
INCIDENCE AND FACTORS RELATED TO ANKLE SPRAINS IN ATHLETES OF FUTSAL NATIONAL TEAMS

Incidência e fatores relacionados a entorses de tornozelo em atletas de seleções nacionais de futsal

Bruno Manfredini Baroni¹, Rafael Abeche Generosi², Ernesto Cesar Pinto Leal Junior³

¹ University of Caxias do Sul (UCS); Laboratory of Human Movement (LMH-UCS); Sports Medicine Institute (IME-UCS) – Caxias do Sul, RS - Brazil, e-mail: baroni09@yahoo.com.br

² University of Caxias do Sul (UCS); Laboratory of Human Movement (LMH-UCS) - Caxias do Sul, RS - Brazil, e-mail: rafaelgenerosi@hotmail.com

³ University of Caxias do Sul (UCS); Laboratory of Human Movement (LMH-UCS); Sports Medicine Institute (IME-UCS) – Caxias do Sul, RS - Brazil. Section for Physiotherapy Science, Inst. Public Health and Primary Health Care, University of Bergen, Bergen - Norway, e-mail: ecplealj@ucs.br

Abstract

Introduction: Like soccer, the most popular sport on the planet, futsal also is regulated by the Fédération Internationale de Football Association (FIFA). Although futsal is increasingly popular worldwide, few authors have studied futsal injuries. **Objective:** To analyze the incidence and factors related one of the most common sports injury – the ankle sprain – in world elite futsal athletes. **Methods:** 65 male athletes from six national futsal teams (Brazil, Argentina, Chile, Italy, Croatia and, Czech Republic) answer a questionnaire included information about their personal data, history of ankle sprains during their careers, and more in-depth data on ankle sprains in 2006 (the year of the research). **Results:** A total of 75.38% of the athletes had suffered ankle sprains in their careers, 63.27% in both ankles, 24.49% in the dominant ankle only, and 12.24% in the nondominant ankle only. Among the 2006 injuries, 81.25% were characterized as inversion injuries and 18.75% as eversion injuries; 50% were recurrences, and 37.5% of the athletes still had clinical symptoms (as pain or instability) at the time of data collection. **Conclusions:** Ankle sprains occur frequently in futsal athletes and can result in persistent symptoms. We hope the present results help physiotherapists to design rehabilitation and prevention efficient programs, thus reducing players' time out of sporting activities and improving their performance.

Keywords: Injury; Epidemiology; Ankle instability.

Resumo

Introdução: Assim como o futebol, esporte mais popular no planeta, o futsal também é regulamentado pela Fédération Internationale de Football Association (FIFA). Embora o futsal seja cada vez mais popular mundialmente, poucos autores têm estudado as lesões no futsal. Objetivo: Analisar a incidência e os fatores relacionados a uma das lesões esportivas mais comuns – a entorse de tornozelo – em atletas de futsal da elite mundial. Métodos: 65 atletas masculinos de seis seleções nacionais (Brasil, Argentina, Chile, Itália, Croácia e República Tcheca) responderam a um questionário incluindo informações sobre seus dados pessoais, histórico de entorses de tornozelo durante suas carreiras, e dados mais aprofundados sobre entorses de tornozelo ocorridas em 2006 (o ano da pesquisa). Resultados: Um total de 75,38% dos atletas já sofreram entorses de tornozelo em suas carreiras, 63,27% em ambos os tornozelos, 24,49% somente no tornozelo do membro dominante, e 12,24% somente no não-dominante. Dentre as lesões ocorridas em 2006, 81,25% foram caracterizadas como lesões em inversão e 18,75% como lesões em eversão; 50% foram recidivas, e 37,5% dos atletas ainda possuíam sintomas clínicos (como dor ou instabilidade) no período da coleta dos dados. Conclusões: Entorses de tornozelo ocorrem frequentemente em atletas de futsal e podem resultar em sintomas persistentes. Espera-se que os presentes resultados auxiliem os fisioterapeutas a desenvolver programas eficientes de reabilitação e prevenção, então reduzindo o tempo de afastamento dos jogadores das atividades esportivas e incrementando seu desempenho.

Palavras-chave: Lesão; Epidemiologia; Instabilidade de tornozelo.

INTRODUCTION

The *Fédération Internationale de Football Association* (FIFA) is an entity composed of 204 affiliated nations that manages soccer, the most popular sport in the world, with approximately 200 thousand professional athletes and 240 million amateurs (1). In addition to soccer, FIFA is also responsible for the world organization of futsal.

Futsal, or *fútbol de salón*, was first played in the 1930s, in Uruguay, when lack of space for practicing field soccer resulted in the game's being adapted for basketball courts. The sport also spread to Brazil in the 1930s, and in the early 1970s, the *Federación Internacional de Fútbol de Salón* (FIFUSA) was formed in Rio de Janeiro. In 1990, also in Brazil, the rules *fútbol de salón* (practiced by FIFUSA) were merged with those of 5-on-5 soccer (recognized by FIFA and widespread in Europe) to create the current sport of futsal (2).

Today, futsal is the sport with the largest number of apprentices in Brazil. With a large number of practice sites available, it is played by more than 12 million Brazilians. In five FIFA World Championships, Brazil won three, was the runner-up in one, and took third place in another. Many renowned soccer stars credit a great part of their success to the lessons they learned from futsal, the sport that began their athletic lives (3).

The popularity of futsal continues to grow worldwide. Its evolution in Europe has been notable, with Spain, Russia, Belgium, Holland, Italy, and Portugal having strong national leagues. The Eastern European nations are also participating in the sport (2).

A large number of authors have studied soccer injuries in different populations, including female athletes (4, 5), adolescent athletes (6, 7), and male professional athletes (8, 9). However, because futsal is a relatively recent sport, injury studies are lacking. In some works, the term "indoor soccer" is found (10, 11), but it should not be mistaken for futsal. These studies actually describe a sport known in Brazil as society soccer, which is played on synthetic grass courts. Observing the World Futsal Championship on Guatemala 2000, Junge et al. (12) found 191 injuries to each 1000 game hours.

Many authors have identified the ankle sprain as be the most common athletic, accounting for 15% to 45% of total injuries in both contact and non-contact sports. Ankle sprains are responsible for 75% of ankle injuries, and 85% to 90% of these are inversion mechanisms (13, 14).

An ankle sprain can affect not only the function of the ankle and foot but also the knees and spine (15). Most ankle sprains in soccer are caused by lateral or medial forces contacting the foot or ankle and resulting in a corresponding inversion or eversion (16). Thacker et al. (17) reviewed nine studies to affirm that an athlete's history of ankle sprains is an important risk factor for recurrent injury. Ankle sprains are also responsible for chronic pain or instability in 20% to 50% of athletes (18).

Ankle sprains and their occurrence in soccer players have been studied in depth (17,19,16,20). However, in futsal there is clearly a lack about it. So, our objective was to investigate ankle sprains in world elite futsal players.

MATERIAL AND METHODS

Subjects were male athletes on the participant futsal national teams during the time period of October 17 through 21, 2006, in Brazil. The South American teams consisted of Brazil (BRA), Argentina (ARG), and Chile (CHI), and the European teams were Italy (ITA), Croatia (CRO), and the Czech Republic (CZE). In total, 65 athletes participated in the study: 12 from Brazil, 11 from Argentina, 13 from Chile, 6 from Italy, 11 from Croatia and 12 from the Czech Republic. Subject demographics, including age, height, and body mass, by team and by tactical position, are found in Tables 1-3, respectively. This data were collected with the technical commissions of national teams.

TABLE 1 - Average age (in years) of the athletes by team and by tactical position

| | Goalkeepers | Fullbacks | Wingers | Pivots | General |
|-------|----------------|----------------|----------------|----------------|----------------|
| BRA | 29.00 (± 5.66) | 23.50 (± 2.12) | 25.33 (± 2.42) | 28.00 (± 1.41) | 26.08 (± 3.15) |
| ARG | 23.00 (± 0.00) | 26.00 (± 0.00) | 22.20 (± 1.64) | 24.00 (± 3.61) | 23.45 (± 2.42) |
| CHI | 26.50 (± 9.19) | 29.00 (± 2.83) | 26.00 (± 5.02) | 27.33 (± 6.43) | 26.85 (± 5.13) |
| ITA | 24.00 (± 0.00) | 24.00 (± 0.00) | 25.66 (± 2.31) | 28.00 (± 0.00) | 25.50 (± 2.07) |
| CRO | 28.00 (± 0.00) | 26.40 (± 3.78) | 23.66 (± 3.79) | 29.00 (± 4.24) | 26.27 (± 3.77) |
| CZE | 36.33 (± 6.03) | 25.50 (± 3.54) | 25.80 (± 4.02) | 27.00 (± 1.41) | 27.75 (± 6.52) |
| TOTAL | 29.50 (± 6.85) | 26.00 (± 3.01) | 24.86 (± 3.47) | 26.15 (± 4.18) | 26.08 (± 4.39) |

Abbreviations: BRA, Brazil; ARG, Argentina; CHI, Chile; ITA, Italy; CRO, Croatia; CZE, Czech Republic.

TABLE 2 - Average height (in cm) of the athletes for team and for tactical position

| | Goalkeepers | Fullbacks | Wingers | Pivots | General |
|-------|------------------|-----------------|-----------------|-----------------|-----------------|
| BRA | 171.50 (± 2.12) | 171.00 (± 1.41) | 172.66 (± 4.41) | 181.00 (± 1.41) | 173.58 (± 4.70) |
| ARG | 182.00 (± 0.00) | 170.50 (± 4.95) | 176.60 (± 7.16) | 177.33 (± 5.77) | 176.18 (± 6.32) |
| CHI | 184.00 (± 11.31) | 174.00 (± 5.66) | 172.50 (± 2.74) | 173.33 (± 6.11) | 174.69 (± 6.33) |
| ITA | 180.00 (± 0.00) | 175.00 (± 0.00) | 176.00 (± 6.51) | 173.00 (± 0.00) | 176.17 (± 4.71) |
| CRO | 184.00 (± 0.00) | 177.00 (± 4.32) | 181.66 (± 4.73) | 185.00 (± 7.07) | 181.18 (± 4.85) |
| CZE | 185.66 (± 3.21) | 180.50 (± 2.12) | 175.40 (± 2.30) | 178.00 (± 0.00) | 179.50 (± 5.14) |
| TOTAL | 181.70 (± 7.10) | 175.79 (± 5.09) | 175.18 (± 5.14) | 177.92 (± 5.78) | 176.86 (± 5.93) |

Abbreviations: BRA, Brazil; ARG, Argentina; CHI, Chile; ITA, Italy; CRO, Croatia; CZE, Czech Republic.

TABLE 3 - Average body mass (in kg) of the athletes by team and by tactical position

| | Goalkeepers | Fullbacks | Wingers | Pivots | G e n e r a l |
|--------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| BRA | 79.00 (\pm 1.41) | 70.50 (\pm 2.12) | 68.50 (\pm 8.48) | 83.00 (\pm 7.07) | 73.00 (\pm 8.64) |
| ARG | 83.00 (\pm 0.00) | 75.50 (\pm 6.36) | 70.20 (\pm 3.35) | 75.16 (\pm 9.29) | 73.73 (\pm 6.48) |
| CHI | 88.00 (\pm 9.90) | 71.00 (\pm 2.83) | 70.83 (\pm 3.43) | 72.33 (\pm 4.51) | 73.85 (\pm 7.55) |
| ITA | 83.00 (\pm 0.00) | 76.50 (\pm 0.00) | 77.66 (\pm 12.50) | 65.00 (\pm 0.00) | 76.33 (\pm 9.91) |
| CRO | 84.00 (\pm 0.00) | 71.40 (\pm 3.05) | 72.66 (\pm 8.33) | 82.00 (\pm 8.49) | 74.82 (\pm 7.12) |
| CZE | 87.66 (\pm 4.51) | 72.50 (\pm 3.54) | 71.60 (\pm 6.50) | 68.50 (\pm 2.12) | 76.08 (\pm 8.53) |
| TOTAL | 84.70 (\pm 5.38) | 72.36 (\pm 3.50) | 71.64 (\pm 6.91) | 75.00 (\pm 8.02) | 74.48 (\pm 7.72) |

Abbreviations: BRA, Brazil; ARG, Argentina; CHI, Chile; ITA, Italy; CRO, Croatia; CZE, Czech Republic.

We used a questionnaire to collect the athletes' personal data (name, age, team, tactical position, dominant foot), history of ankle sprains during their careers, and more in-depth data on ankle sprains in 2006.

In order to facilitate the athletes' understanding and to reduce errors, the questionnaire consisted of objective questions (the athlete only needed to mark the answer that fit) and translated to the official language of each nationality. The questionnaire was given to the athletes by each delegation leader and returned to the researchers before the end of the competition.

Along with the questionnaire was an informed consent document, also in the official language of each country, in which the athletes agreed to participate in the research. This document stated that there would be no remuneration, that the study posed no risk to participants' health, that they could drop out of the study whenever they wanted, and that their personal data would remain confidential. The study was submitted to and approved by an Ethics and Research Committee (protocol number H163/CEP/2006).

RESULTS

Table 4 demonstrates the percentage of ankle sprains in the athletes.

TABLE 4 - Ankle sprain occurrence on the athletes

| | Total of athletes | With sprain history |
|--------------|--------------------------|----------------------------|
| BRA | 12 | 11 (91.66%) |
| ARG | 11 | 5 (45.45%) |
| CHI | 13 | 11 (84.61%) |
| ITA | 6 | 3 (50.00%) |
| CRO | 11 | 8 (72.72%) |
| CZE | 12 | 11 (91.66%) |
| TOTAL | 65 | 49 (75.38%) |

Abbreviations: BRA, Brazil; ARG, Argentina; CHI, Chile; ITA, Italy; CRO, Croatia; CZE, Czech Republic.

Of the 49 athletes who had already had ankle sprains during their careers, 63.27% (n = 31) had sprains in both ankles, 24.49% (n = 12) had injured only the dominant ankle, and 12.24% (n = 6) had injured only the nondominant ankle. Of the athletes with a history of ankle sprains, 18.37% had persistent symptoms at the time of data collection. In addition, 61.22% of the injured athletes had recurrent ankle sprains during their careers.

When we looked at tactical game positions, we found that the pivots had the most ankle sprains at 92.30% (12 of the 13 athletes). The goalkeepers had 90% (9 of the 10 athletes), followed by the wingers with 71.43% (20 of the 28 athletes) and fullbacks with 57.14% (8 of the 14 athletes).

Among the 49 athletes with a history of ankle sprains, 25 (51.02%) used some type of protection (eg. pads, tightening of the limb with bandages, adhesive plaster boot, etc.) in this area, whereas 24 (48.98%) trained and participated without any protection.

Of the 65 athletes in the study, 14 (31.53%) identified an ankle sprain in 2006. Of these, 42.86% (n = 6) injured the dominant ankle, 42.86% (n = 6) injured the nondominant ankle, and 14.28% (n = 2) had sprains in both ankles.

Of the 16 injuries in 2006, 13 (81.25%) were characterized as inversion mechanisms and 3 (18.75%) as eversion mechanisms. Eight of the ankle sprains in 2006 (50%) were recurrences, and 6 athletes (37.5%) had persistent clinical symptoms (as pain, instability, insecurity or staggering) at the time of data collection.

Figure 1 demonstrates the time of the season in which the injuries happened: pre-season (before the beginning of the championships), beginning (of the season), half (of the season), and end (of the season).

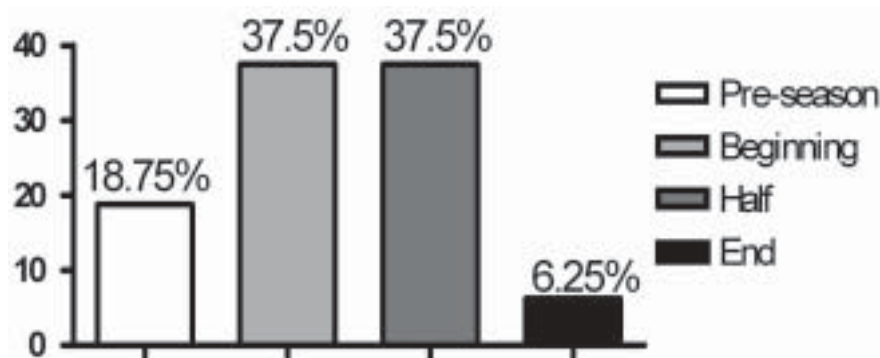


FIGURA 1 - Period of occurrence of the ankle sprains in 2006

The type of participation was divided into training, match, "informal game" (a recreational game), or other (not related to the sporting practice), as observed in Figure 2.

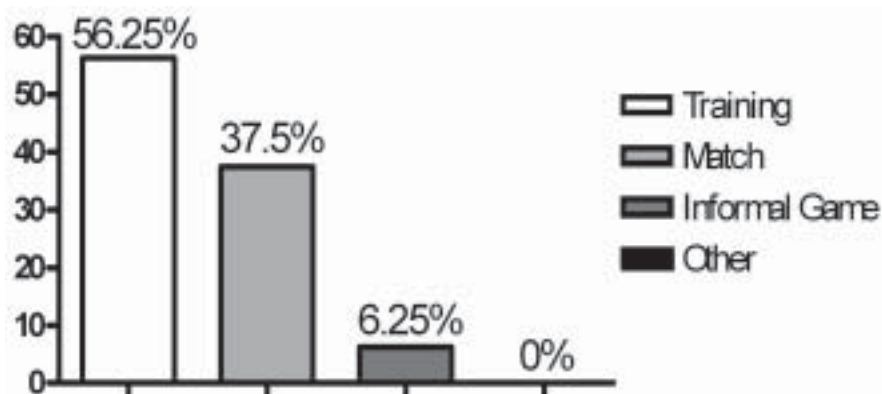


FIGURA 2 - of occurrence of the ankle sprains in 2006

Among the injuries in training (56.25% of the total), 66.67% occurred in collective training (ie, a match played between the main team and the reserve team), 22.22% occurred in recreational training (characterized by the athletes' casual attitude, almost a recreational game), and 11.11% occurred in tactical training (ie, similar to collective training, but with more emphasis on the execution of plays as programmed by the coach).

Injury mechanisms were divided into struggle for ball possession on the ground, struggle for ball possession in the air (in other words, landing), ball carrying, kick or pass, alone without the ball, and others. These data are shown in Figure 3.

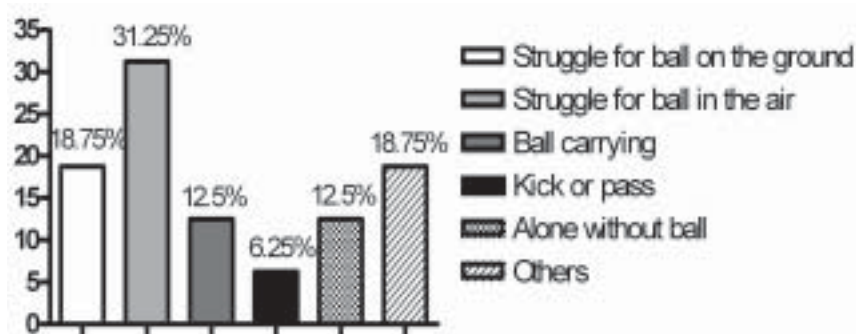


FIGURA 3 - mechanism of the sprains happened in 2006

The treatment received by the athletes in the ankle sprains in 2006 was as follows: 62.5% of the sprains forced the athlete's withdrawal from the sporting activities, 6.25% were treated with immobilization, and 50% underwent physiotherapy. No athletes required surgical intervention.

DISCUSSION

Ankle sprains are frequent in professional futsal athletes, affecting 75.38% of the test subjects at least once in their careers. Among the teams, Brazil and the Czech Republic had the largest percentage of athletes with ankle sprains (91.66%), followed by Chile (84.61%), Croatia (72.72%), Italy (50%), and Argentina (45.45%).

However, we cannot compare our results with most of the studies of the area, because they addressed the percentage of ankle sprains in relation to the total number of injuries, while we focused on the percentage of injured athletes.

Authors have tried to relate the athlete's dominant foot with the affected ankle. Of all the athletes with a history of ankle sprain, the ankle of the dominant limb (ie, kicking leg) was injured in 24.59% of the cases and the nondominant limb in 12.24%; most (63.27%) had sprains in both ankles. In other words, except for the athletes with bilateral injuries, twice as many athletes injured the dominant ankle than the nondominant ankle. Ekstrand and Gillquist (21) also observed the most of the ankle sprains affected the dominant limb in soccer athletes.

Because the dominant limb has more developed motor coordination than the nondominant limb, we might expect fewer ankle sprains in the former. According to Lentell et al. (22) the proprioceptive deficit increases the risk of occurrence of this injury. However, we believe these numbers can be explained in the following way: the dominant limb is the one that is more accomplished at kicking, being used for that function most of the time, while the nondominant limb consequently takes on a support function. These actions, repeated daily in trainings and games, would create a pattern, so that the dominant limb would "specialize" in the kick and the nondominant limb in the support. Therefore,

the dominant limb is less effective than the nondominant limb when support is required, which corresponds precisely to the mechanism of the great majority of ankle sprains. This fact emphasizes the importance of training both legs, both for injury prevention and skills development.

From among the athletes with a history of ankle sprain, 61.22% has already had at least one recurrence. This finding is consistent with the results of Thacker et al. (17) who noted that the most common risk factor for ankle sprains in athletes is a previous history of this injury.

Persistent symptoms including pain, instability (feeling of a "limp" ankle), insecurity, and staggering were described by 18.37% of the athletes in the ankles with a previous sprain history. The interval between injuries was not specified. Saunders (18) stated that symptoms such as pain and instability account for 20% to 50% of the cases of ankle sprains.

Several authors have described the use of external immobilization methods to prevent ankle sprains. Among these, the review by Thacker et al. (17) stands out, where the authors mention more than 40 studies on the subject. In our research, of the 49 athletes who already had ankle sprains, 25 (51.02%) used some type of protection (pads, tightening of the limb with bandages, adhesive plaster boot, etc.) in that area. Junge and Dvorak (1), after a review of 14 randomized studies, stated the use of some external ankle supports can to prevent sprains during sports such as soccer and are especially recommended for athletes with previous history of sprains.

Junge and Dvorak (1) also stated that neuromuscular (or proprioceptive) training is an important factor in injury prevention. According to Stasinopoulos (23) proprioceptive training has been used to prevent ankle sprains since 1965, when Freeman was the first to proposed it. However, Andrews et al. (24) concluded that the ideal method, modality, duration, and frequency have not yet been scientifically determined.

Stasinopoulos (23) suggested that improvements in technique can be an important injury prevention measure and should be taught to the athletes by the coaches. This author mentions the works of Ekstrand and Tropp (20), who reduced the incidence of ankle sprains in amateur soccer athletes with a program of specific technical training. In a group of amateur volleyball players, Bahr et al. (25) implemented a prevention program merging specific technical training and proprioceptive training. As a result, they achieved a 50% reduction in the incidence of ankle sprains.

In addition to its unique characteristics of speed and intensity of the struggle for ball possession, futsal is a sport that demands intelligence, movement, and speed from the athletes. The futsal player needs to know how to act in all sections of the court, performing different tactical functions (defending and attacking with the same skill and enthusiasm). Except for the goalkeepers, the line athletes (fullbacks, wingers, and pivots) are not limited to a single specific function during a match. Therefore, correlating the incidence of injuries with tactical positions becomes relatively meaningless.

Of the 65 athletes who participated in our study, 14 (21.53%) had an ankle sprain in 2006: 6 athletes (42.86%) injured the dominant limb, 6 (42.86%) injured the nondominant limb, and 2 (14.28%) had sprains in both ankles. This equal injury incidence in the dominant and nondominant limbs contradicts both the data collected by Ekstrand and Gillquist (21) and our own findings relating to the athletes' histories of ankle sprains.

Of the 16 injuries in 2006, 13 (81.25%) resulted from inversion mechanisms and 3 (18.75%) from eversion mechanisms. It is believed that the inversion mechanisms are responsible for 85% to 90% of ankle sprains (14). These numbers seem to prove what some authors have described about the predisposition of the lateral area to suffer sprains. The strong deltoid ligament increases stability on the medial aspect, and the lateral malleolus limits the outward motion of the foot; on the sides, the ligaments present insufficient resistance to ankle inversion when demands are imposed by sport (13, 24).

In 2006, the most of the ankle sprains occurred at the beginning and in the middle of the season (37.5% each), followed by the pre-season (before the beginning of the championships, with 18.75%) and, lastly, the end of the season (6.25%). We found no other studies of injuries according to the time of season, and we suggest that perhaps due to the dates of data collection (October), the end of season injuries were the least frequent ones.

As for activity practiced by the athlete when he had the injury in 2006, the most ankle sprains (56.25%) occurred in training, compared with only 37.5% in matches. This fact is probably because professional athletes spend more time in practices and training than in games. Yet, just 1 injury (representing 6.25% of the total), happened during a recreational practice (informal game), which shows us that even high-level athletes are subject to injuries during leisure activities.

We tried to identify the type of training that was being practiced when the 2006 injuries occurred. "Collective training" (matches between the main team and the reserves) were responsible for 66.67% of all ankle sprains sustained in training. This finding can be justified by the fact that this type of training is similar to the match itself, with the athletes moving more and struggling for ball possession, thus allowing for more physical contact.

Recreational training was responsible for 22.22% of training injuries. Here, the athletes play mostly for fun (almost like a recreational game). The reduced concentration level may predispose athletes to injuries.

In 2006, the struggle for ball possession in the air (landing) accounted for 31.25% of injuries, followed by ball possession on the ground (18.75%), ball carrying and being alone without ball (12.5% each), and kicking or passing (6.25%). "Other mechanisms" also turned out to be an important category at 18.75%, mostly for goalkeepers, who perform movements different from those describe in the questionnaire, such as defending shots with the lower limbs. Perhaps futsal athletes are not adapted to the aerial plays that demand jumping and landing, because the sport is played mostly with the ball rolling on the court.

Of the 16 injuries in 2006, 8 (50%) were recurrences and 6 (or 37.5%) had persistent clinical symptoms (such as pain and instability) at the time of data collection. These findings are consistent with those of authors such as Thacker et al. (17) and Saunders (18) regarding the predisposition of injured ankles to recurrent sprains and the likelihood of chronic pain and/or instability after a sprain. A previous history of ankle sprain and inadequate rehabilitation as risk factors for future injuries has been described already by Arnason et al. (26), Dvorak et al. (27), Inklaar (28) and Hawkins et al. (29).

Withdrawal from sporting activities was necessary in 62.5% of our subjects. In 6.25%, temporary immobilization of the ankle, be it with casts, plaster, pads, or bandages, was enough. Physiotherapy was carried out in 50% of the athletes, and surgical intervention in any subjects.

Based on the literature available, it is difficult to establish guidelines for the treatment received by the athletes, because we did not determine the severity of our athletes' injuries. Thus, withdrawing the athlete from sporting activities for a certain period of time seems to be the choice of both South American and European medical departments. The excellent results achieved by physiotherapy in athletes receiving conservative treatment of ankle sprains has been described by Mattacola and Dwyer (30).

Our study confirms the ankle sprain as a frequent injury in athletes at the highest level of futsal, a sport that, in spite of its world ascension, has not been well studied with regard to injury epidemiology. Epidemiology studies can be considered the first step to enhance our knowledge regarding an injury. Thus, we hope that the data presented here serve as a base to improve ankle sprain injury prevention and rehabilitation programs for athletes, in order to avoid, as much as possible, removing athletes from sport and, consequently, improving their performance.

REFERENCES

1. Junge A, Dvorak J. Soccer injuries: a review on incidence and prevention. *Sports Med.* 2004;34(13):929-38.
2. FGFs - Federacy of Futsal of Rio Grande do Sul (Brazil). The Futsal, Futsal in the World [Internet]. 2006. [cited 2006 Nov 25]. Available from: http://www.futsalrs.com.br/base_interna.asp?m=2.
3. CBFs - Brazilian Confederation of Futsal. Who We Are, Origin [Internet]. 2006. [cited 2006 Nov 25]. Available from: <http://www.cbfs.com.br/novo/origem.asp>.

4. Engstrom B, Johansson C, Tornkvist H. Soccer injuries among elite female players. *Am J Sports Med.* 1991;19(4):372-5.
5. Faude O, Junge A, Kindermann W, Dvorak J. Injuries in female soccer players: a prospective study in the German national league. *Am J Sports Med.* 2005;33(11):1694-700. Epub 2005 Aug 10.
6. Emery CA, Meeuwisse WH, Hartmann S. Evaluation of risk factors in adolescent soccer: implementation and validation of an injury surveillance system. *Am J Sports Med.* 2005;33(12):1882-91. Epub 2005 Sep 12.
7. Kakavelakis KN, Vlazakis S, Vlahakis I, Charissis G. Soccer injuries on childhood. *Scand J Med Sci Sports.* 2003;13(3):175-8.
8. Hawkins RD, Fuller CW. A prospective epidemiological study of injuries in four English professional football clubs. *Br J Sports Med.* 1999;33(3):196-203.
9. Morgan BE, Oberlander MA. An examination of injuries in major league soccer. The inaugural season. *Am J Sports Med.* 2001;29(4):426-30.
10. Emery CA, Meeuwisse WH. Risk factors for injury in indoor compared with outdoor adolescent soccer. *Am J Sports Med.* 2006;34(10):1636-42. Epub 2006 May 9.
11. Putukian M, Knowles WK, Swere S, Castle NG. Injuries in indoor soccer. The Lake Placid Dawn to Dark Soccer Tournament. *Am J Sports Med.* 1996;24(3):317-22.
12. Junge A, Dvorak J, Graf-Baumann T, Peterson L. Football injuries during FIFA tournaments and the Olympic Games, 1998-2001: development and implementation of an injury-reporting system. *Am J Sports Med.* 2004;32(1 Suppl):80S-9S.
13. Hammil J, Knutzen KM. Biomechanical basis of human movement. New York: Williams & Wilkins; 1995.
14. Pacheco AM, Vaz MA, Pacheco I. Evaluation of the time for the electromyographic response in volleyball players and non-athletes who had ankle sprain. *Braz J Sports Med* 2005;11:325-30.
15. Pahor S, Toppenberg R. An investigation of neural tissue involvement in ankle inversion sprains. *Man Ther.* 1996;1(4):192-197.
16. Giza E, Fuller C, Junge A, Dvorak J. Mechanisms of foot and ankle injuries in soccer. *Am J Sports Med.* 2003;31(4):550-4.
17. Thaker SB, Stroup DF, Branche CM, Gilchrist J, Goodman RA, Weitman EA. The prevention of ankle sprains in sports. A systematic review of the literature. *Am J Sports Med.* 1999;27(6):753-60.
18. Saunders EA. Ligamentous injuries of the ankle. *Am Fam Physician.* 1980;22(2):132-8.
19. Hubbard TJ, Hertel J. Mechanical contributions to chronic lateral ankle instability. *Sports Med.* 2006;36(3):263-77.
20. Ekstrand J, Tropp H. The incidence of ankle sprain in soccer. *Foot Ankle.* 1990;11(1):41-4.
21. Ekstrand J, Gillquist J. Soccer injuries and their mechanisms: a prospective study. *Med Sci Sports Exerc.* 1983;15(3):267-70.
22. Lentell G, Baas B, Lopez D, Mcgure L, Sarrels M, Snyder P. The contributions of proprioceptive deficits, muscle function, and anatomic laxity to functional instability of the ankle. *J Orthop Sports Phys Ther.* 1995;21(4):206-15.

23. Stasinopoulos D. Comparison o three preventive methods in order to reduce the incidence of ankle inversion sprains among female volleyball players. *Br J Sports Med* 2004;38:182-185.
24. Andrews J, Harrelson G, Wilk K. *Physical rehabilitation of the injured athlete*. 3rd ed. Philadelphia, PA: Saunders; 2004.
25. Bahr R, Lian O, Bahr IA. A twofold reduction in the incidence of acute ankle sprains in volleyball after the introduction of an injury prevention program: a prospective cohort study. *Scand J Med Sci Sports*. 1997;7(3):172-7.
26. Arnason A, Sigurdsson SB, Gudmundsson A, Holme I, Engebtsen L, Bahr R. Risk factors for injuries in football. *Am J Sports Med*. 2004;32(1 Suppl):5S-16S.
27. Dvorak J, Junge A, Chomiak J, Graf-Baumann T, Peterson L, Rösch D, et al. Risk factor analisys for injuries in football players: possibilities for a prevention program. *Am J Sports Med*. 2000;28(5 Suppl):S69-74.
28. Inklaar H. Soccer injuries II: aetiology and prevention. *Sports Med*. 1994;18(2):81-93.
29. Hawkins RD; Hulse MA; Wilkinson C, Hodson A, Gibson M. The association football medical research programme: an audit of injuries in professional football. *Br J Sports Med*. 2001;35(1):43-7.
30. Mattacola CG, Dwyer MK. Rehabilitation of the ankle acute sprain or chronic instability. *J Athl Train*. 2002;37:413-29.

Recebido: 25/04/2008

Received: 04/25/2008

Aprovado: 04/08/2008

Approved: 04/04/2008