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SHOULDER

Upper extremity injuries in male elite football players

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Abstract
Purpose To investigate the epidemiology of upper extremity injuries in male elite football players and to describe their characteristics, incidence and lay-off times.
Methods Between 2001 and 2011, 57 male European elite football teams (2,914 players and 6,215 player seasons) were followed prospectively. Time-loss injuries and exposure to training and matches were recorded on individual basis.
Results In total, 11,750 injuries were recorded, 355 (3 %) of those affected the upper extremities giving an incidence of 0.23 injuries/1,000 h of football. The incidence in match play was almost 7 times higher than in training (0.83 vs. 0.12 injuries/1,000 h, rate ratio 6.7, 95 % confidence interval 5.5–8.3). As much as 32 % of traumatic match injuries occurred as a result of foul play situations. Goalkeepers had a significantly higher incidence of upper extremity injuries compared to outfield players (0.80 vs. 0.16 injuries/1,000 h, rate ratio 5.0, 95 % confidence interval 4.0–6.2). The average absence due to an upper extremity injury was 23 ± 34 days.
Conclusions Upper extremity injuries are uncommon among male elite football players. Goalkeepers, however, are prone to upper extremity injury, with a five times higher incidence compared to outfield players.
Level of evidence II.

Keywords Soccer · Incidence · Lay-off times · Re-injury · Goalkeeper

Introduction

Football is one of the most popular sports in the world with more than 260 million active players according to FIFA (Fédération Internationale de Football Associations) [12]. Participation in the sport causes a large amount of acute and chronic injuries in players of every age and at all playing levels [23]. Several studies have investigated the incidence and nature of injuries during football play [2, 6–11, 14, 16–20, 22, 24, 25, 30–34].

It has been estimated that a male elite team with 25 players in the squad can expect about 50 time-loss injuries each season [11]. Due to the way football is played, the injury incidence is higher in the lower compared to the upper extremity, with more than 4 out of 5 injuries located to the lower extremities [2, 6, 11, 14, 31, 32].

Although the pattern of lower extremity injuries is well described, little has been published regarding the incidence, nature and time loss for injuries to the upper extremity in football. The consequence of an injury may differ depending on the body location, for example lower or upper extremity, or the playing situation, for example if sustained by a goalkeeper or an outfield player, and this is also less described in the literature.

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The aim of this study was, therefore, to investigate the epidemiology of upper extremity injuries in male elite football players in Europe and to describe their characteristics, incidence and lay-off times. The hypothesis was that the incidence and injury pattern of upper extremity injuries differ between goalkeepers and outfield players and that lay-off times differ depending on type and location of injury, as well as on playing position.

Materials and methods

Between 2001 and 2011, 57 male European football teams from 16 countries were followed prospectively to compile data of exposure and injuries during training or matches. Three cohorts were followed: the UEFA (Union of European Football Associations) Champions League (UCL), the Swedish top division (SWE) and the artificial turf (ART) cohorts. The 57 teams were followed over a varying number of seasons (1–10 seasons). The UCL cohort comprised 27 professional teams (1,570 players followed for 3,790 player seasons) from 10 European countries. The SWE cohort consisted of 17 teams (718 players and 1,036 player seasons) from the SWE, and the ART cohort included 16 teams (736 players and 1,389 player seasons) from the top two domestic divisions in eight European countries playing their home matches on artificial turf. The player and cohort characteristics are shown in Table 1.

Inclusionary criteria All contracted players from the first team were invited to participate in the study. If a player left the team during the season, their registered data were included for their time of participation.

Table 1 Player and cohort characteristics

	UCL[1]	SWE[1]	ART[1]	Total[1]
No. of players (player seasons[2])	1,570 (3,790)	718 (1,036)	736 (1,389)	2,914 (6,215)
No. of teams (team seasons[2])	27 (142)	17 (45)	16 (56)	57 (243)
No. of injuries overall	7,140	2,110	2,500	11,750
Player anthropometrics[3]				
Age (years)	25.7 ± 4.6[a,c]	24.9 ± 4.7	25.1 ± 4.8	25.5 ± 4.6
Height (cm)	182.3 ± 6.4	183.0 ± 5.9[b]	182.0 ± 6.2	182.3 ± 6.2
Weight (kg)	77.9 ± 7.0	78.9 ± 6.4[b,c]	78.1 ± 6.9	78.1 ± 6.9
Exposure in total (h/player/season[3])	245 ± 86[a,c]	288 ± 87[b,c]	223 ± 103[a,b]	247 ± 93
Exposure training (h/player/season[3])	206 ± 72[a,c]	251 ± 74[b,c]	192 ± 88[a,b]	210 ± 78
Exposure match (h/player/season[3])	39 ± 24[a,c]	37 ± 17[b]	31 ± 20[a,b]	37 ± 22
No. of UEI (% of total no. of injuries)	232 (3)*	48 (2)*	75 (3)*	355 (3)
No. of UEI caused by trauma (% of total in cohort)	216 (94)*	39 (81)*	62 (83)*	317 (90)
No. of UEI caused by overuse (% of total in cohort)	15 (6)*	9 (19)*	13 (17)*	37 (10)
Total UEI incidence[4]	0.25 (0.22–0.28)*	0.16 (0.12–0.21)*	0.24 (0.19–0.30)*	0.23 (0.21–0.26)
UEI incidence, training[4]	0.14 (0.11–0.17)*	0.09 (0.06–0.13)*	0.12 (0.09–0.17)*	0.12 (0.11–0.14)
UEI incidence, match[4]	0.84 (0.70–1.00)*	0.66 (0.44–0.97)*	0.99 (0.73–1.33)*	0.83 (0.73–0.96)
UEI severity (%)				
Slight/minimal (0–3 days)	37 (16)	14 (30)	28 (37)	79 (22)
Mild (4–7 days)	49 (21)	13 (27)	11 (15)	73 (21)
Moderate (8–28 days)	84 (36)	16 (33)	21 (28)	121 (34)
Severe (>28 days)	62 (27)	5 (10)	15 (20)	82 (23)
Re-injuries (%)	27 (12)*	5 (10)*	10 (13)*	42 (12)

UEI upper extremity injury

* No significant difference between cohorts

[1] UEFA Champions League (UCL), Swedish top division (SWE), UEFA artificial turf (ART)

[2] One team or player participating in one season equals one team or one player season, respectively

[3] Values are mean ± standard deviation

[4] Incidence of UEI expressed as no. of injuries/1,000 h of total exposure (95 % CI)

[a] Significant difference between ART and UCL cohorts

[b] Significant difference between ART and SWE cohorts

[c] Significant difference between UCL and SWE cohorts

Exclusionary criteria and dropouts Two teams have been excluded from the study due to delivering of insufficient data. Teams were followed during the full football season, including pre-season and the competitive season. Teams in the UCL and SWE cohorts trained mainly on natural grass and played their home matches on natural grass. Teams in the ART cohort all played on third-generation artificial turf at their home grounds and also trained mainly on artificial turf, while away matches were played mainly on natural grass. Three teams were initially included in the SWE cohort (seasons 2001 and 2002) and then entered the ART cohort due to a change from natural grass to artificial turf playing surface.

Data collection and definitions

The study design followed the consensus on definitions and data collection procedures—for epidemiological studies on injuries in football [13, 15]. The full methodology and the validation of the injury and exposure reporting system and definitions have been described previously [15]. To ensure high reliability of data registration, all teams were provided with a study manual describing the definitions used and procedures to record data, including examples. In addition, all reports were checked each month by the study group, and feedback was sent to the teams in order to correct any missing or unclear data. The manual was translated from English to French, Italian, Spanish, German, Russian and Swedish and distributed to relevant clubs.

Player baseline data were collected annually. Individual player participation in training and matches (minutes of exposure) was registered by the club contact person on a standard exposure form. This included exposures with the first and second team, as well as any national team exposure. The team medical staff recorded injuries on a standard injury form that provided information about the diagnosis, nature and circumstances of injury occurrence. Exposure and injury data were sent to the study group on a monthly basis. All injuries resulting in a player being unable to fully participate in training or match play (i.e. time-loss injury) were recorded, and the player was considered injured until the team medical staff allowed full participation in training and availability for match selection. All injuries were followed until the final day of rehabilitation. The definitions applied in the study are shown in Table 2.

The registration of an upper extremity injury was based on the clinical examination by the team medical staff. No specific diagnostic criteria were sent out in advance. Upper extremity injuries were grouped into shoulder/clavicle, upper arm, elbow, forearm, wrist and hand/finger/thumb. The Orchard Sports Injury Classification System (OSICS) [28] was used to classify specific upper extremity injuries.

Table 2 Study definitions

Training session	Team training that involved physical activity under the supervision of the coaching staff
Match	Competitive or friendly match against another team
Injury	Injury resulting from playing football and leading to a player being unable to fully participate in future training or match play (i.e. time-loss injury)
Upper extremity injury	Overuse or traumatic injury located to the upper extremity leading to a player being unable to fully participate in training or match play
Rehabilitation	A player was considered injured until the team medical staff allowed full participation in training and availability for match selection
Re-injury	Injury of the same type and at the same site as an index injury occurring no more than 2 months after a player's return to full participation from the index injury
Slight/minimal injury	Injury causing absence of 1–3 days from training and match play
Mild injury	Injury causing absence of 4–7 days from training and match play
Moderate injury	Injury causing absence of 8–28 days from training and match play
Severe injury	Injury causing absence of over 28 days from training and match play
Traumatic injury	Injury with sudden onset and known cause
Overuse injury	Injury with insidious onset and no known trauma
Season prevalence	Number of injured players in a season/total number of players in the same season × 100
Injury incidence	Number of injuries per 1,000 player hours [(Σ injuries/Σ exposure hours) × 1,000]

Four grades of severity were used depending on days of absence from training or match; slight/minimal (0–3 days), mild (4–7 days), moderate (8–28 days) and severe (>28 days).

Statistical analyses

ANOVA with Bonferroni post hoc test was used for group comparisons of continuous variables. Group comparisons on categorical variables were analysed with χ^2 test and z test. Injury incidence, calculated as the number of injuries per 1,000 player hours, was analysed with rate ratios (RR) and 95 % confidence intervals (95 % CI) and was significance-tested using z-statistics [26]. All tests were two-sided with the significance level set at $p < 0.05$. Bonferroni adjustment was used for all multiple comparisons.

Written informed consent was collected from each player in accordance with the Declaration of Helsinki. The study protocol involving the SWE cohort was approved by the Regional Ethical Review Board in Linköping, Sweden, and the study protocol for the UCL and ART cohorts was

approved by the UEFA Football Development Division and the UEFA Medical Committee.

Results

Overall, 1,537,936 h of exposure (1,306,761 of training and 231,176 of match play) was registered. In total, 11,750 injuries were registered during the study period, 355 (3 %) of which were located to the upper extremities (Table 1). The injury distribution in training and match play was similar for upper extremity injuries (46 and 54 %, respectively) as for all injuries in total (49 and 51 %, respectively). The incidence of injury to the upper extremities was almost 7 times higher during match play compared with training (0.83 vs. 0.12/1,000 h, RR 6.7, 95 % CI 5.5–8.3, $p < 0.001$). There were no significant differences in injury incidences between the three cohorts (Table 1).

Location and severity of injuries

Of the 355 upper extremity injuries, 56 % involved the shoulder/clavicle, 24 % involved the hand/finger/thumb, and the last 20 % were spread between the elbow (10 %), wrist (5 %), forearm (4 %) and upper arm (1 %). The most common injury type was joint and ligament injury, representing 51 % of all upper extremity injuries, followed by fractures and bone stress (25 %), and injuries to the muscle–tendon (13 %). The distribution of upper extremity injury locations and their severity are shown in Table 3.

Table 3 Location and severity of upper extremity injuries

	Slight/minimal[a], *n* (%)	Mild[b], *n* (%)	Moderate[c], *n* (%)	Severe[d], *n* (%)	Total, *n* (%)
Shoulder/clavicle	42 (21)	42 (21)	67 (34)	46 (22)	197 (56)
Upper arm	2 (40)	3 (60)	0 (0)	0 (0)	5 (1)
Elbow	5 (14)	15 (42)	9 (25)	7 (19)	36 (10)
Forearm	2 (13)	1 (7)	5 (33)	7 (47)	15 (4)
Wrist	4 (24)	1 (6)	10 (59)	2 (12)	17 (5)
Hand/finger/thumb	24 (28)	11 (13)	30 (35)	20 (24)	85 (24)
Total	79 (22)	73 (21)	121 (34)	82 (23)	355 (100)

The approximations of the percentages in table have been made to equal 100 %

[a] 0–3 days of absence

[b] 4–7 days of absence

[c] 8–28 days of absence

[d] >28 days of absence

Table 4 Days of absence and recurrence rates for the 6 most common upper extremity injuries

Diagnosis	*n* (%)[a]	Days of absence[b]	Recurrence rate, %[c]
Shoulder AC joint sprain	45 (13)	11.9 ± 12.1	4
Shoulder dislocation	44 (12)	40.9 ± 43.8	32
Hand metacarpal fracture	29 (8)	16.8 ± 16.5	10
Shoulder rotator cuff tendinopathy	22 (6)	13.6 ± 30.2	14
Hand fracture phalanx finger	21 (6)	19.9 ± 21.8	0
Shoulder AC joint dislocation	17 (5)	21.6 ± 20.0	0

AC denotes acromioclavicular

[a] Percentage of all upper extremity injuries

[b] Values are mean ± SD

[c] Re-injuries in percentage of injury type

Most common injury types

The six most common injury types, representing in total 50 % of all upper extremity injuries, are shown in Table 4 with days of absence and recurrence rates. The two most common injury types were acromioclavicular (AC) joint sprain and shoulder dislocation, representing 25 % of all upper extremity injuries. Shoulder dislocations had the longest lay-off time and the highest recurrence rate of the six injury types, with an average of 41 ± 44 days of absence and with 32 % re-injuries.

Injury circumstances

Ninety per cent of upper extremity injuries were traumatic, while 10 % were overuse injuries. The distribution of traumatic versus overuse injuries was similar in the three cohorts (Table 1). Thirty-five per cent of all overuse injuries affected the rotator cuff. As much as 32 % of the traumatic upper extremity injuries during matches occurred during foul play.

Injuries by playing position

Goalkeepers had a significantly higher incidence of upper extremity injuries compared to outfield players (0.8 vs. 0.16 injuries/1,000 h, RR 5.0, 95 % CI 4.0–6.2, $p < 0.001$). The prevalence of upper extremity injuries per season was consistently higher among goalkeepers compared to outfield players (10–25 % vs. 2–5 %). Of all injuries registered among goalkeepers, 18 % affected the upper extremities. The corresponding proportion among outfield players was 2 % ($p < 0.05$). As seen in Table 5, goalkeepers had more lay-off days and missed more matches and training sessions to all of the most common upper extremity injuries, the difference being significant

Table 5 Days of absence for the most common upper extremity injuries

Diagnosis	Goalkeeper			Outfield player[1]		
	Mean ± SD	Median	Ptile[1] 25–75 %	Mean ± SD	Median	Ptile[1] 25–75 %
Shoulder AC joint sprain	24 ± 16[a]	25	7–34	8 ± 8	6	2–10
Shoulder AC joint dislocation	42 ± 36	42	16–67	18 ± 17	14	8–24
Shoulder impingement/rotator cuff tendinopathy	15 ± 33	5	3–7	6 ± 2	6	5–8
Shoulder rotator cuff tear	116 ± 61	144	46–157	121 ± 2	121	119–122
Shoulder dislocation	78 ± 42	100	30–105	38 ± 43	19	11–61
Elbow olecranon bursitis	22 ± 26	6	5–32	4	4	4
Elbow MCL sprain	21 ± 23	8	4–37	4	4	4
Hand metacarpal fracture	54 ± 12[a]	55	41–65	13 ± 11	11	3–18
Hand phalanx fracture	27 ± 24[a]	26	10–30	9 ± 12	5	3–10

AC denotes acromioclavicular; MCL denotes medial collateral ligament

[1] Ptile = percentile

[a] Significant difference between goalkeeper and outfield player in days of absence, $p < 0.05$

for shoulder AC joint sprain and metacarpal/phalanx fractures ($p < 0.05$).

Consequences of injuries to the upper extremities

Diagnoses, lay-off periods and recurrence rates for the six most common injury subtypes are shown in Table 4. In general, a football team with 25 players can expect 1–2 upper extremity injuries each season. There was no significant difference in the mean absence due to injury between the three cohorts, neither for index nor for re-injuries.

Re-injuries

Overall, 14 % of the registered injuries during the study period were re-injuries. Of the upper extremity injuries, 12 % were re-injuries. There was no significant difference between the three cohorts concerning the distribution of re-injuries to the upper extremity. Re-injury rates of the six most common injury types to the upper extremity are shown in Table 4.

Discussion

The principal finding of this study was that upper extremity injuries only represent 3 % of all time-loss injuries to professional football players. This means that an elite-level team of 25 players can expect 1–2 injuries to the upper extremity each season, as compared to around 40–45 injuries to the lower extremity.

We are not aware of any other studies evaluating upper extremity injuries in football from a field perspective. Sytema et al. [29] found upper extremity injuries to be 27 % of all football injuries at an emergency department. However, studies of injuries at hospitals and injuries at the sport field are not comparable; they use different definitions and data collection methods since they have different purposes. The aim of hospital studies is to evaluate the burden to the general healthcare system, while the aim of field studies is to evaluate the risk and consequences for the athletes and their clubs. In retrospective field studies of American football, Mall et al. [27] and Carlisle et al. [5] found 10 % of all injuries affecting the upper extremity. However, different sports have different injury patterns depending on the way the sport is carried out. Compared to American football, the upper extremity is seldom used in football; there is no ball carrying (except for goalkeepers) and less contact between players. However, for the same reasons, upper extremity injuries might be underestimated in football since outfield players might be able to train and play in spite of upper extremity injuries like finger fractures or AC joint injuries.

Goalkeepers have higher upper extremity injuries rate and longer lay-off

Another interesting finding was that upper extremity injuries were 5 times more common in goalkeepers compared to outfield players. This is in contrast to injuries overall where goalkeepers are reported to sustain fewer injuries than outfield players [3]. Further, the consequences of upper extremity injuries were more serious for goalkeepers than for outfield players. Goalkeepers had more absence days and missed more matches and trainings because of upper extremity injuries, especially for fractures and AC joint sprains. Goalkeepers are allowed to stop the ball with their hands and are often reaching for the ball and landing on the ground with their upper extremities away from their body, which makes them vulnerable to upper extremity injuries.

Shoulder dislocations cause long lay-off and have a high recurrence rate

Shoulder dislocation is the most common dislocation of the human joints in the general population [21]. Four out of the 6 most common injury subtypes in this study affected the shoulder. Dislocation of the shoulder was the most common, and these injuries were also the most severe with an average of almost 1.5 months of lay-off days due to injury. The absence from full training and matches was twice as long for goalkeepers as for outfield players, a reflection of the importance of shoulder function for goalkeepers. Thirty-four per cent of shoulder dislocations were re-injuries, which is relatively high considering the fact that professional football players have access to the highest quality of rehabilitation facilities.

An AC joint lesion is a severe injury for the goalkeeper but minor for the outfield player

An injury to the AC joint has been reported to be the most prevalent type of shoulder injury in contact sports [4]. In this study, it represented 17 % of upper extremity injuries. The consequences for an AC joint lesion in soccer differ significantly between goalkeepers and outfield players, the average absence days being 24 ± 16 versus 8 ± 8 days for an AC sprain and 42 ± 36 versus 18 ± 17 days for an AC dislocation.

Fractures of the metacarpal and phalanx in the hand

The most significant difference between goalkeepers and outfielders can be found in injuries involving the hand. A very obvious reason for this is the fact that goalkeepers require a functional hand to play, while an outfielder in most cases can play with protection on the injured area. The most common hand injury in the present study was fractures. Aitken et al. [1] reported that phalangeal fractures and metacarpal fractures are the most common fractures of the hand in sports in general and these fractures were also the most common in the present study. A metacarpal fracture caused more than 4 times longer absence from football for a goalkeeper compared to an outfield player (54 ± 12 vs. 13 ± 11 days, $p < 0.05$), while a fracture of the finger caused 3 times longer absence (27 ± 24 vs. 9 ± 12 days, $p < 0.05$).

Clinical relevance

In the day-to-day clinical work, it is important to provide information about the absence from sports that is to be expected after specific injuries. The information obtained in this study provides a benchmark in terms of the nature, number and consequences of upper extremity injuries in male elite-level soccer players. The study clearly shows that goalkeepers suffer more upper extremity injuries and also have longer absence times compared to outfield players. As a consequence, clubs should aim for preventive measures specifically for goalkeepers. Further, since almost one-third (32 %) of shoulder dislocations were recurrent injuries, there seems to be a need for improved functional assessment before releasing them to return to play after this injury.

Strength of the study

An obvious strength of this study is its design, with a large and homogenous group of male elite footballers followed prospectively with a standardised methodology that complies with the international consensus agreements on procedures for epidemiological studies of football injuries.

Further, the data in the study are very robust with very little or no data missing since all data in the injury reports are double checked against absence registrations in the attendance forms. Also, to avoid underreporting, injury data have been double checked against the official websites of clubs as well as media.

Limitations of the study

A limitation of the study is that information was not available as to which injuries required surgical intervention and which were treated conservatively. Further, even if a large group of players have been followed for several seasons, some specific diagnoses have few cases and the data for these injuries are less robust, which is reflected by the large standard deviations.

Also, one might argue whether the noticed difference in injury incidence and severity between goalkeepers and outfield players is a real difference or an effect of the time-loss definition used in this study. The same medical diagnosis, for example a phalanx fracture, would cause little or no time loss (median 5 days) for an outfield player, while the consequence for a goalkeeper is substantial time loss (median 27 days). Similarly, there is for the same reason a possible risk of underestimation of the true number of upper extremity injuries in outfield players which might have needed surgery or other medical treatment but did not result in time loss.

Conclusion

Upper extremity injuries are uncommon among male elite football players. Importantly, there is a five times greater injury rate in goalkeepers compared to outfield players,

which should be taken into consideration. The difference in the football-specific demands of a goalkeeper compared to an outfield player is the most likely explanation. Studies that focus on the prevention of upper extremity injuries to goalkeepers would be highly regarded and could be of significant benefit.

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References

1. Aitken S, Court-Brown CM (2008) The epidemiology of sports-related fractures of the hand. Injury 39:1377–1383
2. Árnason Á, Gudmundsson Á, Dahl HA et al (1996) Soccer injuries in Iceland. Scand J Med Sci Sports 6:40–45
3. Árnason A, Tenga A, Engebretsen L et al (2004) A prospective video-based analysis of injury situations in elite male football: football incident analysis. Am J Sports Med 32:1459–1465
4. Bishop JY, Kaeding C (2006) Treatment of the acute traumatic acromioclavicular separation. Sports Med Arthrosc 14:237–245
5. Carlisle JC, Goldfarb CA, Mall N et al (2008) Upper extremity injuries in the National Football League: part II: elbow, forearm, and wrist injuries. Am J Sports Med 36:1945–1952
6. Ekstrand J, Gillquist J (1983) Soccer injuries and their mechanisms: a prospective study. Med Sci Sports Exerc 15:267–270
7. Ekstrand J, Tropp H (1990) The incidence of ankle sprains in soccer. Foot Ankle 11:41–44
8. Ekstrand J, Gillquist J, Liljedahl SO (1983) Prevention of soccer injuries. Supervision by doctor and physiotherapist. Am J Sports Med 11:116–120
9. Ekstrand J, Gillquist J, Möller M et al (1983) Incidence of soccer injuries and their relation to training and team success. Am J Sports Med 11:63–67
10. Ekstrand J, Timpka T, Hägglund M (2006) Risk of injury in elite football played on artificial turf versus natural grass: a prospective two-cohort study. Br J Sports Med 40:975–980
11. Ekstrand J, Hägglund M, Waldén M (2011) Injury incidence and injury patterns in professional football—the UEFA injury study. Br J Sports Med 45:553–558
12. FIFA (2012) *270 million people active in football*. http://www.fifa.com/mm/document/affederation/administration/01/28/72/70/hof-ee.pdf
13. Fuller CW, Ekstrand J, Junge A et al (2006) Consensus statement on injury definitions and data collection procedures in studies of football (soccer) injuries. Br J Sports Med 40:193–201
14. Hägglund M, Waldén M, Ekstrand J (2005) Injury incidence and distribution in elite football–a prospective study of the Danish and the Swedish top divisions. Scand J Med Sci Sports 15:21–28
15. Hägglund M, Waldén M, Bahr R et al (2005) Methods for epidemiological study of injuries to professional football players: developing the UEFA model. Br J Sports Med 39:340–346
16. Hägglund M, Waldén M, Ekstrand J (2006) Previous injury as a risk factor for injury in elite football: a prospective study over two consecutive seasons. Br J Sports Med 40:767–772
17. Hägglund M, Waldén M, Ekstrand J (2007) Lower reinjury rate with a coach-controlled rehabilitation program in amateur male soccer: a randomized controlled trial. Am J Sports Med 35:1433–1442
18. Hägglund M, Waldén M, Ekstrand J (2008) Injuries among male and female elite football players. Scand J Med Sci Sports 19:819–827
19. Hawkins RD, Fuller CW (1999) A prospective epidemiological study of injuries in four English professional football clubs. Br J Sports Med 33:196–203
20. Hawkins RD, Hulse MA, Wilkinson C et al (2001) The association football medical research programme: an audit of injuries in professional football. Br J Sports Med 35:43–47
21. Hovelius L (1982) Incidence of shoulder dislocation in Sweden. Clin Orthop Relat Res 166:127–131
22. Inklaar H (1994) Soccer injuries. I: incidence and severity. Sports Med 18:55–73
23. Junge A, Dvorak J (2004) Soccer injuries: a review on incidence and prevention. Sports Med 34:929–938
24. Junge A, Dvorak J, Graf-Baumann T (2004) Football injuries during the World Cup 2002. Am J Sports Med 32:23S–27S
25. Le Gall F, Carling C, Reilly T et al (2006) Incidence of injuries in elite French youth soccer players: a 10-season study. Am J Sports Med 34:928–938
26. Lindenfeld TN, Schmitt DJ, Hendy MP et al (1994) Incidence of injury in indoor soccer. Am J Sports Med 22:364–371
27. Mall NA, Carlisle JC, Matava MJ et al (2008) Upper extremity injuries in the National Football League: part I: hand and digital injuries. Am J Sports Med 36:1938–1944
28. Orchard J (1993) Orchard sports injury classification system (OSICS). Sports Health 11:39–41
29. Sytema R, Dekker R, Dijkstra PU et al (2010) Upper extremity sports injury: risk factors in comparison to lower extremity injury in more than 25,000 cases. Clin J Sport Med 20:256–263
30. Volpi P, Melegati G, Tornese D et al (2004) Muscle strains in soccer: a five-year survey of an Italian major league team. Knee Surg Sports Traumatol Arthrosc 12:482–485
31. Waldén M, Hägglund M, Ekstrand J (2005) Injuries in Swedish elite football–a prospective study on injury definitions, risk for injury and injury pattern during 2001. Scand J Med Sci Sports 15:118–125
32. Waldén M, Hägglund M, Ekstrand J (2005) UEFA Champions League study: a prospective study of injuries in professional football during the 2001–2002 season. Br J Sports Med 39:542–546
33. Waldén M, Hägglund M, Ekstrand J (2007) Football injuries during European Championships 2004–2005. Knee Surg Sports Traumatol Arthrosc 15:1155–1162
34. Woods C, Hawkins R, Hulse M et al (2002) The Football Association Medical Research Programme: an audit of injuries in professional football-analysis of preseason injuries. Br J Sports Med 36:436–441