

Examination of functional ankle instability in soccer players: a prospective study

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Abstract

Aim

The foot area is one of the most active body parts in soccer branch. There may be various loads on the foot in soccer players and ankle instability may occur. The present study aimed to evaluate functional ankle instability in soccer players and examine it in terms of some variables.

Methods

A total of 175 male soccer players were included in the present study. The ankle instability of soccer players was evaluated with the Identification of Functional Ankle Instability (IdFAI) scale.

Results

It was determined that 35.4% of the soccer players had functional ankle instability in their right foot, 29.7% in their left foot, and 46.3% on at least one side. The average IdFAI total score of the all players was 9.39 ± 6.18 for the right side and 8.20 ± 5.55 for the left side. When the soccer players were evaluated regarding the position they played, it was determined that the mean of the IdFAI total score for both feet was higher in the midfielders.

Conclusions

It is thought that the results of the study may contribute to the determination of risk factors for the foot part and shed light on the development of prevention strategies for injuries in soccer players.

Key words: Sports, Soccer, Foot, Ankle, Instability

Introduction

The foot is a complex and functional structure that enables various physical activities. The ankle joint is classified as a trochlear type joint, positioned between the tibia, fibula, and talus bones¹. Ankle stabilization is the ability to maintain the correct position of the joint and find the appropriate position in changing conditions. The stabilization of ankle is provided by static and dynamic components². Functional ankle instability can be defined as involuntary joint movement that does not exceed the normal physiological limits. Functional instability can be caused by tibiofibular sprains, proprioceptive deficits, decrease in muscle strength, capsule damage, and traction neuropathy of the nervus peroneus superficialis or nervus suralis³⁻⁷. Assessment of ankle instability can be accomplished through clinical evaluation scales, radiography, measurements of joint range of motion, and muscle strength assessments. Among these methods, scales have gained popularity in recent years and have been specifically developed to evaluate ankle injuries, as well as the presence and severity of instability^{5,8}.

Soccer is a popular sport branch that contributes socially, culturally, and economically. In soccer, both aerobic and anaerobic energy systems are utilized, and numerous factors, such as flexibility, speed, strength, agility, balance, coordination, muscular endurance, and cardiorespiratory endurance, can significantly influence the athlete's

performance⁹⁻¹¹. The foot and ankle are very active and important body parts for the soccer branch. In soccer, there may be loads on the foot area with various microtraumas or macrotraumas that could cause ankle injuries for soccer players. In soccer players with a history of ankle injuries, it is possible for injury-related situations to develop into ankle instability. So, ankle instability can be seen commonly in soccer players and may cause decreases in their sportive performance^{4,5,12,13}. Therefore, maintaining a good level of functional ankle stability is very important for football players. In this context, studies focusing on ankle instability in soccer players carry significant importance, as they can aid in identifying risk factors and developing effective prevention strategies within the scope of injuries, especially for the foot part. Nevertheless, it is noteworthy that the existing literature is limited in terms of evaluating functional ankle instability in soccer players. The present study expanding the research in this area will contribute valuable insights to enhance safety of athletes and optimize performance in the sport. The aim of the present study was to evaluate functional ankle instability in male soccer players and examine it in terms of some variables.

Material and methods

Study design

In the present study, a prospective cross-sectional design was

employed.

Study place and period

Data were collected between April 2022 and September 2022 in the laboratory of the Faculty of Sports Sciences at Kahramanmaraş Sutcu Imam University.

Study population

Before collecting data the power analysis was made with the G*Power program (version 3.1.9.4, Franz Faul, Universität Kiel, Germany). The sample size was found to be 179, with an effect size of 0.22, a power of 0.90, and an error level of 0.05. The inclusion criteria were to be between the ages of 18-35, to be a soccer player for at least 5 years, to be male, and not to have undergone any surgery on the ankle or foot. The exclusion criteria for the study were being younger than 18, older than 35, and playing soccer for less than five years. A total of 179 soccer players who met the inclusion criteria for the present study were reached. Four individuals were found to have incomplete responses on the scale and were subsequently excluded from the study. As a result, the final sample consisted of 175 soccer players.

Data collection

The data were collected with the Identification of Functional Ankle Instability (IdFAI) scale and an information form containing some information about the participants. Some characteristics of the soccer players were evaluated using the information form, which included questions such as age, sports year, position in soccer, and league level played. The soccer players' ankle instability was evaluated with the Identification of Functional Ankle Instability (IdFAI) scale. The IdFAI is an easy-to-apply, valid, and reliable scale used to define functional ankle instability. The scale was developed by Simon et al. (2012). The validity and reliability of the Turkish version of the scale were done by Tayfur et al. (2020). The Turkish version of the IdFAI's internal consistency was found to be sufficient (Cronbach alpha's coefficients: 0.790 and 0.707), and test-retest reliability was high (ICC value: 0.942). The scale form contains 10 questions. The first question on the scale evaluates the entire history of the case and does not participate in the calculation of the total score. The items in the other 9 questions have a point value of at least 0 and at most 5. The total score is calculated by adding the scores for the answers to the nine questions. The total score can be a minimum of 0 points and a maximum of 37 points. According to the scale, those with a total score of 11 and above are considered "instability", and those with a total score of 10 and below are considered "no instability". The higher the total score, the greater the presence and severity of instability^{5,14}. The participants filled out the IdFAI scale separately for their right and left feet.

Data analysis

The analysis of the data obtained from the research was carried out using the SPSS (version 25, SPSS Inc., Chicago, IL, USA) program. Whether the data were normally distributed or not was evaluated with Kolmogorov-Smirnov test. In addition, the assumption of normal distribution was examined with kurtosis-skewness values and histogram graphics. According to the examinations, it was determined that the data were in accordance with the normal distribution. One-way analysis of variance (ANOVA) was performed to determine whether there was a difference between the groups in terms of variables. When there was a difference between the groups

according to the results of ANOVA, Tukey's test, one of the multiple comparison tests, was used to determine which group the difference originated from. Pearson correlation analysis was performed to determine the relationship status in the present study. The results were evaluated at a 95% confidence interval, with a significance level of $p < 0.05$.

Ethical considerations

The ethics committee's approval was received for the present study from the Kahramanmaraş Sutcu Imam University Medical Research Ethics Committee (Date: 08.02.2022, Session no: 2022/06, Decision no: 06). Before the study, an informed consent form was obtained from the participants who agreed to participate in the study. The Helsinki Declaration was followed throughout the research process.

Results

A total of 175 soccer players with age of 22.87 ± 7.17 years and sports year of 11.53 ± 6.63 years were included in the present study. The distribution of soccer players according to their dominant lower extremity, their positions in soccer, and the top league level they play are presented in Table 1.

The IdFAI total scores of the soccer players for the right and left feet are presented in Table 2.

Table 1. Distribution of soccer players according to some characteristics

		n (%)
Dominant Lower Extremity	Right	159 (90.9%)
	Left	16 (9.1%)
	Total	175 (100%)
Positions in Soccer	Goalkeeper	14 (8%)
	Defense	59 (33.7%)
	Midfielder	71 (40.6%)
	Striker	31 (17.7%)
	Total	175 (100%)
League Level	Amateur League	53 (30.3%)
	Super Amateur League	60 (34.3%)
	Regional Amateur League	19 (10.9%)
	Professional League	43 (24.6%)
	Total	175 (100%)

Table 2. IdFAI total scores of soccer players

Extremity	IdFAI Total Score
	Mean \pm SD
Right Foot	9.39 \pm 6.18
Left Foot	8.20 \pm 5.55

IdFAI: Functional Ankle Instability Definition; SD: Standard Deviation

The number and percentage values of ankle instability of the soccer players according to the dominant lower extremity, their position in soccer, and the level of the top league they play are given in Table 4.

Table 3. Distribution of instability in soccer players

Instability Occurrence	n (%)
At least One Side	81 (46.3%)
Right Footed	62 (35.4%)
Left Footed	52 (29.7%)
Unilateral	48 (27.4%)
Bilateral	94 (53.7%)

forward, and midfielder-forward) ($p>0.05$). It was found that the difference between the IdFAI total score averages of the left foot between midfielders and strikers, between midfielders and defenders was statistically significant ($p=0.019$; $p<0.001$, respectively). There was no statistically significant difference between the other groups (goalkeeper-defender, goalkeeper-midfielder, goalkeeper-forward, defender-forward) ($p>0.05$) (Table 5). The correlation analysis results of the number of ankle sprains and IdFAI total scores of the soccer players are presented in Table 6.

Table 4. Distribution of instability according to some characteristics of soccer players

		One Side Instability	Instability on Both Sides	No instability	Total
		n (%)	n (%)	n (%)	n (%)
Dominant Lower Extremity	Right	34 (21.4%)	93 (58.5%)	32 (20.1%)	159 (100%)
	Left	14 (87.5%)	1 (6.25%)	1 (6.25%)	16 (100%)
Positions in Soccer	Goalkeeper	3 (21.4%)	9 (64.3%)	2 (14.3%)	14 (100%)
	Defense	10 (16.9%)	43 (72.9%)	6 (10.2%)	59 (100%)
	Midfielder	23 (32.4%)	27 (38.0%)	21 (29.6%)	71 (100%)
	Striker	12 (38.7%)	15 (48.4%)	4 (12.9%)	31 (100%)
League Level	Amateur League	11 (20.8%)	36 (67.9%)	6 (11.3%)	53 (100%)
	Super Amateur League	18 (30.0%)	33 (55.0%)	9 (15.0%)	60 (100%)
	Regional Amateur League	4 (21.1%)	9 (47.4%)	6 (31.6%)	19 (100%)
	Professional League	15 (34.9%)	16 (37.2%)	12 (27.9%)	43 (100%)

Table 5. Comparison of IdFAI total scores for the right and left feet according to the positions of the soccer players

	Goalkeeper Mean±SD	Defense Mean±SD	Midfielder Mean±SD	Striker Mean±SD	F	p ¹	Tukey	p ²
Right Foot	9.79±8.25	7.63±5.17	11.06±6.28	8.77±5.94	3.595	0.015*	M>D	0.008*
Left Foot	8.71±5.81	5.83±4.03	10.49±5.77	7.19±5.56	9.050	<0.001*	M>S	0.019*
							M>D	<0.001*

p¹: Statistical significance level of one-way anova; p²: Statistical significance level of tukey test; SD: Standard Deviation; M: Midfielder; D: Defense; S: Striker; *p<0.05

Table 6. Correlation analyzes of ankle sprains and IdFAI total scores

Variables	r	p
Number of Right Foot Sprains and Number of Left Foot Sprains	0.484	<0.001**
Number of Right Foot Sprains and Right Foot IdFAI Total Score	0.302	<0.001**
Number of Left Foot Sprains and Left Foot IdFAI Total Score	0.453	<0.001**
Right Foot IdFAI Total Score and Left Foot IdFAI Total Score	0.546	<0.001**

According to the ANOVA, it was determined that the mean of the IdFAI total score of the right and left foot showed a statistically significant difference between the positions of the soccer players ($p=0.015$, $p<0.001$). According to Tukey’s test, it was determined that the difference between the IdFAI total score averages of the right foot between midfielders and defenders was statistically significant ($p=0.008$). There was no statistically significant difference between the other groups (midfielder-forward, goalkeeper-defender, goalkeeper-midfielder, goalkeeper-forward, defender-

Discussion

In the present study, it was found that 81 (46.3%) of all soccer players participating in the study had instability on at least one side. It was found that 62 (35.4%) of the soccer players who participated in the study had functional ankle instability in the right foot. It was found that 52 (29.7%) of the soccer players who participated in the study had functional ankle instability in the left foot. Although it was seen in a higher percentage value on the right side, the incidence was not low for the foot of both lower extremities. In addition,

functional ankle instability was seen unilaterally in 48 soccer players (27.4%) and bilaterally in 94 soccer players (53.7%).

Ankle injuries are quite common in athletes. In a study, it was reported that the ankle is the most common injury part among 70 sports branches¹⁵. Tanen et al.¹⁶ evaluated high school and university athletes to determine the prevalence of chronic ankle instability in their study. All athletes participating in their study filled out the Cumberland Ankle Instability Tool for both the right and left sides. At the end of their study, chronic ankle instability was detected in 23.4% of 512 athletes. Cruz et al.¹⁷ aimed to determine the prevalence of ankle instability and risk factors affecting ankle instability in male soccer players. Cruz et al.¹⁷ reported that 290 (49.2%) of 589 male soccer players had at least a previous history of sprain. 117 (40%) of the athletes reported instability in at least one of their limbs. Bilateral instability was observed in 48 (41%) of 117 athletes, and among the rest, 42 (36%) had right extremity instability and 27 (23%) left extremity instability. Cruz et al.'s study was similar to the present study in terms of the percentage rate of instability in at least one of the limbs in male soccer players, but differed from the present study in terms of the result that the bilateral incidence is less than the unilateral incidence.

The value of the IdFAI total score is important for the severity of instability, and the severity of instability increases as the score increases.⁵ In the present study, the right-side's IdFAI total scores (9.39 ± 6.18) of all participants were higher than the left-side's IdFAI total scores (8.20 ± 5.55). This result showed that functional ankle instability is more severe on the right side in soccer players. In addition, the result of a higher score on the right side showed parallelism with a higher rate of instability on the right side.

In the present study, when soccer players were evaluated according to their dominant lower extremities, it was found that the percentage of instability on one side of those with the right dominant side was less than the percentage of instability on both sides. It was found that the percentage of instability on one side of those with the left dominant side was higher than the percentage of instability on both sides. This result can be thought that people with the right dominant side use the lower extremities of both sides more actively, more forcefully or for a longer time, that the lower extremities of both sides are exposed to more stress, and therefore instability is seen more on both sides.

In the present study, when the foot instability of the soccer players was evaluated according to the positions they played, it was found that the percentage value of those with instability on one side was the highest in strikers and the lowest in defenders. It was seen that the percentage value of those with instability on both sides was the highest in the defenders and the lowest in the midfielders. According to these results, it may be thought that defenders are more risky in terms of foot instability in both lower extremities than soccer players in other positions.

In the present study, the soccer players were divided into groups according to the top league level they played at, and each group (amateur league, super amateur league, regional amateur league, professional league) was evaluated in terms of functional ankle instability. According to the top league in which the athletes played, the incidence of instability on one side was as follows: professional league, super amateur league, regional amateur league, and amateur league, respectively, from the highest percentage to the lowest percentage.

According to the top league in which the athletes played, the incidence of instability on both sides was as follows: amateur league, super amateur league, regional amateur league, and professional league, respectively, from the highest percentage to the lowest percentage. The percentage rate of unilateral instability was found to be the highest in the soccer players in the professional league group, and the percentage of instability on both sides was the highest in the soccer players in the amateur group. The content of the trainings, the stress of the competitions, and the sports experience may have affected these results. In addition, when the result of instability on both sides is evaluated, it is thought that injury prevention strategies, general and special injury prevention methods should be applied more carefully for both sides of the lower extremity, especially in amateur football players. Rein et al.¹⁸ compared the functional ankle stability of amateur and professional soccer players and the control group in their study. In the study of Rein et al., it was reported that ankle sprains are observed more frequently and carry a higher risk for functional ankle instability in professional soccer players. The result in Rein et al.'s study can be interpreted as being similar to the result that the rate of instability on one side was higher in the professional league group than in the amateur group in the present study.

In the present study, it was seen that the instability scores of the right and left feet differed according to soccer players' positions. For the right foot, there was a difference between midfielders and defenders, and midfielders had higher instability score than defenders. For the left foot, there was a difference between midfielders and strikers, between midfielders and defenders. Also, midfielders had higher instability scores than strikers and defenders. It was understood that instability was more severe in the midfielders for the right and left foot. From these results of the present study, it is thought that more care should be taken in midfielders to protect the ankle joint and foot. Cruz et al.¹⁷ reported that player position is associated with ankle instability on male soccer players in their study. They also stated that strikers and defenders have more risk. The result in Cruz et al.'s study that there was a relationship between instability and player positions can be evaluated as similar to the result of the present study that there was a statistically significant difference between the groups of players' positions in terms of IdFAI score.

According to the correlation analyses performed in the present study, there was a positive correlation between the number of right foot sprains and the number of left foot sprains, between the number of right foot sprains and the right foot instability score, and between the number of left foot sprains and the left foot instability score. In addition, a positive correlation was determined between the right foot instability score and the left foot instability score. The relationship between the number of right and left foot sprains suggested that increased sprain on one side's foot might have caused more load on the other foot. Thus, it also suggested that there may be an increase in the number of ankle sprains on the other side. The increased severity of instability as the number of foot sprains increased for both the right and left foot can be explained by the fact that excessive exposure to foot sprains may adversely affect the structural components of the foot, and thus the severity of instability may increase. According to the relationship between the right and left foot instability scores, as the severity of instability increases on one side of the foot, the severity of instability on the other

side of the foot also increases. This result can be interpreted as the lack of stability on a foot may cause more load to be placed on the other foot, and thus the stability of the other foot may also be more adversely affected.

Conclusions

As a result, unilateral or bilateral ankle instability may be affected by the dominant extremity, the position of the soccer players, and the top league level in which soccer players play. Foot part assessments made according to the characteristics of soccer players are thought to be important in determining risk factors and developing or applying protective measures. The studies on these issues can contribute to the literature within the scope of foot injuries, ankle sprains, ankle instability, risk factors of foot injuries, and foot protection strategies in athletes. It is considered that further studies are needed to evaluate the instability of soccer players based on their different features.

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Conflict of Interest

The authors declare that there is no conflict of interest for this article.

Authors' Contributions

Data gathering and idea owner of this study: Gülşah Ünver, Hikmet Kocaman, Hüseyin Eroğlu Study design: Gülşah Ünver Data gathering: Gülşah Ünver, Hikmet Kocaman, Hüseyin Eroğlu Writing and submitting manuscript: Gülşah Ünver, Hikmet Kocaman Editing and approval of final draft: Gülşah Ünver, Hikmet Kocaman, Hüseyin Eroğlu

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