reason why this is happening reflects that the preferred leg displays decisive power capabilities for the execution of specific tasks. On the other hand, Maupas and his collaborators have indicated that just some research studies have demonstrated no training caused asymmetries in musculoskeletal measurement in athletes from preferred leg sports[4]. According to Capranica and his collaborators, some other research studies that treated laterality, have underlined that symmetry exists in young football players due to their lack of development[5]. However, this exists just in the period right before these young football players become more selective and specialized in their activities. Thereupon, they start developing increased muscle strength in relation to their natural foot preference. According to the same authors, the planned training may affect the equitable use of both legs and, consequently, mitigate the negative effects that occur regarding the symmetry.

Many coaches believe that it is desirable for players to be able to use either foot equally well and that excessive one-sidedness would be a disadvantage, foot preference is always a relevant issue in football[6]. This means, it is essential for a good football player to kick the ball well with both legs. However, even top-level players show bilateral differences and fail to score when it is not possible to play the ball with their preferred leg. Therefore, the ability to kick with both legs is regarded as a desirable skill in top-level football players[7]. Given the apparent desirability of bilateral kicking skill in the football game, studies comparing preferred and non-preferred legs are not numerous, in spite of the many studies that have focused on the dynamics of football instep or similar maximal kicking. Some former studies comparing preferred and non-preferred legs have demonstrate many asymmetries between the preferred and non-preferred legs, while some of them found no side-to-side difference in some characteristics [2,5,7,8,9,10,11,12,13,14].

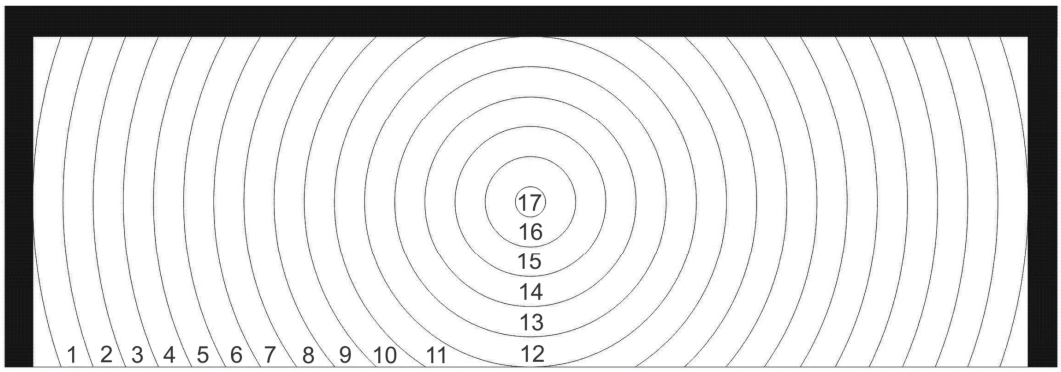
As the characteristics of the preferred leg are different from the non-preferred leg in most cases, the authors believed it would be reasonable to hypothesize that the accuracy of instep kicking between preferred and non-preferred leg is significantly different among the optimal and maximal intensity in a resting state, and in a state of fatigue all in favor of preferred leg. Due to the fact that the accuracy of instep kicking between preferred and non-preferred leg of football players in following occasions: with optimal and maximal intensities and in a resting state and a state of fatigue respectively, has not been investigated so far, the aim of the present study was to compare accuracy of instep kicking between preferred and non-preferred leg depending on the different intensity (optimal and maximal) in a resting state, and in a state of fatigue.

Received for publication January 28, 2013

Materials and Metods

Twenty football players from the junior premier league volunteered to be subjects. The players' characteristics were: age (yrs) 16.7±0.47, height (cm) 178.91±4.26, and body weight (kg) 71.52±5.13. The criteria for selecting footballers for the sample were as follows: having a good health condition, then being a member of the team in the club for seven year at least and being under the supervision of qualified coaches all the time.

For the data collecting, it was used a valid and reliable method for measuring the accuracy of instep kicking[15]. It was conducted outdoors on a natural football pitch and all subjects wore their own shorts, t-shirt and football shoes. Following a warm up, stretching exercises and familiarization trials subjects were asked to shoot on target from the distance of 20 meters with both, preferred and non-preferred leg within four occasions: with optimal and maximal intensities and in a resting state (respondents had to shoot only if their heart rate is under 90 bpm) and a state of fatigue (respondents had to shoot as soon as they complete ten squats) respectively and we defined eight different variables, four variables regarding preferred leg: POR (shoot by preferred leg with optimal intensity in a resting state), POF (shoot by preferred leg with optimal intensity in a state of fatigue), PMR (shoot by preferred leg with maximal intensity in a resting state), PMF (shoot by preferred leg with maximal intensity in a state of fatigue), as well as four variables regarding non-preferred leg: NOR (shoot by non-preferred leg with optimal intensity in a resting state), NOF (shoot by non-preferred leg with optimal intensity in a state of fatigue), NMR (shoot by non-preferred leg with maximal intensity in a resting state), NMF (shoot by non-preferred leg with maximal intensity in a state of fatigue). Subjects kicked a total of ten shoots, using a standard size ball, at an outlined target on a steady vertical surface in standard dimensions (7.32 x 2.44 m). The centre of the target (Picture 1) was marked with a cross lines which divided the target to four equal rectangles. From the central point it was drawn many concentric circles and the first one had the same diameter as a standard ball (22.1 cm). All other circles were outlined with their mutual space between of a size of a standard ball diameter. The central circle brought 17 points, which was a maximal number of points for one shoot, whereas peripheral circles on the left and right brought one point. It means that every shoot closer to center brought the larger number of points, while every failure was identified by zero points.



PICTURE 1
THE TARGET

The data obtained in the research were processed using the application statistics program SPSS for Windows 15.0. adjusted for the use on personal computers. Descriptive statistics were the first calculated, and then it was determined whether there was significance with respect to the difference between the mean in every variable recreationally, which was done testing the difference between the mean of independent samples, using the popularly known, t-test which was set at $p<0.01$. The analysis provided the answers to the question of whether there was and how prominent was the difference between instep kicking by preferred and non-preferred leg among various states and intensities in young football players.

Results

This section offers the results of the descriptive statistics, as well as the results of discriminative analysis classified into two tables and four graphs.

The first table, in the first three columns contains the means (M), the standard deviations (SD) and the standard errors (SE), as well as minimum (Min) and maximum (Max), range (R), Skewness (Sk.) and Kurtosis (Ku.).

TABLE 1
DESCRIPTIVE STATISTICS

	M	SD	SE	Min	Max	R	Sk.	Ku.
Age (yrs)	16.7	0.47	0.1	16	17	1	-0.94	-1.24
Height (cm)	178.91	4.26	0.95	171.5	188.6	17.1	0.31	0.42
Weight (kg)	71.52	5.13	1.15	64	84	20	0.59	0.24
POR	9.97	0.26	3.62	0	16	16	-0.72	-0.19
POF	9.5	0.3	4.31	0	17	17	-0.93	0.16
PMR	6.53	0.37	5.23	0	16	16	0.02	-1.45
PMF	6.47	0.35	4.96	0	15	15	-0.05	-1.50
NOR	8.09	0.33	4.60	0	17	17	-0.20	-0.88
NOF	8	0.37	5.28	0	17	17	-0.34	-1.29
NMR	4.94	0.38	5.30	0	16	16	0.59	-1.11
NMF	5.97	0.37	5.18	0	17	17	0.13	-1.44

Legend: POR – shoot by preferred leg with optimal intensity in a resting state, POF – shoot by preferred leg with optimal intensity in a state of fatigue, PMR – shoot by preferred leg with maximal intensity in a resting state, PMF – shoot by preferred leg with maximal intensity in a state of fatigue, NOR – shoot by non-preferred leg with optimal intensity in a resting state, NOF – shoot by non-preferred leg with optimal intensity in a state of fatigue, NMR – shoot by non-preferred leg with maximal intensity in a resting state, NMF – shoot by non-preferred leg with maximal intensity in a state of fatigue

The second table shows the result of independent t-test and it is presented through cross tabular scheme at a significance level of p=.01.

TABLE 2
INDEPENDENT T-TEST

intensity	state	t-test
optimal	rest	2.95*
	fatigue	2.98*
maximal	rest	2.77*
	fatigue	1.02

*p<0.01

The first graph shows the differences of instep kicking among preferred and non-preferred leg in a resting state with optimal intensity. The value of this comparison is 2.95 and it means that there is significant difference between these two variables at a significance level of p=.01.

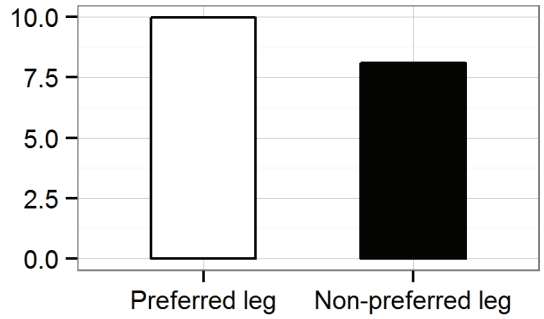


FIGURE 1
COMPARISON OF INSTEP KICKING AMONG PREFERRED AND NON-PREFERRED LEG IN A RESTING STATE WITH OPTIMAL INTENSITY

The second graph shows the differences of instep kicking among preferred and non-preferred leg in a state of fatigue with optimal intensity. The value of this comparison is 2.98 and it means that there is significant difference between these two variables at a significance level of p=.01.

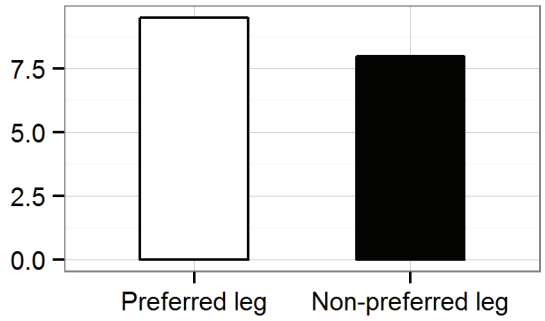


FIGURE 2
COMPARISON OF INSTEP KICKING AMONG PREFERRED AND NON-PREFERRED LEG IN A STATE OF FATIGUE WITH OPTIMAL INTENSITY

The third graph shows the differences of instep kicking among preferred and non-preferred leg in a resting state with maximal intensity. The value of this comparison is 2.77 and it means that there is significant difference between these two variables at a significance level of p=.01.

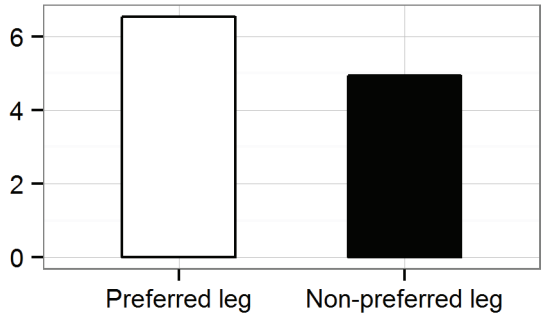


FIGURE 3
COMPARISON OF INSTEP KICKING AMONG PREFERRED AND NON-PREFERRED LEG IN A RESTING STATE WITH MAXIMAL INTENSITY

The fourth graph shows the differences of instep kicking among preferred and non-preferred leg in a state of fatigue with maximal intensity. The value of this comparison is 1.02 and it means that there is no significant difference between these two variables at a significance level of p=.01.

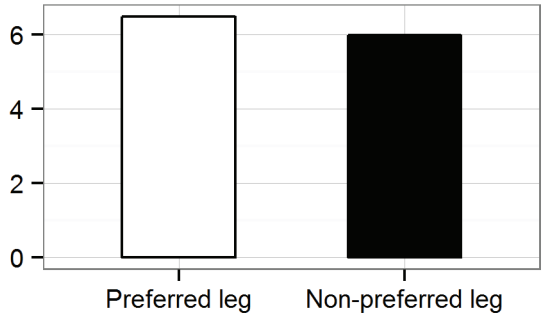


FIGURE 4
COMPARISON OF INSTEP KICKING AMONG PREFERRED AND NON-PREFERRED LEG IN A STATE OF FATIGUE WITH MAXIMAL INTENSITY

Generally, in comparison of accuracy between preferred and non-preferred leg in a resting state with optimal and maximal intensity, as it was expected there were significant differences as well as in a state of fatigue with optimal intensity, all in favor of preferred leg. While the football instep kicking significant differences between preferred and non-preferred leg in a state of fatigue with maximal intensity were not noticable (1.02).

Discusion

At the turn of the 21st century, it is the fact that football is one of the most popular sports, with more than 250 million

registered players in over 200 countries and over 1.4 billion people interested in it[16]. Most of footballers play this popular game and tend to use one leg as a preferred one because they need it for better receiving, controlling and kicking the ball[17]. From the scientific point of view, numerous previous studies have been published on measuring differences between the preferred and non-preferred leg in football players. Detailed review of previous literature indicates that the preferred leg of football players, when compared with the non-preferred leg, the first produces significantly higher ball speed in maximal instep kicking[10] and three-steps drive kicking[7]. Furthermore, the preferred leg, when compared with the non-preferred leg has considerably greater angular velocities of the shank and thigh on impact with the ball[7,12], as well as it has significantly greater peak and average torques measured by computerized dynamometer during knee extension at angular velocities of 0, 60, 180 and 240 degrees per second[12,17]. It is also very important to underline that the preferred leg, when compared with the non-preferred leg has considerably greater knee muscle moment[12] and strength of knee flexor muscles[2], a notably larger muscle size[9] and considerably higher accuracy at kicking the ball[7].

As many characteristics of the preferred leg are very different from the non-preferred leg, it was reasonable to hypothesise that, the accuracy of instep kicking between preferred and non-preferred leg is significantly different among the optimal and maximal intensity in a resting state, and in a state of fatigue all in favor of preferred leg. However, this research study did not confirm the entire hypothesis and the discussion whether there are differences between the preferred and non-preferred leg still remains controversial. Generally, in comparison of accuracy between preferred and non-preferred leg in a resting state with optimal and maximal intensity, as it was expected there were significant differences as well as in a state of fatigue with optimal intensity, all in favor of preferred leg, while the football instep kicking significant differences between preferred and non-preferred leg in a state of fatigue with maximal intensity were not noticable. The discrepancy of results may even be caused by the uncertainty of which leg is defined as the preferred one as well as may be the result of the amateur level of the players.

The current finding clearly demonstrated that the young football players have much more uniformed legs at the expense of accuracy when fatigued and kick the ball with the maximal intensity. It means that a state of fatigue can affect the tested accuracy of instep kicking with the maximal intensity in the positive manner. This fact should be taken into consideration by contemporary trainers as football is a highly intermittent sport, requiring from athletes to accelerate hundreds of times with repeated bouts of high-intensity running and players often have to fight with fatigue. This means that football players should be advised to use both legs in this situation as the ability to kick effectively with either leg is an essential attribute for a player. This ability provides a player with greater disposal options and makes it more difficult for the opposition to defend[18]. Furthermore, it is interesting to mention that 20% of kicks in Australian Football League games are performed with the non-preferred foot, and this percentage can be as high as 45% for some individuals[18] and the findings from this research study would not be valid for mentioned population. This means that the consensus is required to define the term preferred leg, as well to standardize the tests that should be established to find out the preferred side.

Conclusion

Before this research study would be concluded, it is also very important to be underlined that some former studies that focused on accurate football kick indicated the possible influence of certain kinematic variables on the accuracy of target hit[19], such as a decrease in the approach velocity of the football players, as well as linear and angular joint velocities and ball speed, compared with powerful kicks[20,21,22]. The mentioned variables that affect the accuracy are influenced, next to the preferred leg, also by various factors, such as muscle strength[23,24], and training level[25,26]. This research study has identified some of the characteristics of asymmetry in football kicking performance. However, this issue is not completely explored and further studies are required to determine how all of these factors influence kicking accuracy in the same time.

Acknowledgements

This study was presented as Abstract Poster Presentation in the 1st International Conference in Science and Football, Scuola dello Sport CONI Sicilia: Palermo, Italy.

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POREĐENJE UDARACA UNUTRAŠNJOM STRANOM HRPTA STOPALA IZMEĐU PROTEŽIRANE I NEPROTEŽIRANE NOGE KOD MLADIH FUDBALERA

S A Ž E T A K

Cilj ovog istraživanja je dobijanje relevantnih znanja o značajnim razlikama kada je u pitanju poređenje udaraca unutrašnjom stranom hrpta stopala protežiranom i neprotežiranom nogom u zavisnosti od stanja zamora i intenziteta rada mladih fudbalera. Uzorak ispitanika je obuhvatio 20 ispitanika čije su karakteristike bile sljedeće: godine (god) 16.7±0.47, visina (cm) 178.91±4.26, i težina (kg) 71.52±5.13. Uzorak varijabli je sadržao osam varijabli koje su definisale tačnost udaraca unutrašnjom stranom hrpta stopala protežiranom i neprotežiranom nogom u različitim uslovima: optimalnim i maksimalnim intenzitetom, i u odmornom stanju i u stanju zamora, naizmjenično. Razlike u tačnosti udaraca unutrašnjom stranom hrpta stopala između protežiranje i neprotežirane noge u odmornom stanju sa optimalnim i maksimalnim intenzitetom, kao i u zamorenom stanju sa optimalnim intenzitetom su se, kao što je i očekivano, pokazale statistički značajne. Dok značajne razlike nisu primijećene kod tačnosti udaraca unutrašnjom stranom hrpta stopala između protežiranje i neprotežirane noge u zamorenom stanju sa maksimalnim intenzitetom. Navedena saznanja jasno ukazuju da mladi fudbaleri imaju mnogo jasnije uniformisana stopala na štetu tačnosti kada u zamorenom stanju udaraju po lopti sa maksimalnim intenzitetom. Dakle, trebalo bi zaključiti da stanje zamora utiče na testiranu tačnost udaraca unutrašnjom stranom hrpta stopala između protežiranje i neprotežirane noge sa maksimalnim intenzitetom.

Ključne riječi: lateralnost, fudbal, intenzitet, odmorno stanje, stanje zamora.