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A Case Study

A comparative study on comparison of maximum leg strength of non- preferred and preferred leg of university male soccer players

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■ **ABSTRACT**

Most soccer players have favoured foot for kicking the ball, and it is believed that this preference may lead to an asymmetry in the strength of the lower extremities. Thus, this study was designed to determine whether asymmetry in strength is present in the legs of soccer players forty elite and sub-elite soccer players (Mean age: 20.775 SD: 2.224427) were studied (data are presented as mean+SD). The strength of legs (hamstrings and quadriceps) was measured using a leg dynamometer A significant difference between the preferred and non-preferred leg was found in (hamstrings and quadriceps) both the cases the hamstrings and quadriceps of the preferred leg were stronger than those of the non-preferred leg. It is concluded that the lower strength of the knee flex or muscles of the preferred leg may be associated with the differential use of these muscle during the kicking action and thus, constitutes a unique training effect associated with soccer. This in turn can lead to muscular imbalance which is generally regarded as an injury risk factor.

■ **Key Words :** Muscle strength, Leg strength, Soccer players

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Although most soccer players favour one particular foot for kicking the ball, it is not known whether this preference causes an asymmetry in the strength and flexibility of the lower extremities. This information may be important when attempting to rehabilitate the injured soccer player. In designing a rehabilitation programme for injured players, information about bilateral differences (notably hamstring/quadriceps ratios as well as joint flexibility) is important. After an injury, a return to specific athletic training and subsequently to competition is only advised upon restoration of normal functioning including muscle strength and joint flexibility (Smodlaka, 1977; Agre and Baxter, 1987). Early studies have shown that a bilateral leg strength difference of 10 per cent or greater may be a contributing factor to injury (Grace *et al*., 1984, Edwards, 1981). More recently, Chin *et al*. (1994) stated that there were, respectively eight and 12 out of 21 subjects who had bilateral hamstrings imbalance greater than 10 per cent when measured at slow and fast isokinetic velocities. Knapik *et al*. (1991) suggested that players with a strength imbalance of greater than 15 per cent were 2.6 times more likely to suffer injury in the weaker leg. Fowler and Reilly (1993) reported a 20 per cent difference in bilateral muscle strength in professional soccer players prone to injury. The ratio between the strength of the knee extensors and knee flexors is also of particular interest, with a low ratio being associated with a higher risk of injury (Fowler and Reilly, 1993). The hamstring/quadriceps strength ratio varies from 50 per cent to 62 per cent in healthy people (Knapik and Ramos, 1980) whereas ratios for soccer players vary from 41 per cent and 81 per cent depending upon the

angular velocity of movement. The agonist – antagonist relationship for knee extension and flexion may be better described by the more functional ratio of eccentric hamstring to concentric quadriceps, known as the dynamic control ratio (Aagaard *et al.*, 1998). Muscular tightness which restricts the range of motion is also believed to predispose the muscle to injury and to impair performance in sports where flexibility is important (Rahnama *et al*., 2003). Around 17 per cent of injuries in soccer have been attributed to muscle tightness (Ekstrand and Gillquist, 1983). The causes of these imbalances are not known but could be due to the nature of the game in which players repeatedly kick the ball with a preferred leg. This may lead to asymmetry in lower limb strength and flexibility. Therefore, this study was designed to determine whether asymmetry between the preferred and non-preferred kicking leg is present in the lower limb strength and flexibility of soccer players. For the purpose to conduct the research it is hypothesized that the strength of the preferred leg will be more than the non preferred leg.

Selection of subjects:

A sample of 40 soccer players were selected by random sampling who were playing soccer regularly in the university team and also at other reputed level. Before undergoing the test, all the atheletes were informed about the testing procedures, including possible risks involved and benefits of the study for the development and improvisation in the soccer in the modern era.

Data collection:

The data collection was done in January 2013 in the Lakshmibai National University of Physical Education, Gwalior, Madhya Pradesh, India. Maximum leg strength was measured with the help of leg dynamometer.

Variable measured:

The variables selected for the study is as follows: Maximum leg strength in kg.

Statistical analysis:

For the data analysis "independent t-test" was employed. Before applying, "independent t-test", data on maximum leg strength in both the groups (preferred leg and non- preferred leg) was tested for the homogeneity of variance with the help of Levene's test.

■ OBSERVATIONS AND DISCUSSION

The group statistics of the subjects is shown in Table 1 in Table 1-4 is showes that the mean of preferred leg (83.2750) is greater than the mean of non-preferred leg (56.6000) on strength.

Fig. 1 shows that the means of both the groups *i.e.* preferred leg and non-preferred leg on maximum leg strength is unequal.

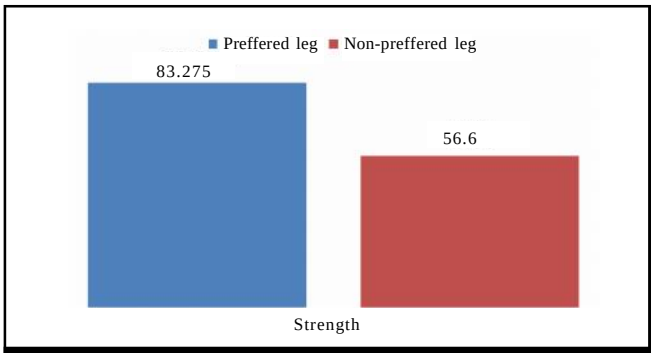

Fig. 1: Maximum leg strength

Table 2 shows that the, the F-value of maximum leg strength (=4.545) was significant, as significance value 0.036<0.05.It means that the two variances are significantly different; that is, the two variances are not equal.

After applying Levene's test, "independent t-test" was employed to compare the means of the groups on maximum leg strength. The table for the," independent t-test" is shown is Table 3.

Table 1: group statistics of the subjects

Variables	Leg	N	Mean	Std. deviation
Strength	Preferred leg	40	83.2750	7.64933
	Non -preferred leg	40	56.6000	9.93775

Table 2: Levene's test for equality of variances

Variables	F	Sig.
Maximum leg strength	4.545	.036

Table 3 : Independent samples t-test between preferred leg and non - preferred leg of Soccer Players on maximum leg strength

Variables	t	df	Sig. (2-tailed)	Mean dfference
Strength	13.453	78	.000	26.67500

* indicate significance of value at P=0.05

Table 3 shows that there was a significant difference found in the means of preferred leg and non preferred leg on maximum leg strength as $p<0.05$.

The purpose of this study was to assess the asymmetry in soccer players which may arise as a result of the conditioning effect of soccer training. It was examined by comparing the strength and flexibility characteristics of the preferred and the non-preferred leg. All the players favoured one foot in kicking and receiving the ball. This preference did not affect lower extremity flexibility but it did affect lower extremity strength. In the players studied, a bilateral strength difference was found with the knee flex or muscles of the preferred leg weaker than those in the non-preferred leg. This strength difference was apparent at an angular velocity of 2.09 rad/s in both concentric and eccentric modes. A possible explanation for the difference in muscle strength is that, during kicking, the knee of the non-preferred (*i.e.* support) limb is bent so that its flexor muscles help to stabilize the joints, support the weight of the body and resist the reaction of the torque developed by the opposite limb. In contrast, during kicking by the preferred leg, knee flexor activity needs to be minimized so as to allow the knee to extend rapidly as it makes contact with the ball. This biomechanical situation may act as a differential training stimulus to knee flexor strength of the preferred and non-preferred legs. This finding contrasts with literature reports which imply that soccer training does not result in a lateral dominance in strength (Agre and Baxter, 1987; Capranica *et al.*, 1992), but is in agreement with those that have reported a lower extremity bilateral peak torque asymmetry in baseball players, non-athletes and other athletic populations (Goslin and Charteris, 1979; Barnes, 1981; Charteris and Goslin, 1982; Coleman, 1982; Puhl *et al*., 1982). It appears that the demands, a player places on specific muscles in bearing the weight of the body during kicking and possibly other activities such as jumping vertically to head the ball, are a possible cause of the difference between the preferred and non-preferred leg in soccer players. Edwards (1981) and Grace *et al*. (1984) indicated that a contra lateral strength difference of 10 per cent or more may be a contributing factor in injury. About 68 per cent of players in the present study were found to have a deficit in one or more specific muscle groups. The incidence is similar to that reported by Ekstrand and Gillquist (1982), who found that 67 per cent of the soccer players investigated, had one or more abnormalities in their musculoskeletal profiles. The present findings, also support Chin *et al*. (1994), who reported that eight and 12 out of 21 subjects had contra lateral hamstrings imbalance ratios greater than 10 per cent when measured at slow and fast isokinetic speeds, respectively.

Conclusion:

The strength characteristics in the lower extremities of these players revealed a difference between the preferred and non-preferred extremities, with the knee flexors of the preferred leg weaker than the those of non-preferred leg. It appears that soccer training produces a unique lateral dominance in these players. In addition and possibly as a consequence of this, two-thirds of these players had abnormalities in their musculo-skeletal profiles. The assessment of muscle function can be used to reveal specific deficiencies in apparently healthy players which may predispose them to injury. This type of information may be of value in preseason evaluations of other soccer players as well as in the rehabilitation of injured players.

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