

# **FLOORBALL AND BASKETBALL INJURIES: A PROSPECTIVE TWO-YEAR STUDY**

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HIETAMO JUSSI: FLOORBALL AND BASKETBALL INJURIES: A PROSPECTIVE TWO- YEAR STUDY

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Tämän tutkimuksen tarkoituksena oli tutkia urheiluvammojen ilmaantuvuutta, syitä, tyyppiä ja vakavuutta salibandyn ja koripallon pelaajilla. Tutkimukseen osallistui yhteensä 132 salibandyn ja 96 koripallon pelaajaa. Salibandyn pelaajista 96 oli naisia ja 36 miehiä. Koripalloilijoista 60 oli naisia ja 36 miehiä. Pelaajille sattuneita vammoja seurattiin kahden kauden ajan vuosina 2011-2013 ja kaikki pelaajille sattuneet vammat dokumentoitiin käyttäen strukturoitua kyselykaavaketta. Kahden kauden aikana sattui yhteensä 228 vammaa salibandyn pelaajille, näistä 192 naisille ja 36 miehille. Koripalloilijoille puolestaan sattui yhteensä 114 vammaa, 57 naisille ja 57 miehille. Salibandyvammojen ilmaantuvuus naisilla oli 1,2 ja miehillä 1,0 yhtä pelaajakautta kohden. Naiskoripalloilijoilla ilmaantuvuus oli 0,7 ja mieskoripalloilijoilla 1,0 yhtä pelaajakautta kohden. Salibandyn pelaajista rasitusvammoja oli kaikista vammoista naisilla 40 % ja miehillä 47 %. Koripalloilijoilla puolestaan 30 % naisten ja 23 % miesten vammoista oli rasitusvammoja. Nilkan nyrjähdys oli yleisin vammatyyppi molemmissa lajeissa ja molemmilla sukupuolilla. Myös polven rasitusvammat olivat yleisiä molemmissa lajeissa. Polvivammat olivat vakavimpia vammoja molemmissa lajeissa ja molemmilla sukupuolilla mitattuna poissaolopäivien määrällä. Rasitusvammat aiheuttivat enemmän poissaolopäiviä kuin äkilliset vammat. Eturistisiteen repeämiä sattui salibandyssä kahden kauden aikana 7, jotka kaikki naisille. Koripallossa eturistisiteen repeämiä sattui yksi sekä naisille että miehille. Tämän tutkimuksen perusteella vammojen ehkäisyyn tähtäävissä tutkimuksissa ja toimenpiteissä pitäisi keskittyä salibandyn osalta erityisesti nilkkavammoihin, jotka syntyvät ilman kontaktia vastustajaan ja toisaalta polven rasitusvammoihin. Koripallon osalta taas huomio pitäisi kiinnittää ehkäisemään hypyn alastulossa syntyneitä nilkkavammoja ja toisaalta myös polven rasitusvammoja.

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# 1. INTRODUCTION

Floorball and basketball are two of the most popular team sports in Finland. There were about 48500 licensed floorball players (Finnish Floorball Federation, [www.salibandy.net](http://www.salibandy.net)) and about 15500 licensed basketball players (Finnish Basketball Federation, personal communication) in 2012. In worldwide, the number of licensed floorball players is rising every year and it was about 284 000 in 2011. In addition, about one million amateur players play floorball as a leisure activity. (International Floorball Federation, [www.floorball.org](http://www.floorball.org)) Basketball is well known to be along with football the most popular sport worldwide and the number of estimated players raises over 450 million (International Basketball Federation, [www.fiba.com](http://www.fiba.com)).

Floorball and basketball are both indoor team sports. It is obvious that these sports share same kinds of injury patterns that are related to sudden accelerations, stops and turns on the hard playing surface. Neither is considered as contact sport but body contacts are still unavoidable in both sports. In addition, players wear hardly any protective equipment in these sports. Hits and trips with the stick in floorball and jumping and landing in basketball are specific potential dangers in these sports.

Only few previous studies have investigated epidemiology of floorball injuries. They have shown that ankle and knee are the most common injury sites and in most cases injuries occur in games (Löfgren et al., 1994;Pasanen et al., 2008a;Snellman et al., 2001;Wikstrom and Andersson, 1997). Both sexes seem to have the same total injury rate (Snellman et al., 2001;Wikstrom and Andersson, 1997), but follow-up times in these prospective studies were short. There are differences in the findings of previous studies. Especially the proportion of overuse injuries varies between the studies.

Epidemiology of basketball injuries have been studied intensively mainly in US. Ankle and knee are the most common injury sites also in basketball and there is higher risk to injure in games regardless of player's age, gender or competition level (Agel et al., 2007;Borowski et al., 2008;Deitch et al., 2006;Dick et al., 2007;McKay et al., 2001b;Meeuwisse et al., 2003;Starkey,

2000). Many studies have shown that female basketball players have a higher risk to suffer a knee injury, especially ACL injury, than their male counterparts (Agel et al., 2005; Agel et al., 2007; Arendt and Dick, 1995; Borowski et al., 2008; Deitch et al., 2006; Messina et al., 1999; Mihata et al., 2006; Oliphant and Drawbert, 1996; Powell and Barber-Foss, 2000; Zelisko et al., 1982). There are no previous studies describing the epidemiology of injuries in these sports with same study methods. The aim of this prospective study was to investigate the incidence, nature, causes and severity of injuries in Finnish floorball and basketball players.

## **2. MATERIALS AND METHODS**

### **2.1 Participants**

Four female floorball teams, two male floorball teams, two female basketball teams and one male basketball team participated in the study. All teams were from Tampere area. Two of these female floorball teams played in Finnish adult elite league and two in Finnish junior elite league. Both of male floorball teams played in Finnish junior elite league. All basketball teams played in female or male Finnish junior elite league. Junior- aged floorball players were 13-19 years old and junior- aged basketball players 12-20 years old. Altogether 95 female floorball players, 36 male floorball players, 60 female basketball players and 36 male basketball players participated in the study. At the beginning, anthropometric data, basic medical information, illnesses and previous injuries were recorded on these athletes. Players' previous playing and practicing history were also recorded.

### **2.2 Study procedure**

During the seasons 2011-2012 and 2012-2013 (a period from May 2011 to May 2013) all injuries were registered with a structured questionnaire except male floorball players' injuries which were registered only during the season 2012-2013. Time of occurrence, place, cause, type, location, severity, diagnosis and possible recurrence of the injury was registered. Injured players completed

the questionnaires themselves and a study physician (J.H) then contacted them immediately and checked the accuracy and consistency of the filled questions. In addition, each team had a contact person who gave information of players' injuries to research group every three weeks and at the end of both seasons every player filled a questionnaire, in which they were asked about all the injuries of the season. Thus the completeness and coverage of registration could be checked. Player- seasons were used as exposure times when calculating the incidence of floorball and basketball injuries. The player-seasons consisted of the sum of the number of players for the two seasons. Information of the number of players in each team in each season was given by the contact person before and after the seasons.

### **2.3 Injury definitions and severity**

Only time- loss injuries included in the study meaning that an injured player had to be unable to participate fully in practice sessions or games at least during the next 24 hours. Thus injuries such as skin lacerations which needed medical attention, but when an injured player could continue playing and practicing without breaks, were not recorded. A traumatic injury was defined as any injury which occurred in a practice session or game and resulted from an identifiable event. Injuries which occurred in other sport activities than practices or games of players' own teams were not recorded. An overuse injury was defined as any injury which developed gradually without an identifiable event. Overuse injuries were recorded to occur in a practice session, game or neither especially depending on the answers of the returned injury questionnaires. Multiple injuries or injuries with multiple diagnoses were taken into analyses according to the most severe injury or diagnosis. The categories of injury severity were remodeled from the criteria originally defined for football injuries (Fuller et al., 2006): minimal (1-3 days); mild (4-7 days); moderate (8-28 days); severe (>28 days).

### **2.4 Dropouts**

Seventeen female floorball players, 11 female basketball players and 11 male basketball players dropped out between or during the seasons 2011-2012 and 2012-2013. Instead 23 female

floorball players, 26 female basketball players and 6 male basketball players joined the clubs between or during the two seasons. Players who dropped out or joined the clubs between or during the seasons were included in the analyses as representing only one player-season. Players dropped out between the seasons mainly because they were too old to play in junior league team anymore.

## 2.5 Statistical methods

The injury incidence was expressed as the number of reported injuries divided by the number of player seasons. Incidence rate was calculated separately for floorball and basketball players and for females and males. SPSS 20.0 for Windows software was used for the statistical analyses. Frequency tables were used for categorical variables.

## 3. RESULTS

### 3.1 Incidence of injuries

Overall there were 16 team seasons and 330 player seasons in the study period. Overall there were 341 time-loss injuries during the study period. Over the two seasons 76 out of the 95 (80%) female floorball players and 23 out of the 36 (64%) male floorball players got injured. Respectively 30 out of the 60 (50%) female basketball players and 27 out of the 36 (75%) male basketball players got injured. **Table 1** shows the team-seasons, the player-seasons, the number of reported injuries and the injury rates per player-season for both sports and for both sexes.

Table 1. Study participation and injury rates for floorball and basketball

Variable	Floorball		Basketball	
	Women	Men	Women	Men
Team- seasons	8	2	4	2
Player- seasons	156	36	83	55
Reported injuries	192	36	57	57
Injury rate/player season	1.2	1.0	0.69	1.0

## 3.2 Floorball

### 3.2.1 Injury places

In women's floorball 64 (33%) injuries occurred in practices and 66 (34%) in games. In men's floorball 10 (28%) injuries occurred in practices and 11(31%) in games. Sixty two (32%) of women's and 15 (42%) of men's injuries developed slowly meaning that there was not an exact injury place. These injuries were categorized automatically as overuse injuries. In practices, women and men got injured (61% and 90%, respectively) during the practice of floorball and (39% and 10%, respectively) in other practices. In women, 19% of all injuries in practices were from overuse. In men, none overuse injuries occurred in practices in the study period. In women's games 37 (56%) injuries occurred in forwards, 27 (41%) in defenders and 2 (3%) in goalkeepers. Instead in men's games 4 (36%) injuries occurred in forwards and 7 (64%) in defenders. No injuries occurred in goalkeepers in men's games in the study period. In games, 15% of women and 27% of men got injured during the first period, 44% and 18%, respectively during the second period and 35% and 36% during the third period. In addition 2% of women's injuries in games occurred during overtime. Five percent of women's and 18% of men's injuries in games were from overuse.

### 3.2.2 Injury locations and types

Overall in women's floorball, 115 (60%) were traumatic and 77 (40%) were overuse injuries. In men's floorball 19 (53%) were traumatic and 17 (47%) were overuse injuries. Thirty nine (20%) women's and 9 (25%) men's injuries were recurrences. In women 23 (59%) of these recurrent injuries were traumatic and 16 (41%) were overuse injuries. Respectively in men 3 (33%) were



traumatic and 6 (67%) were from overuse. **Figure 1** shows that most often women sustained ankle (21%), knee (20%) and thigh (10%) injuries and men sustained knee (31%), ankle (19%) and thigh (11%) injuries. Women’s traumatic injuries most often involved the ankle (34%), knee (15%) and thigh (14%) and overuse injuries the knee (27%) and foot (14%) followed by the back and shin/calf (both 12%). Men’s traumatic injuries also most often involved the ankle (32%), knee (21%) and thigh (16%) and overuse injuries the knee (41%) and back (12%). As seen in **figure 2** women’s and men’s most common injury types were muscle/tendon injuries (46% and 53%, respectively) and joint/ligament injuries (39% and 28%, respectively) followed by contusions (8%) in women and bone injuries (11%) in men. **Figure 3** shows that women’s injury diagnoses were most often ankle sprains (20%), other overuse injuries of the knee (9%) and tight strains (8%). Instead, men’s injury diagnoses were most often ankle sprains (17%) followed by patellar tendinopathies, other overuse injuries of the knee and tight strains (each 11%). During the two year study there were 7 ACL ruptures in women, thus the incidence of ACL injuries were 4.5 per 100 player-seasons. There were not any ACL ruptures in men in the study period.

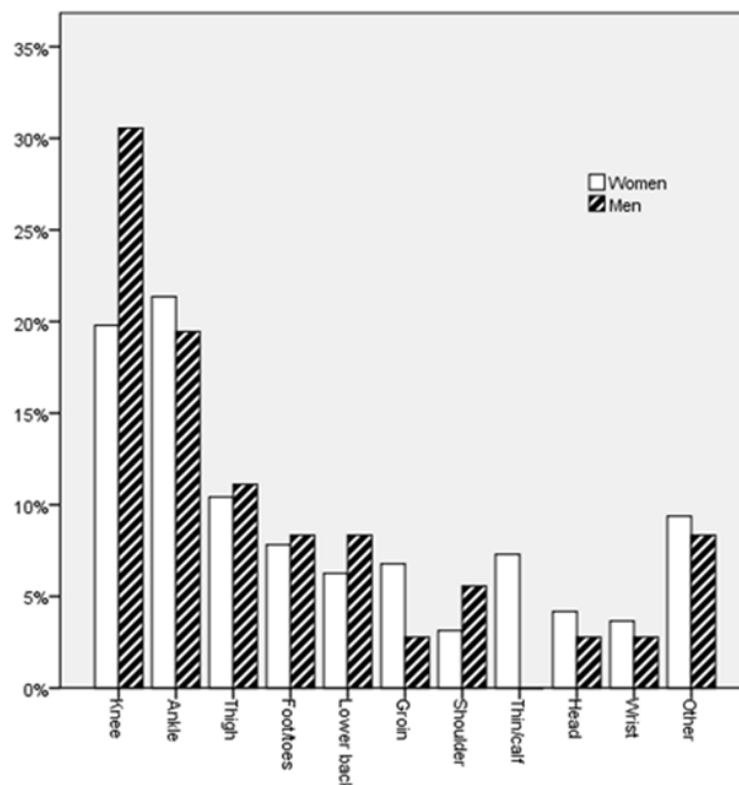


Figure 1. Percentage distribution of injuries by anatomical site in floorball

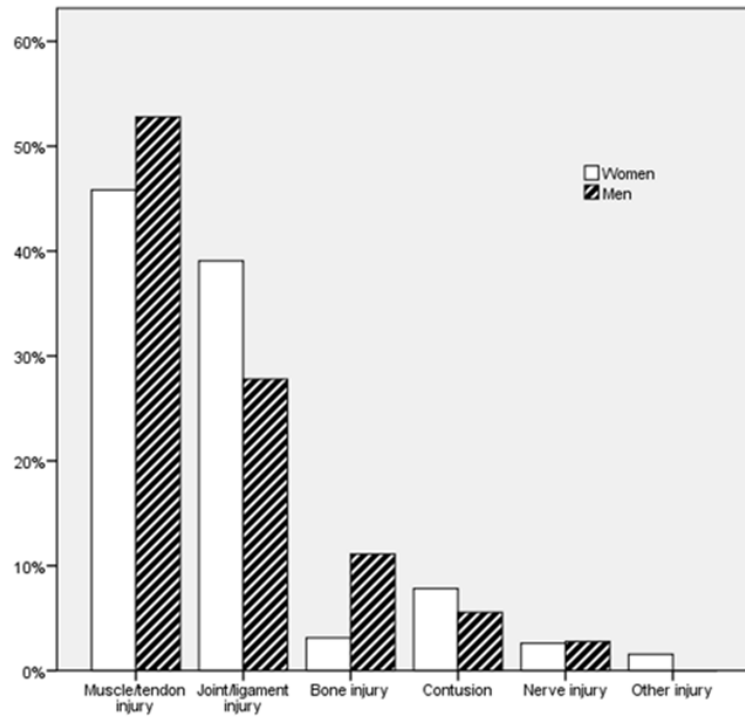


Figure 2. Percentage distribution of injuries by injury type in floorball

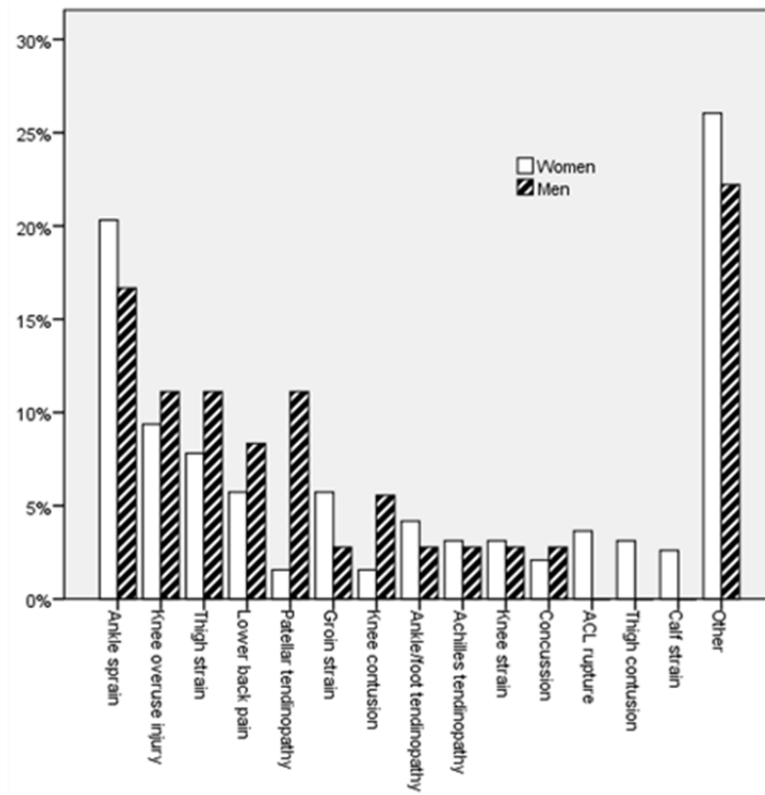


Figure 3. Percentage distribution of injuries by injury diagnosis in floorball

### 3.2.3 Injury events

Fifty nine (51%) women's and 9 (47%) men's traumatic injuries were contact and 56 (49%) women's and 10 (53%) men's non-contact injuries. The most common causes of contact injuries in women were collisions with another player (46%), tackles (25%) and trips with the stick (12%). The most common cause of contact injuries in men was also collision with another player (44%). Almost all non-contact injuries in women and men were caused by sudden movement (71% and 80%, respectively).

### 3.2.4 Injury severity

Overall there were in women's floorball 49 (26%) and in men's floorball 5 (14%) minimal injuries, 39 (20%) and 9 (25%) mild injuries, respectively, 47 (25%) and 9 (25%) moderate and 57 (30%) and 13 (36%) severe injuries. **Table 2** shows the injury severity by body region for both sexes and **table 3** shows the injury severity by injury mechanism for both sexes. In women 11 (19%) severe injuries occurred in games, 22 (39%) in practices and 24 (42%) developed slowly without exact place. Respectively in men 4 (31%) occurred in games, none in practices and 9 (69%) developed slowly. In women's games 9 (82%) severe injuries occurred for forwards and 2 (18%) for defenders. Instead in men's games 1 (25%) severe injury occurred for a forward and 3 (75%) for defenders.

Table 2. Injury severity in women's and men's floorball classified according to the site of injury

Body region	Injury severity							
	Minimal (%)		Mild (%)		Moderate (%)		Severe (%)	
	Women	Men	Women	Men	Women	Men	Women	Men
Knee	7 (18)	4 (36)	4 (11)	1 (9)	9 (24)	2 (18)	18 (47)	4 (36)
Ankle	11 (27)	-	12 (29)	2 (83)	10 (24)	3 (43)	8 (20)	2 (29)
Thigh	5 (25)	-	7 (35)	3 (75)	6 (30)	1 (25)	2 (10)	-
Foot/toes	2 (13)	-	1 (7)	-	4 (27)	2 (67)	8 (53)	1 (33)
Lower back	3 (25)	1 (33)	3 (25)	1 (33)	2 (17)	-	4 (33)	1 (33)
Groin	4 (31)	-	2 (15)	-	1 (8)	-	6 (46)	1 (100)
Shoulder	2 (33)	-	2 (33)	1 (50)	1 (17)	-	1 (17)	1 (50)
Shin/calf	3 (21)	-	-	-	6 (43)	-	5 (36)	-
Head	3 (38)	-	3 (38)	1 (100)	1 (13)	-	1 (13)	-
Wrist	-	-	4 (57)	-	3 (43)	-	-	1 (100)
Other	9 (50)	-	1 (6)	-	4 (22)	1 (33)	4 (22)	2 (67)

Table 3. Injury severity in women's and men's floorball according to mechanism of injury

Injury Mechanism	Injury severity							
	Minimal (%)		Mild (%)		Moderate (%)		Severe (%)	
	Women	Men	Women	Men	Women	Men	Women	Men
Traumatic	35 (30)	4 (21)	24 (21)	7 (37)	27 (24)	4 (21)	29 (25)	4 (21)
Contact	20 (34)	3 (33)	16 (27)	2 (22)	12 (20)	1 (11)	11 (19)	3 (33)
Non-Contact	15 (27)	1 (10)	8 (14)	5 (50)	15 (27)	3 (30)	18 (32)	1 (10)
Overuse	14 (18)	1 (6)	15 (20)	2 (12)	20 (26)	5 (29)	28 (36)	9 (53)

### 3.3 Basketball

#### 3.3.1 Injury places

In women's basketball 29 (51%) injuries occurred in practices and 17 (30%) in games. In men's basketball 32 (56%) injuries occurred in practices and 14 (25%) in games. Eleven (19%) of women's injuries and 11 (19%) of men's injuries developed slowly and again these injuries were categorized as overuse injuries. In practices, women and men got injured (90% and 88%, respectively) during the practice of basketball and (10% and 13%, respectively) in other practices. In women 10% and

in men 3% of all injuries in practices were from overuse. In women's games 8 (47%) injuries occurred in forwards, 6 (35%) in centers and 3 (18%) in guards. Instead in men's games 6 (43%) injuries occurred in forwards, 2 (14%) in centers and 6 (43%) in guards. In games, 18% of women and 14% of men got injured during the first period, 18% and 14%, respectively, during the second period, 29% and 36% during the third period and 24% and 29% during the fourth period, respectively. Twelve percent of women's and 7% of men's injuries in games were from overuse.

### 3.3.2 Injury locations and types

Overall in women's basketball, 40 (70%) were traumatic and 17 (30%) were overuse injuries. In men's basketball 44 (77%) were traumatic and 13 (23%) were overuse injuries. Fourteen (25%) of women's and 21 (37%) of men's injuries were recurrences. In women 12 (86%) recurrent injuries were traumatic and 2 (14%) were overuse injuries. Respectively in men 17 (81%) were traumatic and 4 (19%) were from overuse. **Figure 4** shows that most often women and men sustained ankle (37% and 44%, respectively) and knee (26% and 30%, respectively) injuries followed by shin/calf and hand/fingers (both 7%) injuries in women and back, groin and hand/fingers (each 7%) injuries in men. Women's traumatic injuries most often involved the ankle (48%) and knee (20%) followed by hand/fingers (10%). Instead, women's overuse injuries involved the knee (41%) and shin/calf (24%). Men's traumatic injuries also most often involved the ankle (57%), knee (11%) followed by thigh and hand/fingers (each 9%). In men's overuse injuries the injured site was the knee in almost all cases (92%). As seen in **figure 5** women's and men's most common injury types were joint/ligament injuries (53% and 58%, respectively) and muscle/tendon injuries (32% and 33%, respectively) followed by contusions (7%) in women and bone injuries (5%) in men. As seen in **figure 6** women's injury diagnoses were most often ankle sprains (33%), knee overuse injuries (9%) and knee sprains (7%). Instead, men's injury diagnoses were most often ankle sprains (44%), patellar tendinopathies (18%) followed by thigh strains, lower back pains and knee sprains (each 5%). During the two year study there was 1 ACL rupture in women and 1 in men. The incidence of ACL injuries were 1.2 per 100 player-seasons for women and 1.8 per 100 player-seasons for men.

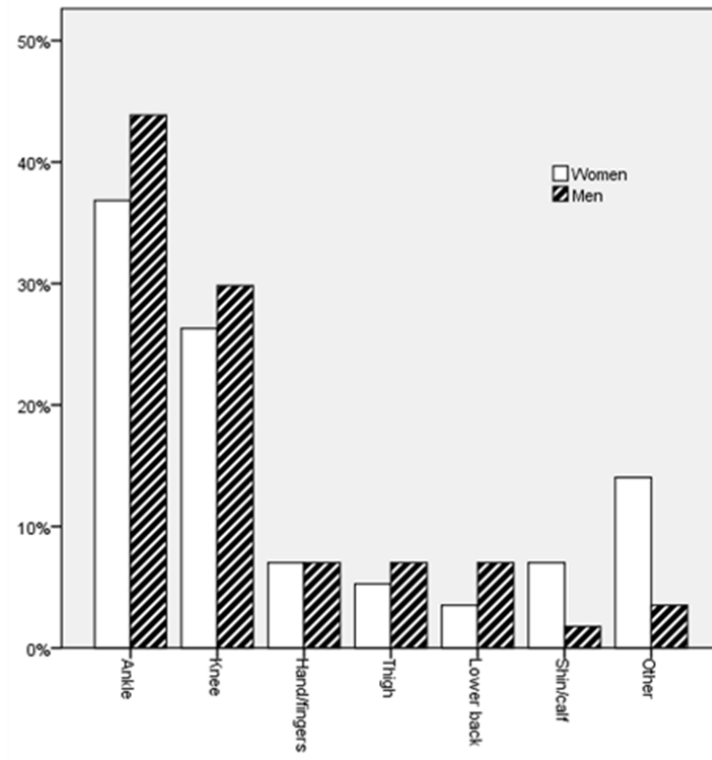


Figure 4. Percentage distribution of injuries by anatomical site in basketball

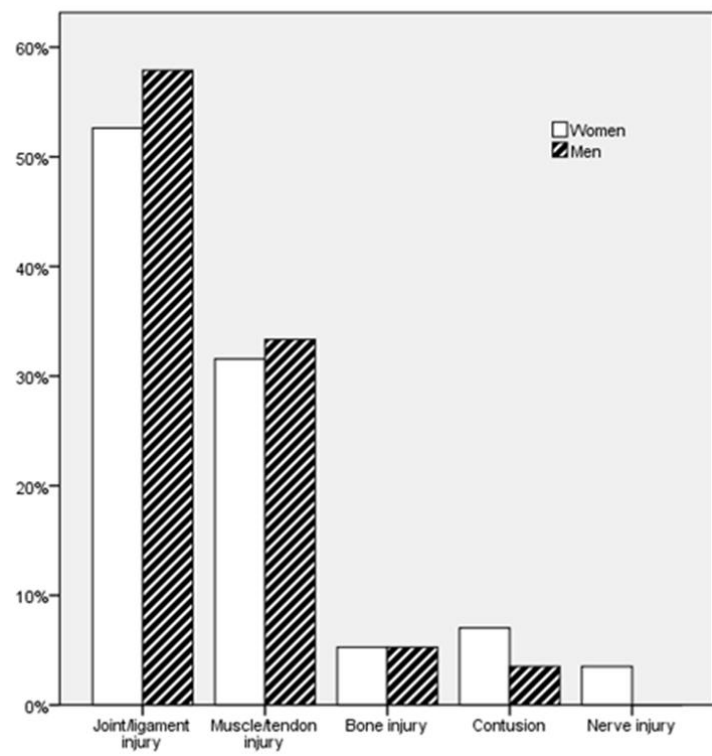


Figure 5. Percentage distribution of injuries by injury type in basketball

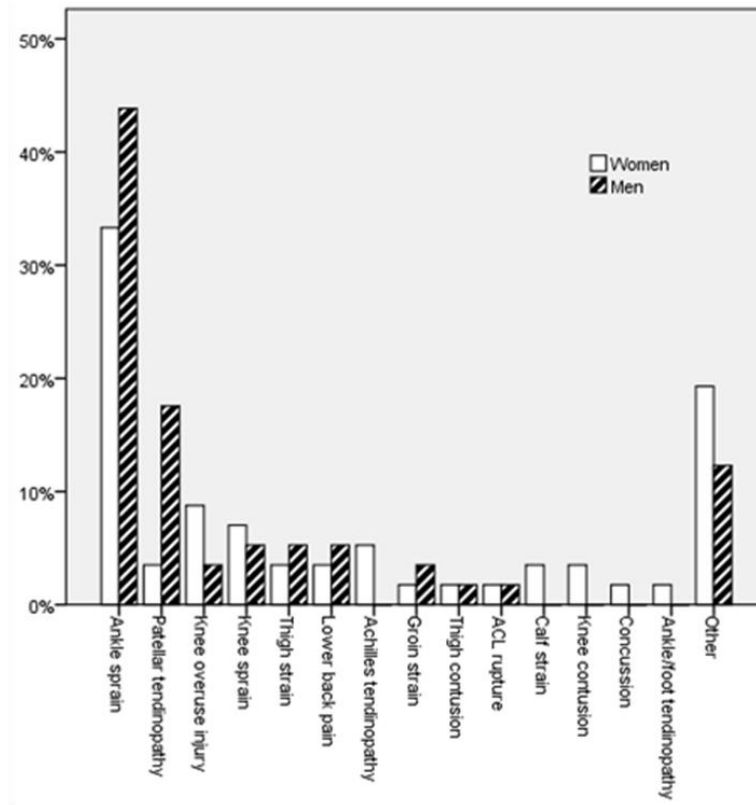


Figure 6. Percentage distribution of injuries by injury diagnosis in basketball

### 3.3.3 Injury events

Twenty four (60%) women's and 27 (61%) men's traumatic injuries were contact and 16 (40%) women's and 17 (39%) men's non-contact injuries. The most common causes of contact injuries in women were collisions with another player (50%), stepping/landing on other players foot (29%) and tackles (13%) while in men stepping/landing on other players foot (44%), collisions with another player (37%) and tackles/ball hits (both 7%) were the most common causes. The most common cause of non-contact injuries in women and men was sudden movement (69% and 47%, respectively) followed by poor landing after jump (25% and 24%, respectively).

### 3.3.4 Injury severity

Overall there were in women's basketball 14 (25%) and in men's basketball 7 (12%) minimal injuries, 7 (12%) and 13 (23%) mild injuries, respectively, 16 (28%) and 20 (35%) moderate and 20

(35%) and 17 (30%) severe injuries. **Table 4** shows the injury severity by body region for both sexes and **table 5** shows the injury severity by injury mechanism for both sexes. In women 4(20%) severe injuries occurred in games, 7 (35%) in practices and 9 (45%) developed slowly. Respectively in men 2 (12%) occurred in games, 9 (53%) in practices and 6 (35%) developed slowly. In women's games 3 (75%) severe injuries occurred for forwards and 1 (25%) occurred for a center. Instead in men's games 1 (50%) severe injury occurred for a forward and 1 (50%) for a guard.

Table 4. Injury severity in women's and men's basketball classified according to the site of injury

Body region	Injury severity							
	Minimal (%)		Mild (%)		Moderate (%)		Severe (%)	
	Women	Men	Women	Men	Women	Men	Women	Men
Ankle	5 (24)	3 (12)	2 (10)	6 (24)	7 (33)	11 (44)	7 (33)	5 (20)
Knee	2 (13)	2 (12)	2 (13)	3 (18)	5 (33)	3 (18)	6 (40)	9 (53)
Hand/Fingers	1 (25)	-	1 (25)	1 (25)	1 (25)	1 (25)	1 (25)	2 (50)
Thigh	3 (100)	1 (25)	-	1 (25)	-	2 (50)	-	-
Foot/toes	-	-	1 (33)	-	-	-	2 (67)	-
Lower back	-	1 (25)	-	-	1 (50)	2 (50)	1 (50)	1 (25)
Shin/calf	-	-	1 (25)	-	1 (25)	1 (100)	2 (50)	-
Other	3 (60)	-	-	2 (100)	1 (20)	-	1 (20)	-

Table 5. Injury severity in women's and men's basketball according to mechanism of injury

Injury Mechanism	Injury severity							
	Minimal (%)		Mild (%)		Moderate (%)		Severe (%)	
	Women	Men	Women	Men	Women	Men	Women	Men
Traumatic	14 (35)	6 (14)	6 (15)	10 (23)	10 (25)	17 (39)	10 (25)	11 (25)
Contact	7 (29)	3 (11)	4 (17)	5 (19)	7 (29)	11 (41)	6 (25)	8 (30)
Non-Contact	7 (44)	3 (18)	2 (13)	5 (29)	3 (19)	6 (35)	4 (25)	3 (18)
Overuse	-	1 (8)	1 (6)	3 (23)	6 (35)	3 (23)	10 (59)	6 (46)



## 4. DISCUSSION

The injury rates of 1.2 per player-season for female and 1.0 per player-season for male floorball players in this study suggest that injury rate in floorball has increased. Wikström and Andersson (1997) reported 58 injuries per 457 players in one season (men and women), Snellman et al. (2001) 120 per 295 players in one season (men and women) and Pasanen et al. (2008) 172 per 374 players in one season (women only). Although the injury incidences were reported as injuries per 1000 exposure hours in these previous studies, the incidence rates over two times higher per player- season in the present study indicate also higher incidence rates per 1000 exposure hours assuming that practicing and playing hours in players have not increased that much. Study methods and injury definitions in these previous studies were comparable with the present study with the exception of the longer follow-up time in the present study. The supposed increase in the incidence of floorball injuries may relate to the fact that the number of licenced floorball players in Finland is nowadays over 15000 more than 10 years before (Finnish Floorball Federation, [www.salibandy.net](http://www.salibandy.net)). Naturally, the competition level and intensity in practices and games have increased resulting in more injuries to occur.

In most of the previous studies in basketball, injury incidences are presented as injuries per 1000 athlete exposures (Agel et al., 2007; Borowski et al., 2008; Deitch et al., 2006; Dick et al., 2007; Drakos et al., 2010; McKay et al., 2001b; Meeuwisse et al., 2003; Starkey, 2000) or injuries per 1000 playing hours (Colliander et al., 1986; Cumps et al., 2007; Yde and Nielsen, 1990). There are few studies of US high school basketball players where injury incidences are presented also as injuries per player-season. Powell et al. (2000) found a rate of 28.7 per 100 player- seasons for women and 28.3 per 100 player- seasons for men. Messina et al. (1999) reported higher rates of 0.49 per player-season for women and 0.56 per player-season for men. Still the injury rates of 0.7 per player-season for women and 1.0 per player-season for men in this study are substantially higher. Cumps et al. (2007) found even higher injury rates as injuries per player-seasons in Belgian basketball players compared to this study. They reported 81 injuries per 98 female players and 128 injuries per 81 male players in one season. It is possible that European basketball players are more susceptible to injure than American players, because Powell et al. (2000) and Messina et al. (1999) included also milder head and face injuries in their analyses. This hypothesis needs further studies.

Previous studies of floorball injuries have shown that ankle and knee are the most common injured sites (Pasanen et al., 2008a; Snellman et al., 2001; Wikstrom and Andersson, 1997). In the present study 41% of all women's and 50% of all men's injuries were ankle or knee injuries thus supporting the fact that these two anatomic sites are the most susceptible to injure. The proportion of overuse injuries seems to increase in floorball. Wikström and Andersson (1997) reported the proportion of overuse injuries being 24% (women and men), Snellman et al. (2001) 17% (women and men) and Pasanen et al. (2008) 30% (women only). We found the proportion of overuse injuries being as high as 40% in women and 47% in men. In the present study ankle injuries were mainly traumatic (95% in women and 86% in men), which is in line with a previous study (Pasanen et al., 2008a), but knee injuries were mainly from overuse (55% in women and 64% in men). Pasanen and colleagues (2008) reported that only 30% of women's knee injuries in floorball were from overuse. These results indicate that especially the number of overuse knee injuries has increased in floorball. In this study 11% of all women's and 22% of all men's injuries were diagnosed either as patellar tendinopathy or other overuse injury of the knee.

All the traumatic ankle injuries were diagnosed as ankle sprains in both sexes in this study. This study supports the previous findings that traumatic ankle injuries occur mainly without contact between players in floorball. Pasanen et al. (2008) reported that 59% of traumatic ankle injuries were non-contact injuries. In this study 62% of women's and 50% of men's traumatic ankle injuries occurred without contact between players. The floor type has previously reported to influence the injury risk of traumatic injuries (Pasanen et al., 2008b). In this study 58% of women's and all men's non-contact ankle injuries occurred in artificial floor, thus supporting the previous results yet exposure times for artificial and wooden surfaces were not measured.

The incidence of ACL ruptures in floorball players was higher in the present study than previous studies. Pasanen et al. (2008) reported 10 ACL ruptures in 374 female players, Snellman et al. (2001) 7 in 295 floorball players (women and men) and Wikström and Andersson (1997) only 3 per 457 floorball players in one season. Seem that these always severe injuries have also become more common in floorball players.

The present study supports the results from previous studies of ankle being the most common injury site followed by the knee in basketball in both sexes (Agel et al., 2007; Borowski et al., 2008; Dick et al., 2007; Gomez et al., 1996; McKay et al., 2001b; Meeuwisse et al., 2003; Messina et al., 1999; Powell and Barber-Foss, 2000; Zelisko et al., 1982). All men's and 91% of women's ankle injuries were sprains in this study. Unlike in basketball, most of the ankle sprains were caused by contact between players (58% in women and 68% in men) and in the most of these injuries the injury mechanism was landing on an opponent's foot after jumping (63% in women and 71% in men). Overall 58% of women's and 64% of men's ankle sprains were attributed to landing tasks. Although jumping and landing have been known to cause a considerable part of ankle sprains in basketball (Agel et al., 2007; Borowski et al., 2008; Cumps et al., 2007; McKay et al., 2001a). Still percentages such high are surprising and have not been reported before. Factors that influence poor landing technique are unknown.

Like in floorball the second common injury diagnosis after ankle sprain in male and female basketball players were overuse injury of the knee. In women 12% and in men 21% of all injuries in basketball were diagnosed either as patellar tendinopathies or other overuse injuries of the knee. Several previous studies have also shown that diagnoses such as patellofemoral inflammation (Deitch et al., 2006; Drakos et al., 2010; Starkey, 2000) or anterior knee pain (Cumps et al., 2007) are the second common injury diagnoses after ankle sprains in basketball. Although these injury diagnoses differ from each other by name, it is obvious that they mean the same entity of overuse injuries of the knee. In the present study 47% of women's knee injuries were from overuse but no fewer than 71% of men's knee injuries were from overuse. These injuries seem to be not only frequent but also in most cases caused long period of time-loss. In this study 46% of women's and 57% of men's overuse injuries of the knee were classified as severe injuries. Starkey (2000) reported that patellofemoral inflammation caused the greatest number of days missed in NBA players although ankle sprain was the most common injury diagnosis. Thus it is important to find risk factors and tools to prevent these injuries.

The incidence of ACL rupture in basketball players is in line with the results from the previous studies considering the quite small sample size in our study. Messina et al. (1999) reported the incidence of ACL rupture being 2.5 per 100 player-seasons in women and 0.4 in men. Meeuwisse

et al. (2003) found the incidence of 0.47 per 100 player-seasons in men. Powell et al. (2000) reported the incidences of ACL surgeries being 0.61 per 100 player-seasons in women and 0.15 in men.

This study had several strengths. The data were collected prospectively and the follow-up time being two years enabled more player-seasons for exposure times in the analyzes. The absolute numbers of injuries were presented separately not only for games and practices but also for traumatic and overuse injuries. When presenting the numbers we took account of the fact that an overuse injury may develop either slowly within weeks or months or after a single practice or game. Because overuse injuries compose a significant part of injuries in both sports as seen in this study and previous studies (Cumps et al., 2007; Deitch et al., 2006; Drakos et al., 2010; Pasanen et al., 2008a; Starkey, 2000) it is necessary to present the absolute numbers of injuries and in further studies the incidence rates for practices and games without these slowly developing overuse injuries. Limitations of this study were small sample sizes and thus the total number of injuries was relatively small especially in male floorball players. One limitation of this study was also that injury incidences were presented only as injuries per player-seasons not per 1000 athlete exposures or per 1000 exposure hours. In addition, all basketball players were junior-aged which means that results are necessarily not to be able to extrapolate to senior players. It is also possible that all minor injuries may not have been reported because the proportion of these injuries in both sports are quite small compared with previous studies (Agel et al., 2007; Borowski et al., 2008; Dick et al., 2007; McKay et al., 2001b; Meeuwisse et al., 2003; Pasanen et al., 2008a; Powell and Barber-Foss, 2000).

In conclusion, this study suggests that number and risks of injuries have increased in floorball in our country. This study also suggests that injury incidences in basketball in Finland are higher compared to those reported in North American basketball. Ankle sprains and overuse injuries of the knee composed the major part of injuries in both sports. Ankle sprains were mainly non-contact injuries in floorball. Instead in basketball ankle injuries were mainly attributed to landing task, either on opponents foot or otherwise improperly. In the future, more effective preventive measures and programmes are clearly needed in both floorball and basketball.

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