Injury rates of the German Women's American Football National Team from 2009 to 2011

Marco Ezechieli,1 Stephan Berger,1 Christian-Helge Siebert,1 Oliver Miltner2
1Department of Orthopaedic Surgery, Hanover Medical School, Hannover; 2Department for Comprehensive Orthopedics and Traumatology, Berlin, Germany

Abstract

American football is one of the leading causes of athletic-related injuries. Injury rates in female elite players are mostly unknown. We hypothesized that the injury rates of female was comparable to those in men’s football during practice, as well as games. From 2009 to 2011, injury data were collected from the German female national team during training camps, World Championship 2010 and International friendly matches. The injury was categorized by location on the body and recorded as fracture/dislocation, strain, concussion, contusion or other injury. Injury rates were determined based on the exposure of an athlete to a game or practice event. The injury rate was calculated as the ratio of injuries per 1000 athlete exposures (AE). The rate of injury was significantly higher during games (58.8/1000 AE) than practice sessions with the national team (11.24/1000 AE). Our findings show that injury rates were determined based on the exposure of an athlete to a game or practice event. The injury rate was calculated as the ratio of injuries per 1000 athlete exposures (AE). The rate of injury was significantly higher during games (58.8/1000 AE) than practice sessions with the national team (11.24/1000 AE). Our findings show that injury rates were determined based on the exposure of an athlete to a game or practice event. The injury rate was calculated as the ratio of injuries per 1000 athlete exposures (AE).

Introduction

Football is a dynamic and fast sport, which came to Germany after the occupation following the Second World War. The German Football Association (AFVD) was founded in 1982. The first official female match took place in 1987, followed by the first official season with 6 teams in 1990. During the following years, the first and second division developed with 7, respectively 8, teams with nearly 300 active female players. In 2009 the preparations started for the first female World Championship in Sweden 2010. In 2010, 40,051 members were officially registered in the AFVD, 14,705 of them female. This number has nearly doubled since the year 2000 with 18,875 members. In the USA, female football is organized in the Independent Women’s Football League - IWFL, which consists of more than 1800 athletes spread across 51 teams. According to the Sporting Manufacturers Association, more than 120,000 American woman played tackle football at least 26 times in 2008. There are several studies that describe the injuries in men’s professional, as well as in college football and in youth leagues. To date no other study has assessed the frequency of injuries in female players and none examined the risk factors for injury in this group. The purpose of this study was to describe the epidemiology of injury in female football players.

Materials and Methods

The injury data were collected from the German national team in the years 2009 to 2011. Injury rates were determined based on the exposure of an athlete to a game or practice event. An athlete exposure was defined as 1 athlete participating in 1 practice or game. The injury rate was calculated as the ratio of injuries per 1000 athlete exposures (AE).

Injury classification

Injuries were classified by the medical staff and categorized as a strain, sprain, concuss, contusion, fracture/dislocation, or other injury. The injury was further categorized by anatomic location (hand, shoulder, knee, ankle). For the purpose of data collection, multiple types of injury were grouped under a single injury classification. For example, both anterior and medial collateral ligament (ACL, MCL) sprains were classified as knee sprains, and high and low ankle sprains were classified as ankle sprains. Shoulder sprains included all acromioclavicular joint sprains as well as shoulder injuries that were not classified as a dislocation or subluxation. Hand sprains included wrist and finger sprains. Contusions included soft tissue and bony contusions in any anatomic location and muscle strains of the thigh and the calf were classified together.

The length of time missed was calculated by determining the number of days an athlete missed practice after a specific injury. The total days missed was the sum of the days an athlete was out and prohibited from participating in regular team practice. In addition, injury severity was divided into 4 groups (A to D) based on the amount of time missed. An injury received grade A if the athlete missed less than 7 days; B, 7 to 14 days; and C, more than 14 days. All athletes who received an A, B, or C grade were able to return to play. A grade D, or major injury, was defined as an injury event that resulted in the athlete needing surgery that required more than 8 weeks of restricted activity and/or being placed on injured reserve. Athletes who were placed on injured reserve or required surgery were excluded from the remainder of the respective training camp.

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Correspondence: Marco Ezechieli, Department of Orthopedic Surgery, Hannover Medical School (MMH), Anna-von-Borries-Strasse 1-7, 30625 Hannover, Germany. Tel. +49.5115356537. Fax: +49.5115354685. E-mail: marco.ezechieli@ddh-gruppe.de
Results

During the two-year follow up, 87 players participated in tryouts, training camps, the World Championships and friendly games. The average age of the players was 26.3 years (range 17-43), the average height was 172 cm (range 158-196 cm) and an average weight of 79.4 kg (range 56.8-135.0 kg). A total of 37 injuries were recorded, 24 occurred during practice and 13 in a game. The injury rate during games was 58.8/1000 AE, in practice 16.3/1000 AE, overall injury rate was 21.5/1000 AE (Table 1).

The rate of injury during tryouts in 2009 and 2010 was 24.0/1000. This was significantly higher than that seen during the practice sessions in 2010 and 2011 with injury rates of 10.4 and 12.8/1000 AE, respectively (Figure 1). The most common injuries during practice sessions were sprains (33.3%) and contusions (20.8%) followed by muscle strains with 16.7% and fractures/dislocations with 12.5%. Specifying the last group consisted of 2 ACL-ruptures and 1 Rookwood III injury, all of which were operated. Concussions were described in 8.3% of the cases, while heat stroke was seen in 8.3% (Figure 2). All heat strokes occurred on a single day with temperatures over 34°C (93.2°F) although sufficient liquid substitution was given throughout the practice. The specifications of the injuries are shown in Table 2. The injury severity was described in the days of time loss after injury and divided into 4 groups. Grade A (time loss <7 days) was documented in 62.5% of the cases, followed by Grade B with 16.7% and Grade C with 8.3%. Severe injuries that lead to an operation were described with 12.5%. Specifically we recorded one acromioclavicular joint rupture type Rookwood III, which was arthroscopically reconstructed with a double tightrope technique and 2 ACL-ruptures that

| Table 1. Total injuries and exposures during 2009–2011 in the German Women’s American Football National Team. |
|---------------------------------------------------------------|
| Practice | Game | Total |
|---|---|---|
| Injuries | 24 | 13 | 37 |
| Exposures | 1472 | 221 | 1693 |
| Injury rate/1000 AE | 16.3 | 58.8 | 21.9 |

| Table 2. Specification of the practice injuries from the years 2009–2011. |
|---------------------------------------------------------------|
| Summary of practice injuries of German National Team |
| Tryouts 2009/2010 | Practice 2010 | Practice 2010 | Total |
|---|---|---|---|
| Injuries/1000 AE | 24.5 | 10.4 | 12.8 | 16.3 |
| Specific injuries | 1x AC separation | 2x ACL rupture | 2x heat strokes | 2x muscle strain |
| | 1x concussion | 1x ankle sprain | 1x contusion | 1x muscle strain |
| | 2x capsule injury finger | 1x ankle sprain | 2x capsule injury finger |
| 1x acute lumbar sprain | 3x contusion | 2x muscle strain | 1x cut hand |

| Injury severity (days%) |
|-------------------------|
| Grade A (<7 days) | 7 (50%) | 5 (75%) | 3 (75%) | 15 (62.5%) |
| Grade B (7–14 days) | 2 (14.3%) | 1 (25%) | 1 (25%) | 4 (16.7%) |
| Grade C (14 days) | 2 (14.3%) | 0 | 0 | 2 (8.3%) |
| Grade D (major) | 3 (21.4%) | 0 | 0 | 3 (12.5%) |

AE, Athlete exposures; ACL, anterior cruciate ligament; AC, acromioclavicular

| Table 3. Injuries of the 4 games in detail. |
|--------------------------------------------|
| GER-CAN | GER-SWE | GER-FIN | GER-FIN |
|---|---|---|---|
| 1. Cervical sprain | 1. Concussion | 1. Knee sprain | 1. Rupture MCL |
| 2. Calf strain | 2. Forearm contusion | 2. Ankle sprain | 2. Ankle sprain |
| | 3. Patella luxation | | 3. Capsule injury finger |
| | 4. Capsule injury finger | | 4. Capsule injury finger |

GER, Germany; CAN, Canada; SWE, Sweden; FIN, Finland; WC, World championship; MCL, medial collateral ligament.

Figure 1. Injury rate /1000AE during 2009–2011 in practice (tryouts, preparation camps and training) (Star: Significance between Tryouts and Camp).

Figure 2. Most common injuries during practice. Circle: Injuries in total numbers. On the right: Percentage of injuries in subdivided injury groups.
Discussion and Conclusions

Previous studies have examined injury rates in middle school, high school, and collegiate football players.4-10 Up to the present point in time no study exists describing the epidemiology of injuries in female football players. Brian et al. showed the injury rates in NFL training camps in the years 1998 to 2007. Early studies suggested that there are between 300,000 and 1.2 million injuries annually during the high school football season.11,12 Injury rates have been found to increase as the level of competition increased. Shankar et al. recently compared injury rates between collegiate and high school football players. The injury rate during practice was 2.56/1000 AE in high school and 5.77/1000 AE in college. The injury rate in professional male football though was documented with 13.6 per 1000 AE, more than double that seen in college. Similarly, the injury rate in games also increases from high school, to college, to the professional level. One explanation may be in part due to the fact that the players are faster, bigger and more skilled. This may lead to higher impact forces in contact sports. In our study, for the first time, female injury rates of elite female American football are presented. The results with 16.3/1000 AE in practice and 58.8/1000 AE during games are comparable to those described for male elite football above. We observed that during the tryouts the injury rates significantly higher than in training following the selection of the national team. This may be due to the high motivation of the players, along with the bad training conditions found in our particular case. The limited involvement of the medical team, as well as minimal time allowed for regeneration, was also not helpful. In the further course it was possible to reduce the injury rates during training sessions before and during the world championship, as well as for the international games. However, the rate of muscular strains - the main injury incurred at all levels during practice - remains unclear. One explanation may be the amount of training at each level, leading to overuse-type injuries in the elite athlete. Additionally, there may be also age-related changes in the muscle-tendon junction that cause the older professional athlete to be at a higher risk of overuse-type injuries.

There are some limitations to this study. First, this study did not differentiate between certain types of injuries within a specific anatomic region. For example, high and low ankle sprains were not differentiated. This study also did not delineate what type of practice (contact or non-contact) caused an injury. Albright et al. found that scrimmages and contact practices were responsible for a significantly greater risk of injury. Other contact sports, including rugby and Australian football, have been found to have an increased number of training injuries during the latter part of practices. The two heat strokes reported in this study took place on a single day and are therefore not representative due to the varying weather conditions during the following years. Another limitation is the small number of AE compared to other studies, but due to the short history of women’s American football in Europe these are the first results in this field. The data demonstrates a trend that we are going to follow in the next European Championship, World Championship and international games.

References

1. American Football Verband Deutschland E.V. Neuer Mitgliederrekord: 40.051 Mitglieder im AFVD. Available from: http://www.afvd.de/text.php?Inhalt=newsmeldung&ID=6325&HP=AFVD
2. Svenska Amerikansk Fotbollförbundet. Förbundet. Available from: http://info1.idrottonline.se/SvenskaAmerikanskFotbollforbundet/Forbundet/
3. Feeley BT, Kennelly S, Barnes RP, et al. Epidemiology of national football league training camp injuries from 1998 to 2007. Am J Sports Med 2008;36:1597-603.
4. Turbeville SD, Cowan LD, Asal NR, et al. Risk factors for injury in middle school football players. Am J Sports Med 2003;31:276-81.
5. Culpepper MI, Morrison T. High school football game injuries from four Birmingham municipal fields. Am J Med Sci 1987;24:378-82.
6. DeLee JC, Farney WC. Incidence of injury in Texas high school football. Am J Sports Med 1992;20:575-80.
7. Powell JW, Barber-Foss KD. Injury patterns
in selected high school sports: a review of the 1995-1997 seasons. J Athletic Training 1999;34:277-84.
8. Shankar PR, Fields SK, Collins CL, et al. Epidemiology of high school and collegiate football injuries in the United States, 2005-2006. Am J Sports Med 2007;35:1295-303.
9. Adickes MS, Stuart MJ. Youth football injuries. Sports Med 2004;34:201-7.
10. Albright JP, Powell JW, Martindale A, et al. Injury patterns in big 10 conference football. Am J Sports Med 2004;32:1394-404.
11. National Collegiate Athletic Association (NCAA) Injury Surveillance System. Indianapolis, IN: NCAA; 2006. Available from: http://www.ncaa.org/membership/ed_outreach/health-safety/iss/index.html. Accessed on: February 16, 2008.
12. National Federation of State High School Associations. NFHS Participation Figures Search. Available at: http://www.nfhs.org/custom/participation_figures/default.aspx. Accessed February 16, 2008.
13. Orchard J, Seward H. Epidemiology of injuries in the Australian Football League, seasons 1997-2000. Br J Sports Med. 2002;36:39-44.
14. Brooks JH, Fuller CW, Kemp SP, et al. Epidemiology of injuries in English professional rugby union. Part 2: training injuries. Br J Sports Med. 2005;39:767-75.