

# LESSONS LEARNED FROM TWO DECADES OF INJURY SURVEILLANCE IN ELITE FOOTBALL

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In 2001, UEFA (Union of European Football Associations) commenced a research project that aimed to reduce the number and severity of injuries and, therefore, increase safety in football. This initiative was the culmination of several years of preparatory work by the UEFA Medical Committee as well as internal discussions within UEFA on optimal study design and standardizing the definitions of injury.

## WHY AND HOW IS THE UEFA INJURY SURVEILLANCE CARRIED OUT?

The so-called UEFA Elite Club Injury Study (ECIS) has subsequently been run every season for the last 18 years with more than 50 top European football clubs

being recruited from 20 different countries. The study has been conducted by the Football Research Group (FRG) at Linköping University in Sweden, under the leadership of Prof. Jan Ekstrand, the former vice-chairman of the UEFA Medical Committee and now Chief Medical Officer at Aspetar Orthopaedic and Sports Medicine Hospital in Doha, Qatar.

The design of the study is aligned with the FIFA (Fédération Internationale de Football Associations)-UEFA consensus statement on injury definitions and data collection procedures<sup>1</sup> and the general methodology is reported in detail elsewhere<sup>2</sup>. Injury surveillance work using the same study design has subsequently

been introduced into other regions and leagues around the world, such as the Asian Football Confederation (AFC)<sup>3</sup>.

## *Which teams are invited to participate and how is injury defined?*

UEFA invited the 32 clubs that qualify for the UEFA Champions League to participate in the study. To allow increased continuity and prevent teams from potentially leaving the study, clubs that have participated earlier but have not made the 32-team list in the current year are permitted to continue their involvement. Within each team, all first team squad members are invited to participate. In the study, an injury is defined as any physical complaint sustained by



a player that occurred during a football training or match which resulted in the player being unable to participate in future football training or match play (i.e. a time loss injury)<sup>1,2</sup>. The player is then considered to be injured until the club medical staff have allowed him full participation in training or match play.

#### ***Feedback of results and information to clubs is vital for participation***

During each season all participating clubs receive reports at three different time points: after preseason, at mid-season, and post-season. These reports summarize the results for their club together with the average data from all participating clubs. To maintain confidentiality this is done without revealing the names of other participating teams. These reports enable club medical and coaching staff to proactively introduce injury prevention measures. It also allows clubs to closely examine variations in both injury incidence and their characteristics within- and between seasons. In addition,

clubs also receive an instrument to evaluate the effect of any prevention measures implemented during the season.

#### **LESSONS LEARNED TO GUIDE THE FUTURE**

##### ***Lesson 1: Injuries influence players' availability***

Since the study's inception, more than 17,000 injuries have been reported. The data shows that a male professional football team with 25 players in its squad can expect approximately 50 time-loss injuries each season, which results in an average of two injuries per player<sup>4</sup>. The impact of injuries on team performance is huge, as almost 12-14% of the squad would be unavailable due to injuries at any time during the season.

##### ***Lesson 2: The injury risks vary between countries in Europe***

Waldén et al studied the influence of climate types on injury epidemiology in men's professional football in Europe<sup>5</sup>. They reported that teams located in northern Europe, which typically have milder

summers and cooler winters (teams from England, Scotland, Germany, Holland, Belgium, northern France and northern Italy) had a higher incidence of injury when compared to teams from southern Europe which tend to have a Mediterranean climate (teams from Spain, Portugal and middle or southern Italy). The injuries that followed this general trend include both traumatic and overuse injuries. However, the incidence of anterior cruciate ligament (ACL) injury, and in particular non-contact ACL injury, followed a reverse trend with teams with a Mediterranean climate experiencing more ACL injuries. The authors suggested that the reason for the higher risk of ACL injuries in Mediterranean countries could be higher shoe-surface traction resulting from a warmer climate.

##### ***Lesson 3: Thighs are the most injured***

Between 85-90% of all injuries are to the lower extremity, with the most common sites among elite male players being the thigh (25%), knee (18%), hip/groin (14%) and ankle (14%). A majority of these injuries are due to trauma (70%), with the remainder being due to overuse (30%).

##### ***Lesson 4: Muscle injuries are the most common at the elite level***

Muscle injuries are a substantial problem for both players and their clubs. They constitute almost one third of all time-loss injuries in men's professional football, and 92% of all injuries affect the four major muscle groups of the lower limb<sup>6,7</sup>. Hamstring injuries are most frequently reported, which probably relates to the speed of the game at the elite level. A team consisting of 25 players in the squad can expect an average of 15 muscle injuries per season, with approximately 6-7 of them affecting this muscle group<sup>8</sup>. The average time to return to sport for all muscle injuries is around 16 days, but there can be large variations in this figure. Factors such as the muscle(s) involved, type, and size of injury are all potential sources of variance.

##### ***Lesson 5: At elite level, imaging may be advantageous***

Magnetic Resonance Imaging (MRI) can be used to verify the diagnosis and prognosis of a hamstring injury. Radiological grading

(categorizing the severity of muscle injury by analyzing MRI images taken 1-2 days post-injury) demonstrated a relationship with the time to return to sport<sup>8</sup>. Most hamstring injuries (70%) seen in professional football are of radiological grade 0 or 1, indicating no signs of fiber disruption, however, these are still responsible for the majority of absentee days.

**Lesson 6: More muscle injuries happen during matches, and in older players**

The risk of muscle injury is six times higher in matches compared to training. The fact that muscle injuries are more frequently seen towards the end of each half of play suggests that fatigue is a factor<sup>6</sup>. Furthermore, the risk of injury of the hamstring and calf muscles increases with age.

**Lesson 7: Almost all male elite footballers with ACL injuries return to full play, but it takes 6-7 months**

The ECIS also includes sub-studies of specific injuries. With respect to ACL injury, Waldén et al<sup>9</sup> reported that under ideal circumstances, more than 90% of players can return to football at an equivalent level of play compared to pre-injury. Injuries to the ACL only make up around 1-2% of all time loss injuries; however, they are associated with the longest time to return to sport. A male elite team with a squad of 25 players can expect an average of one ACL injury every second season. Female footballers have a 2-3 times higher ACL injury risk when compared to their male counterparts. Females also tend to sustain their ACL injuries at a younger age than males. Approximately 19 out of 20 elite football players who sustain an ACL injury end up having an ACL reconstruction. This is consistent with the common opinion that elite level players with an ACL rupture must have surgery to be able to come back on a top level of football. Although some anecdotal and isolated case reports suggest otherwise, at the elite level it is rare for players to return to football without the reconstruction of the ACL.

The elite-level footballer with an ACL injury is presented with a near perfect environment for care. Players are supported by a highly qualified medical team, the

diagnosis of an ACL injury is quickly established (on average within 8 days), allowing very experienced surgeons to perform the reconstruction at an optimal time. An intensive, individually-tailored post-surgical rehabilitation programme then follows, supervised by highly experienced physiotherapists<sup>10</sup>. Under these circumstances, it is possible to achieve greater than 90% rate of return to the pre-injury level of performance.

However, even under the most ideal environment of care, the rehabilitation process is still considerably long after ACL injury. The mean time to return to full team activity after ACL surgery still ranges between 6 to 7 months, and the mean absence before match play is almost 8 months (82% of players return to match play within 8 months).

The fact that it is possible for almost all elite level players to return to football post ACL reconstruction does not necessarily mean that return-to-play is always ideal from a medical point of view. Many elite level footballers suffer from localized swelling and overuse symptoms shortly after their return to football. These signs might indicate that their return is premature<sup>11</sup>.

**Lesson 8: No increased risk of playing on a "football turf" compared to playing on natural grass**

The latest generation of artificial turf surfaces are increasingly being used within

European football. These new pitches offer football-specific features that are similar to those found with well-maintained natural turf pitches. Consequently, in 2004 FIFA decided that matches may be played on artificial surfaces. To this end, the laws of the game (FIFA 2009) state "Where artificial surfaces are used in either competition matches between representative teams of member associations affiliated to FIFA or international club competition matches, the surface must meet the requirements of the FIFA Quality Concept for Artificial Turf or the International Artificial Turf Standard, unless special dispensation is given by FIFA". The FIFA Quality Concept is an evaluation programme consisting of laboratory and field tests which aim to set high quality standards and criteria for artificial surfaces. FIFA and UEFA have introduced the terminology of "football turf" for artificial turf pitches meeting these standards and criteria.

Playing football on older generations of artificial surfaces has been associated with various disadvantages; for example, performance characteristics are believed to change as do the typical injury patterns of the sport<sup>12</sup>. Despite the wide use of turf pitches by non-elite football players, and their obvious advantages such as increased pitch utility and potential to provide year-round pitch quality (regardless of the weather), their acceptance is still limited by elite teams.

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Injury characteristics when playing on artificial turf, in comparison to playing on natural grass, have been studied in both male and female elite level players<sup>13-15</sup>, amateurs<sup>16,17</sup>, youths<sup>18</sup> as well as during tournament play<sup>19</sup>. All these studies have shown no major differences in the overall injury risk between the two surface types.

However, differences may exist in the pattern of injury sustained on these two types of surfaces. There has been some indication of a lower risk of muscle strain when playing on the new generation of artificial turf pitches, although coupled with suggestions of a higher risk of ankle sprain.

***Lesson 9: Traditional preventive methods do not seem to be enough to decrease muscle injuries and severe injuries***

An advantage of the long term ECIS study is that it reveals trends. In a prospective follow-up of the first eleven years of the study (2001-2012), some injury types (such as ankle sprains and medial collateral ligament injuries of the knee) showed a tendency to decrease<sup>20,21</sup>. However, the total injury risk remained the same despite extensive preventative work by the clubs

involved in the study<sup>22</sup>. Hamstring muscle injuries, the most common injury type, even increased from year to year<sup>23</sup>. One reason for this finding may be that the intensity of play at the elite level has increased over time. If this is true, it further strengthens the importance of rethinking our prevention efforts to account for the increase demands of the sport, and achieve buy-in from our elite players to improve compliance with such programmes.

***Lesson 10: We need to think differently to prevent injuries in elite level football***

To further develop our knowledge and processes relating to the ECIS study, UEFA hosts an annual conference with an invitation extended to all head medical officers from participating clubs. These clinicians work 24/7 with the best European football teams containing many of world's best players. When this group was asked in 2013, 'What are the most important factors in preventing injuries in elite level football?', the most common answers were: load on the players, internal communication, leadership style of the coaches and the well-being of players<sup>24</sup>. These answers were considered

surprising at the time, but it demonstrates that the health situation in any professional football club could be considered similar to that found in most workplace environments. For instance, sick leave is dependent on the workload imposed on employees, the leadership style of management, internal communication in the work place as well as the overall well-being of employees.

***Lesson 11: The load on players is frequently measured in elite level teams and it is associated with the injuries, however the predictive power is poor***

McCall et al<sup>25</sup> examined the association and predictive power of internal workload and non-contact injuries during a single season in a sub-group of five ECIS teams. The authors found that the internal acute: chronic workloads (using the session rating of perceived exertion (RPE) scale) of 1:3 and 1:4 weeks are associated with a higher number of non-contact injuries in elite football players. However, these workload markers, when considered in isolation, showed poor predictive ability in identifying individual players who actually went on to develop a non-contact injury.

*Lesson 12: Communication between the head coach/manager and the medical team is vital for maintaining players on the field*

With respect to the quality of internal communication, we sought the opinion of medical staff from elite football teams to determine whether internal communication was in fact correlated with injuries and/or player availability at training and matches<sup>26</sup>. Clubs with good quality internal communication showed fewer injuries and greater player availability when compared to clubs with poor communication. The most notable finding of the study was that internal communication between the head coach and the medical team was of great importance. We found that low or poor communication quality between the head coach and the medical team was significantly associated with the injury rate. Teams with low or poor communication quality had a 6–7% lower player availability at training and matches, and a 50% higher injury burden, when compared to teams with a moderate-high communication quality<sup>26</sup>.

*Lesson 13: The coaches are the most important people for the injury situation in elite level football teams*

Following on from the evidence produced in 2013, we investigated the leadership styles of head coaches in elite men's football to evaluate the association between leadership style, injury rate, and player availability<sup>27</sup>.

The resulting data revealed that a correlation existed between the head coach's leadership style and the incidence of severe injury and player availability; transformational leadership associated with fewer injuries than transactional leadership. To explain this finding further, teams that had coaches with a democratic leadership style had a lower incidence of severe injuries within their teams. The incidence of severe injuries was 29–40% lower in teams where coaches communicated a clear and positive vision of the future, supported their staff members, and gave staff encouragement and recognition<sup>27</sup>.

Further, attendance at training was higher in teams where coaches provided encouragement to their staff members, encouraged innovative thinking, as well as fostering trust and cooperation among its team members<sup>27</sup>.

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*Lesson 14: The key to get attention from coaches: Show the correlation between injuries and performance*

The key for medical teams to gain attention from coaches is to transform medical information into tactical football strategies. The bottom line for any elite level team is performance, with coaches/managers chasing trophies. However, a team can only be successful and win championships if players are available at training and matches.

In a sub-study of the ECIS, Hägglund et al<sup>28</sup> showed that in male professional football, injuries had a significant influence on performance in the domestic leagues as well as in the European cup competitions. These findings stress the importance of injury prevention to increase a team's chances of success.

The association between injury and performance is probably one of the most important messages to convey to the technical/coaching staff and to other stakeholders in professional sports clubs. This message is needed to further improve medical services to players and to bolster injury prevention efforts.

*Lesson 15: The main message from 18 years of injury surveillance in the UEFA study: Communicate and co-operate!*

The findings from the ECIS could be considered as eye opening. The traditional preventative methods aimed at player-related factors such as strength and flexibility have been evaluated in well-designed studies and have been proven to be very effective at both the amateur and

youth level. However, our work conducted to date suggests that this may be insufficient for the demands of elite level football.

Opinions derived from team doctors working in elite football clubs, pointed to the fact that we should be thinking outside of the box. We should not only be considering player-related variables but club/team factors such as load, internal communication, and leadership style. The results from our previous work has shown the association of such factors with injury. The key to keeping elite level players on the pitch and avoiding injury is to widen the horizon and consider other factors that are potentially associated with injury. Communication and co-operation within clubs may be as important as player-related factors.

References available at [www.aspetar.com/journal](http://www.aspetar.com/journal)

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