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Investigation of Sport Injury Patterns in Female Futsal Players*

Eren ULUÖZ
Cukurova University, Department of Physical Education and Sports, Adana, TURKEY
Email: erenuluoz_333@hotmail.com

Abstract

The main purpose of this study was to investigate injury patterns, risk factors and causes in female futsal players. This study was performed on 66 volunteer female athletes (age: 20.72±2.08) playing at different university teams. Sports injuries were detected by means of data forms. Describe statistic was applied and Pearson Correlation Test was used to determine whether there was a significant correlation between the quantitative parameters. Totally, 93 sports injuries were investigated related futsal. Twenty nine (31.20%) of the all injuries occurred in preseason and 64(68.80%) occurred in the competition season. Fifty three (57.00%) of 93 injuries occurred in lower extremities and 22(23.70%) occurred in upper extremity. The overall injury rate of ankle injuries was 25 (26.90%), knee:20 (%21.50),low back: 15 (16.10%), hip/thigh/leg:11(11.80%), shoulder:8(8.60%), elbow:4 (4.30%), hand/finger:5 (5.40%), and head/face:5 (5.40%). The proportion of acute/traumatic injuries was 73 (78.50%) and overuse was 20 (21.50%) and 24.70% of all injuries were caused by contacting to rival player. Because futsal is a foot sport, high rate of lower extremity injuries (ankle, knee, leg, hip and thigh) may be accepted inevitable. Wearing protective equipment, performing functional strength training and efficient warm up/calm down exercises might reduce the risk of sports injuries related futsal.

Keywords: Futsal, Sport injuries, Females

* *This study was presented in the 6th European Sports Medicine Congress.*

Introduction

Football is a one of the most popular and liked sports branches in the world. Football is organized sport with over 200 million males and 21 million females registered with the International Football Association (FIFA) (Giza et al, 2005). Another study has reported that, FIFA has governed body of football in the world. Also, FIFA has 203 members included national associations and represents nearly 200 million active players, of which about 40 million are female (Dvorak and Junge, 2000). In addition to football, FIFA is also organizing the world operations of futsal/indoor soccer branch. Futsal was first played in the 1930s, in Uruguay. Futsal also spread to Brazil in the 1930s, and in the early 1970s, the International Saloon Football Federation (FIFUSA) was established in Rio de Janeiro. (Baroni et al, 2008).

All kinds of football such as field football, beach football and futsal are extremely preferred by the millions people for amateur, professional and recreational purposes. Futsal has preferred numerous of participants because of its similar characteristics to field football. Because it wide spread day by day, especially from the end of the 1980 decade, the futsal space clearly unified and it gets more significant importance with the population (Gayardo et al, 2012). The popularity of futsal continues to grow worldwide. Its development in Europe has been considerable. Especially Spain, Portugal, Russia, Holland, Belgium and Italy, national leagues have strong competition level. The Eastern European nations are also participating in the sport mainly (Baroni et al, 2008).

Unparalleled to other countries where futsal is popular, futsal is becoming new popular in Turkey in 2000s. Although field football has been taken place since at the beginning of the 1900s, futsal is surprisingly becoming popular in 2000s in Turkey. The first national futsal team was established in 2005. Furthermore, the first futsal league named Efes Futsal League was organized in 2009 countrywide. The first organization hosted 1280 players from 64 teams in 8 regions of Turkey. Moreover, Turkey has started hosting international futsal organizations. UEFA Futsal Euro 2012 qualifying group matches was played between 20 and 24 January 2011 in İzmir/Turkey. Turkish Football Federations (TFF) has supported Futsal by various social organizations. For example, "Futsal leagues", "Futsal championships among schools", "Futsal organization for disabled people and women", "Futsal Championships in Universities", "Futsal referee and trainer courses" and "e-learning for Futsal" are the major projects performed by TFF to grow Futsal in Turkey (TFF Official Web Page, 2016).

Numerous scientific studies related to sports injuries have been published until today. It is known that all sport injures cause serious financial and psychological losses both individual and public for players. Injuries are disturbing for elite athletes, amateurs or sedanters. Treatment of sports injuries is usually troublesome, high-priced and time consuming, and therefore, protective measures and activities are legitimated on medical as well as financial grounds. In order to set protective measures, the reasons of injuries and risk factors should be described clearly. Numerous studies have investigated and reported general risk factors and reasons of sports injuries (Caine et al, 1996; Casas and Cassettari, 2006; Junge, 2006; Lysens et al, 1984; Maffuli et al, 2010; Parkkari et al, 2001; Rechel et al, 2008; Sallis et al, 2001; Van Mechellen et al, 1992; Zaricznyj et al, 1980). Authors have described within two groups as "endogen factors" and "external factors":

- Endogen risk factors related to sports injuries:
  - Age
  - Training age
  - Gender

- Anatomic disorders (chronic or acute)
- Lack of range of motion for joints
- Previous injuries (especially uncompleted rehabilitation period)
- Lack of muscle strength
- Unbalanced muscle strength for agonist and antagonist muscles
- Overtraining
- Insufficient or inadequate warm-up and cool down periods
- Tiredness
- Malnutrition
- Muscle calcification due to hardness of training or physiological incapacity
- Psychological deficiencies, etc.

- External risk factors related to sports injuries:
  - Contacting with team mates or opponent players
  - Contacting with an object in playing or training area
  - Repetitive intensive and one way training
  - Consecutive competition periods
  - Fall down to floor improperly
  - Technical inadequacy
  - Choosing unsuitable sport branches for person
  - Mistakes of technical teaching
  - Excessive or poor training
  - Trainer mistakes in training
  - Using unsuitable or non-standard material or equipment
  - Using unsuitable or non-standard floor (performed trainings or competitions)
  - High or low temperature
  - Environmental conditions and negative situation for performing sports, etc.

In futsal, like the other sports, athletes suffer from kinds of sports injuries. Numerous studies have investigated the frequency, type, incidence and the other characteristics of injuries among football and futsal players (Backous et al,1988; Hoff et al, 1986; Chomiak et al, 2000; Reis, 2013). Various population characteristics, age groups, performance levels, genders have caused having different results from previous studies related to sports injuries in futsal.

According to Kofotolis et al (2007) although numerous of studies have focused injury risk factors in professional football players (Arnason et al, 1996; Hawkins et al, 1998; Hawkins et al, 2001) a few studies have investigated on amateur players (Hunt et al, 1990; Junge et al, 2002; Maehlum et al, 1986). Theoretically, sedanters, amateur players have lower fitness/strength and technique capacity levels than professional players. Inadequate of body coordination in connect with low fitness/strength levels and endurance may cause in more player contact and irrelevant movements; therefore, they may prove increased sports injury risk in all sports branches. This situation has been supported by some studies (Chomiak, 2000; Emery, 2005) but other authors have reported the contrast results (Junge et al, 2000; Poulsen, 1991). Since the football is popular, a great number of individuals play in amateur teams. Therefore, investigation of injury risk factors in all types of amateur football may support in developing specific measures aimed to reduce rate of injuries in this category of players. Kofotolis et al (2007) reported that previous research identified numerous factors that may

affect or cause sport injury. Such factors include the age of the player (Barker et al, 1997; Peterson et al, 2000), injury (training/game) conditions (Beynnon et al, 2002; Yde J, 1990), using of dominant leg (Beachy et al, 1997; Clanton et al, 1997; Yde et al, 1990), body size parameters (Barker et al, 1997; Beachy et al, 1997; Woodset al, 2003), history of previous sport injuries (Beachy et al, 1988; Beynnon et al, 2002; Clanton et al, 1997; Ekstrand et al, 1990; Meeuwisse et al, 2000), mechanism of sport injuries (contact or noncontact) (Ekstrand and Gillquist, 1983; Giza et al, 2003; McHugh, 2006; Woods, 2003), time of injury occurrence within a match (Yde et al, 1990; Woods et al, 2003), using of external supporter equipment for injuries (Callaghan, 1997), and player position (Hawkins et al, 2001; Woods et al, 2003).

In the current sports literature in Turkey, although there are numerous studies related to football on different variables such as psychological situation among football players (Bozkus, Turkmen and Kul, 2013; Egesoy et al, 2014), physiological characteristics of players (Uğraş et al, 2002; Açıkada et al, 1998; Edis et al, 2007), biomechanics principles of football (Erkmen et al, 2007; Göktepe et al, 2009), government structure of football (Aydın et al, 2008; Imamoğlu et al, 2007; Orçun and Demirtaş, 2015; Taşğın et al, 2007), recreational purposes among young people (Mansuroğlu, 2002; Sabbağ et al, 2011; Türkmen et al, 2013), there are little studies directly related to futsal sport branch. When the Turkish literature is analyzed, it might be found only about twenty studies on futsal branches. For example, Alvurdu (2008) studied on technical and tactical analysis of Turkish Futsal National Team, Gürkan et al (2012), Göral (2014), Açak et al (2012) analyzed some motoric variables and physiological parameters of futsal players. Also, there are a few studies about psychological characteristic of futsal players. Cengiz et al (2014), Atalay et al (2015), Çağlayan et al (2010), Nas and Birol (2016) studied related psychological characteristic in futsal. Moreover, İşler et al investigated the relationship between futsal competition and sports marketing. On the other hand there is no study related to injury patterns in female futsal players in Turkey. In accordance with the situation, the main purpose of this study was to investigate injury patterns, characteristic and causes of injuries in female futsal players in Turkey.

Materials and Methods

Participants

This study was performed on 66 female athletes. They are playing at different university teams in Turkey. The participants aged 20.72±2.08. The players attended this study voluntarily. The researcher informed the participants about the study at the beginning of the study. Playing futsal least for two years is pre-condition to attend for this study.

Data Collection Instrument

The data of sports injuries were collected by means of data forms. The data form was prepared by the researcher benefit from the literature related to sports injuries. Clinical interview method was used in this study. The researcher interviewed individually all participants. The all data forms were filled by researcher by means of the way of question-answer for each participant. The parameters were focused related to sport injuries in futsal. Investigated parameters are given below;

Demographic variables
Frequency (per player) and number of injuries
Part of season occurred injury
Reason of injury
Extremities affected injury
Injury sites of body
Mechanism of injury (acute/traumatic or overuse)
Duration of return to sport

Data Analysis

Descriptive statistics were performed for the data such as mean, standard deviation, percentage and frequency. In addition to describe statistic, Pearson Correlation Test was used to determine whether there was a correlation between the quantitative parameters or not. Statistical significance level was set at $p<.05$. The SPSS 16.0 statistical software package program was used to perform the analyses.

Findings

The results of "demographic variables", "frequency (per player) number of injuries", "part of season occurred injury", "reason of injury", "extremities affected injury", "injury sites of body", "mechanism of injury (acute/traumatic or overuse)", "duration of return to sport" are given this part of the paper. We found 1.40 injuries per player. There was found a strong negative correlation between training age and injuries ($r=-0.69$; $r2=0.48$; $p<0.05$). Also, weak negative correlation between age and injuries ($r=-0.261$; $r2=0.06$; $p<0.05$). Table 1 shows the results of general descriptive statistics for the players.

Table 1. The results of general descriptive statistics for players

	n	min	max	mean	sd
Age (years)	66	17	28	20.72	2.08
Training age (years)	66	2	13	6.33	2.88

In this study, the average age of the players was 20.72±2.08 and the average training (experience in the sport) age was 6.33±2.88. Totally, 93 sports injuries were reported related to futsal. The results of "part of season occurred injuries" are given Table 2.

Table 2. The results of part of season occurred injuries

	n	%
Preseason	29	31.20
Competition	64	68.80
Total	93	100

"Preseason injuries rate" was 31.20% and "competition season injuries rate was 68.80%. Table 3 shows the results of "extremities affected injuries".

Table 3. The results of extremities affected injuries

	n	%
Lower extremity	53	57.00
Upper extremity	22	23.70
Axial body	18	19.30
Total	93	100

Fifty three injuries with the rate 57.0% of 93 injuries occurred in "lower extremities" and 23.7% occurred in "upper extremities". The rate of injuries of axial body was 19.30 %. The results of injury sites of body are given Table 4.

Table 4. The results of injury sites of body

	n	%
Ankle	25	26.90
Knee	20	21.50
Low back	15	16.10
Hip/thigh/leg	11	11.80
Shoulder	8	8.60
Elbow	4	4.30
Hand/Finger	5	5.40
Head/Face	5	5.40
Total	93	100

The overall rate of ankle injuries was 26.9%, knee: %21.5, low back: 16.1%, hip/thigh/leg:11.8%, shoulder: 8.6%, elbow: 4.3%, hand/finger: 5.4%, and head/face: 5.4%. Table 5 shows results of mechanism of injury (acute/traumatic or overuse).

Table 5. The result of mechanism of injuries

	n	%
Acute/traumatic injuries	73	78.50
Overuse injuries	20	23.70
Total	93	100

The proportion of acute/traumatic injuries was found as 73 (78.50%) and "overuse" was 20 (21.5%). The proportions of injury reasons are given Table 6.

Table 6. The results of injury reasons

	n	%
Overtraining	12	12,9
Falling down/contact to floor	21	22,6
Contacting to rival player	23	24,7
Ball hit	10	10,8
Sudden strain	27	29,0
Total	93	100,0

The most common injury reason was found as "sudden strain" with 29.00% rate. Second common injury reason was "contacting to rival player" with 24.70% rate. "Falling down/contact to floor" was the third common injury reason with 22.60% rate. The other injury reasons were "overtraining" and "ball hit" with 12.90% and 10.80% rates, respectively. Table 7 shows that the results of duration of return to sport.

Table 7. The results of the overall duration of return to sport

	n	%
1-3 days	10	10,8
4-7 days	32	34,4
2-3 weeks	24	25,8
1-2 months	17	18,3
3 months+	10	10,8
Total	93	100,0

In all injuries, the overall duration of return to sport rates were within 1-3 days: 10.8%, 4-7 days:34.4%, 2-3 weeks: 25.8%, 1-2 months: 18.3% and 3+ months: 10.8%.

Discussion

This study investigated the incidence and characteristics of injuries experienced by female futsal players. Similar to literature related to injuries in Futsal, we analyzed the demographic variables of players and also, we investigated the characteristic of injuries such as "frequency (per player) of injuries", "part of season occurred injury", "reason of injury", "extremities affected injury", "injury sites of body", "mechanism of injury (acute/traumatic or overuse)", "duration of return to sport".

We found 1.40 injuries per player in our study. Ribeiro et al (2006) performed an epidemiologic analysis of injuries occurred during the 15th Brazilian Futsal Sub20 Team Selection Championship and they reported 1.39 injuries per player in game. Angoorani et al (2014) reported 1.64 injuries per player in their study which analyzed injuries in Iran Futsal National Team. Similarity of the result of these studies might be expected normally because of all studies performed in the same performance level and age range.

Previous research identified numerous factors that may affect or cause injury. One of the major factors has been reported the age and training age of the player. In this study a strong negative correlation between training age and injuries ($r=-0.69$; $r2=0.48$; $p<0.05$). Also, weak negative correlation between age and injuries ($r=-0.261$; $r2=0.06$; $p<0.05$). Kofotolis et al (2007), Barker et al (1997), Peterson et al (2000) focused the relationship between player age/training age and injuries. It might be thought that, in accordance with increasing sportive experience, players gain more body balance, muscle strength, game practice and improve prevention strategies against injuries. Furthermore, Kofotolis et al (2007) reported that some study (Backous et al, 1988; Ostenberg et al, 2000; Stevenson et al, 2000) focused an increased incidence of injury in older players, Peterson et al (2000) reported an increased incidence of injury in younger players, and Soderman et al (2001) and Chomiak et al (2000) reported no relationship between age and injury. There is a difficulty to compare the findings of these studies since research methods differed in terms of the sport and age range. Backous et al (1988), Ostenberg et al (2000) and Stevenson et al (2000) focused on a narrow age range, which may have made it difficult to observe a relationship between age and injury. Further research could examine these effects, possibly using samples with larger age distribution (Kofotolis et al, 2007).

Recent studies has focused period of injuries occurred in season. Different results have been reported at this point. In our study, preseason injuries rate was 31.20% and competition season injuries rate was 68.80%. Engstro et al and Peterson et al reported greater number of severe injuries at the end of the main seasons. This result is similar with our study. In contrast with the results of our study, Chomiak et al (2000) reported that nearly half of all severe injuries were recorded during the autumn season. A lower number of injuries occurred during the winter preseason, spring season, and summer preseason. In opposite to the results, Nielsen & Yde (1989) reported that the majority of injuries occurred during the spring season, followed by the winter preseason and autumn season. According to Chomiak et al (2000), the explanation for these differences is unclear, although it may be related to the dependence of field quality on the prevailing weather conditions. Different age groups and level of the game might be related to the differences.

Numerous studies have focused injury areas of body (Angoorani et al, 2014; Baroni et al, 2008; Gayardo et al, 2012). In our study fifty three injuries with the rate 57.0% of 93 injuries occurred in lower extremities and 23.7% occurred in upper extremities. The rate of injuries of axial body was 19.30 %. Also, the overall rate of ankle injuries was 26.9%, knee: %21.5, low

back: 16.1%, hip/thigh/leg:11.8%. When the literature is analyzed, it may be found extremely similar results of this point. For example, Heidt et al (2000) reported that all injuries occurred in the lower extremities, with 61.2% occurring at the ankle joint and knee joint. According to Chomiak et al (2000), injuries were occurred in the lower extremities: 74.2% and the upper extremities: 14.4%. The injuries were most prevalent in the knee joint: 30% and the ankle joint: 19%. Giza et al (2004) reported that the most common injury part of body was knee joint, (31.8%), the head area (10.4%), followed by ankle joint (9.3%), and foot (9.3%); 60% of the injuries occurred in the lower extremities in their study. Angoorani et al (2014) who investigated injury in Iranian National Futsal Team players found out that the ankle joint: 40.7% was the most frequent body part of injury, knee joint: 22.2% and groin area: 13%. Gayardo et al (2012) found out that according to the body part injured, the ankle, thigh and knee were the body part with the highest number of injuries. Hence, the injuries in the lower extremity are 86.5% of all injuries experienced by players. Like the all kinds of football, futsal is played dominantly with lower extremity. Because of this reality, it might be acceptable as a natural conclusion that almost all of the recent studies which reported similar results related to relationship lower extremity and injuries with high rate.

In our study, the proportion of acute/traumatic injuries was found as 78.50% and overuse was 21.5%. Also, we found that the most common injury reason was found as "sudden strain" with 29.00% rate. Second common injury reason was "contacting to rival player" with 24.70% rate. "Fall down/contact to floor" was the third common injury reason with 22.60% rate. The other injury reasons were "overtraining" and "ball hit" with 12.90% and 10.80% rates, respectively. In contrast with our study, Gayardo et al (2012) found out that concerning the injury, 51.9% occurred without contact and 46.1% by means of direct contact. Riberio and Costa (2006) reported that the injuries with contact were predominant, with a 65.62% rate. Different results among these studies might be explained various age groups and performance levels.

Another variable analyzed in previous studies relation to futsal injuries is duration of return to the sport. We found that in all injuries, the overall duration of return to sport rates were within 1-3 days: 10.8%, 4-7 days:34.4%, 2-3 weeks: 25.8%, 1-2 months: 18.3% and 3+ months: 10.8%. When the literature is analyzed, it might be found similar and contrast results with our findings. For example, Gall et al (2008) reported that 51.9% of all injuries (traumatic and overuse) were of minor severity (1-7 days), 35.7% were moderate (7-30 days), and 12.4% required a layoff time greater than 30 days. Gayardo et al (2012) found out that 52.9% were moderate (7-28 days) injuries, 33.7% were severe (28+ days), 4.8% were temporary (1-8 days) and nine 8.6% athletes did not reply to the time away. They found high rate of moderate and severe injuries. Gayardo et al quoted that Studies carried out in the women's soccer corresponded to a lower number of severe injuries than the ones found in futsal, with severe injuries ranging between six and 15% of all injuries (Engström et al, 1991; Junge et al, 2007; Le Gall et al, 2008; Söderman et al, 2001). Since futsal is a high intensive contact sport, higher moderate and severe injury rates can be accepted as a natural finding.

Conclusion

Finally, the findings of this study have indicated the similar results with the literature which related to sport injuries in futsal. This study showed that the rate of competition season injuries were exceedingly higher than preseason injuries. Similarly, acute/traumatic injuries had consistently higher proportion than overuse injuries. Contacting to rival players

powerfully under match stress might be major reason of the result. The lower extremity area showed a higher percentage of injuries than the upper extremity. The most common injury area was ankle with >%25 rate. Because futsal is a foot sport, high rate of lower extremity injuries (ankle, knee, leg, hip and thigh) might be accepted natural result.

In order to reduce the risk of injuries in futsal, preventive applications might be exerted. For example, "wearing protective equipment for body area at risk such as knee, elbow, shoulder and ankle", "efficient warm up/calm down exercises", "issuing written and/or practical injury prevention programs to players", "receiving a post-injury medical treatment that ensures complete recovery", "performing functional strength training" may reduce the rate and severity of futsal injuries. Additionally, Campbell et al (2014) suggested that preseason and in-season training had higher injury prevention efficacy than either preseason or in-season training alone. Their analysis identified that plyometric, strengthening and balance exercises are essential for a successful training program that can serve to prevent injuries and enhance performance. These applications may reduce the risk of injuries in futsal. Prospective research should be needed to clearly determine injury patterns in futsal.

Conflict of Interest

The author has not declared any conflicts of interest.

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