

# FIS Injury Surveillance System

2006-2019



Oslo Sports Trauma  
RESEARCH CENTER



## Introduction

The FIS Injury Surveillance System (FIS ISS) was developed prior the 2006/07 winter season by FIS in collaboration with the Oslo Sports Trauma Research Center (OSTRC). The purpose of the FIS ISS is firstly to monitor injury patterns and trends in the different FIS disciplines (alpine skiing, freestyle skiing, snowboarding and ski jumping) and secondly to provide background data for in-depth studies of the causes of injury. The ultimate objective is to reduce the risk of injuries among the athletes by suggesting preventive measure for the future. The purpose of this internal FIS report is to provide complete data to all stakeholders within FIS as a basis for discussions on injury prevention in the different FIS disciplines.

So far, injuries among the World Cup (WC) athletes have been recorded through 13 winter seasons (2006-2019) based on athlete interviews. Athletes were interviewed by research groups from the OSTRC at the final WC events each season. The number of athletes interviewed for each of the 13 seasons is shown in Table 1. Thus, it should be noted that the injuries in this report do not represent the total number of injuries in the World Cup, but only those occurring to the athletes covered by the interviews.

The alpine European Cup was included in the injury surveillance for the first time from the 2013/14 season. FIS asked us to re-include WC male and female ski jumpers in the interviews for the first time since 2008, starting from the 2014/15 season. We were also asked by FIS to discontinue the interviews of Telemark skiers from the 2014/15 season, as sufficient data has been collected.

The athletes were asked about injuries they had sustained in training and competition during the 5-month WC season and which required attention by medical personnel. Coaches and medical staff were interviewed about athletes who did not participate in the final WC events. For all reported injuries, an injury form was completed, and the specific injury information requested on the form included: (1) injury location, expressed as the body part injured and which side of the body, (2) injury severity, expressed as number of days of absence from full participating in training and competition, (3) injury type, (4) injury circumstances, and (5) specific diagnosis. An injury that resulted in at least 1 day of absence from training or competition is referred to as a “time-loss injury”, and an injury with absence > 28 days is defined as a “severe injury”. As we continue our research to understand the causes of injury, focusing on the injury mechanisms for the most prevalent injury types and the contribution of course design and safety equipment, we hope that this report will inspire all stakeholders to consider how they can contribute in the quest for ways to reduce the risk of injuries to our athletes.

Oslo, May 2019

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## Athlete interviews

Table 1. The number of athletes interviewed in the different FIS disciplines for each of the 13 seasons (2006-19) among females and males.

Season	Alpine skiing- WC		Alpine skiing- EC		Freestyle skiing		Snowboarding		Ski jumping		Total
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	All
2006/07	144	116			107	46	92	50			555
2007/08	148	113			177	86	186	94			804
2008/09	148	115			143	103	173	96			778
2009/10	140	128			96	56	172	99			691
2010/11	157	118			171	105	202	113			866
2011/12	148	118			89	53	102	54			564
2012/13	163	124			208	132	238	125			990
2013/14	149	119	91	64	145	85	177	105			935
2014/15	147	107	78	68	208	134	127	78	73	41	1061
2015/16	147	118	69	66	240	133	177	112	89	44	1195
2016/17	113	107	134	104	72	51	188	127	85	46	1027
2017/18	100	100	83	85	180	119	186	115	59	44	1071
2018/19	138	107	67	78	237	143	205	120	76	49	1220
<b>Total</b>	<b>1839</b>	<b>1490</b>	<b>522</b>	<b>465</b>	<b>2073</b>	<b>1246</b>	<b>2225</b>	<b>1288</b>	<b>392</b>	<b>224</b>	<b>11757</b>

# Injury incidence, World Cup

Time-loss injuries (n=2988)

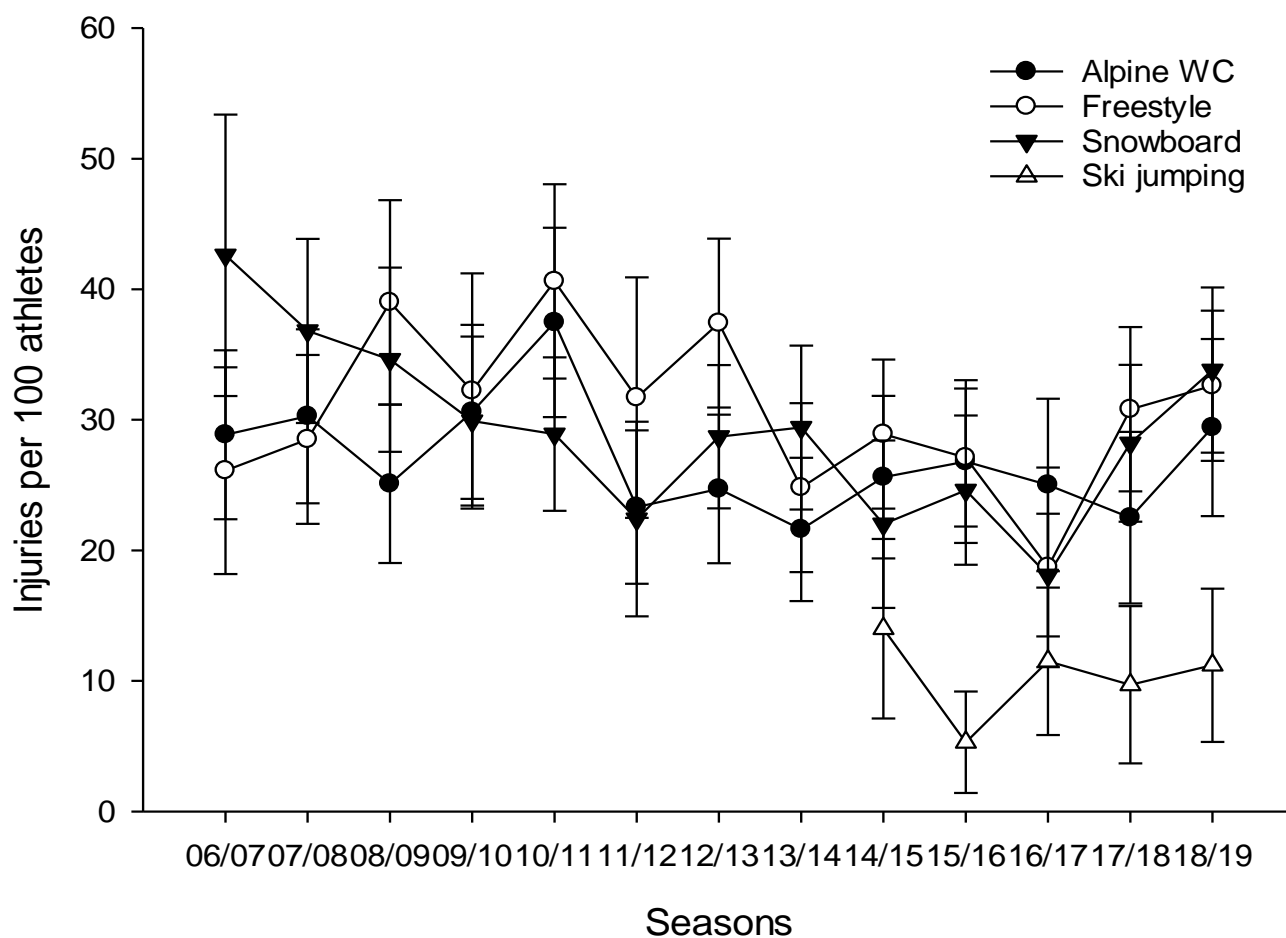


Figure 1. Injury incidence, expressed as injuries per 100 athletes (with 95% confidence intervals), for time-loss, injuries reported for each of the 13 seasons (2006-19) in the different FIS World Cup disciplines.

Note: Ski jumping included from the 2014/2015 season.

# Alpine skiing, World Cup

All injuries (n=1083)

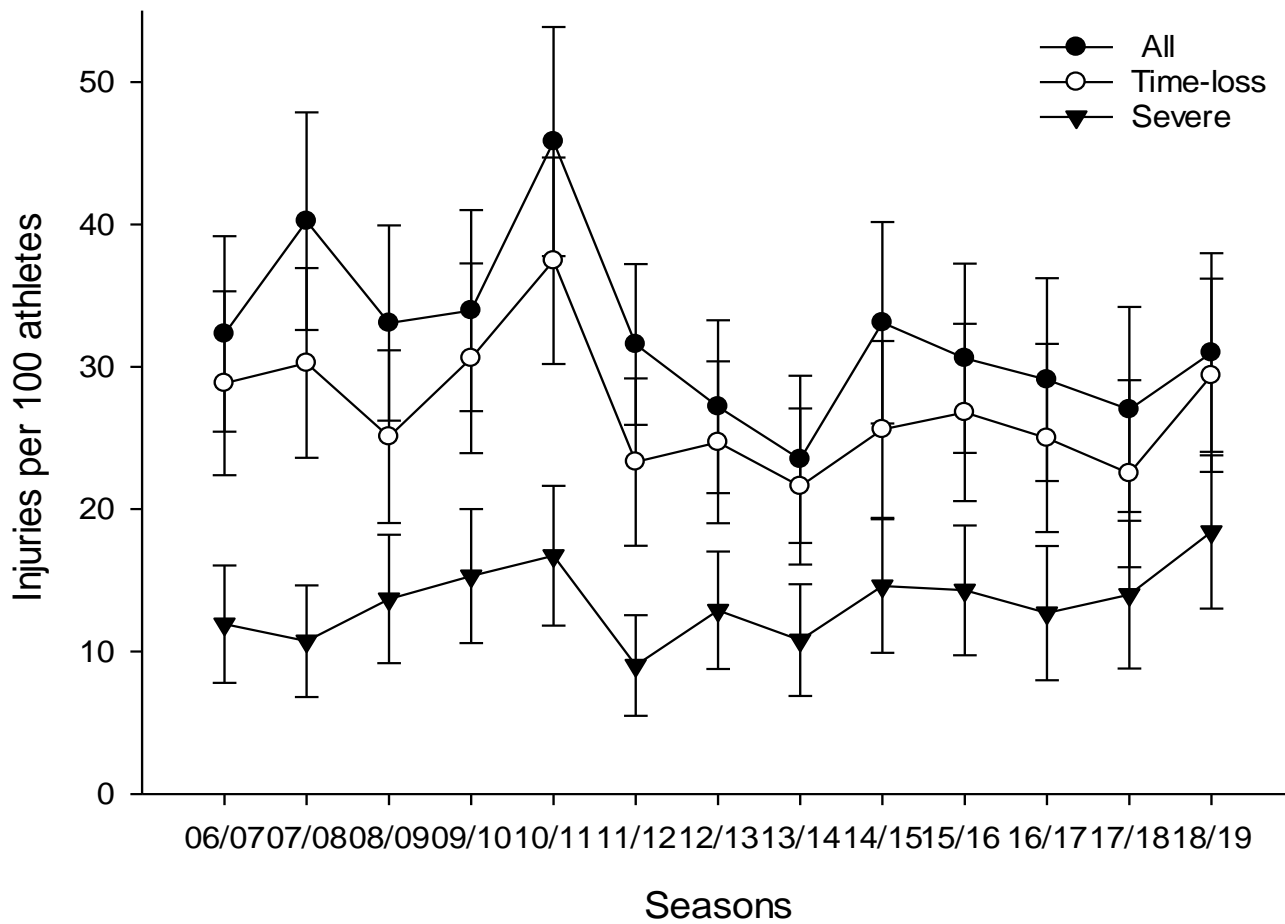


Figure 2. Injury incidence, expressed as injuries per 100 athletes (with 95% confidence intervals), for all injuries, time-loss injuries and severe injuries, reported for each of the 13 seasons (2006-19) in alpine skiing.



# Alpine skiing, World Cup

Time-loss injuries (n=916)

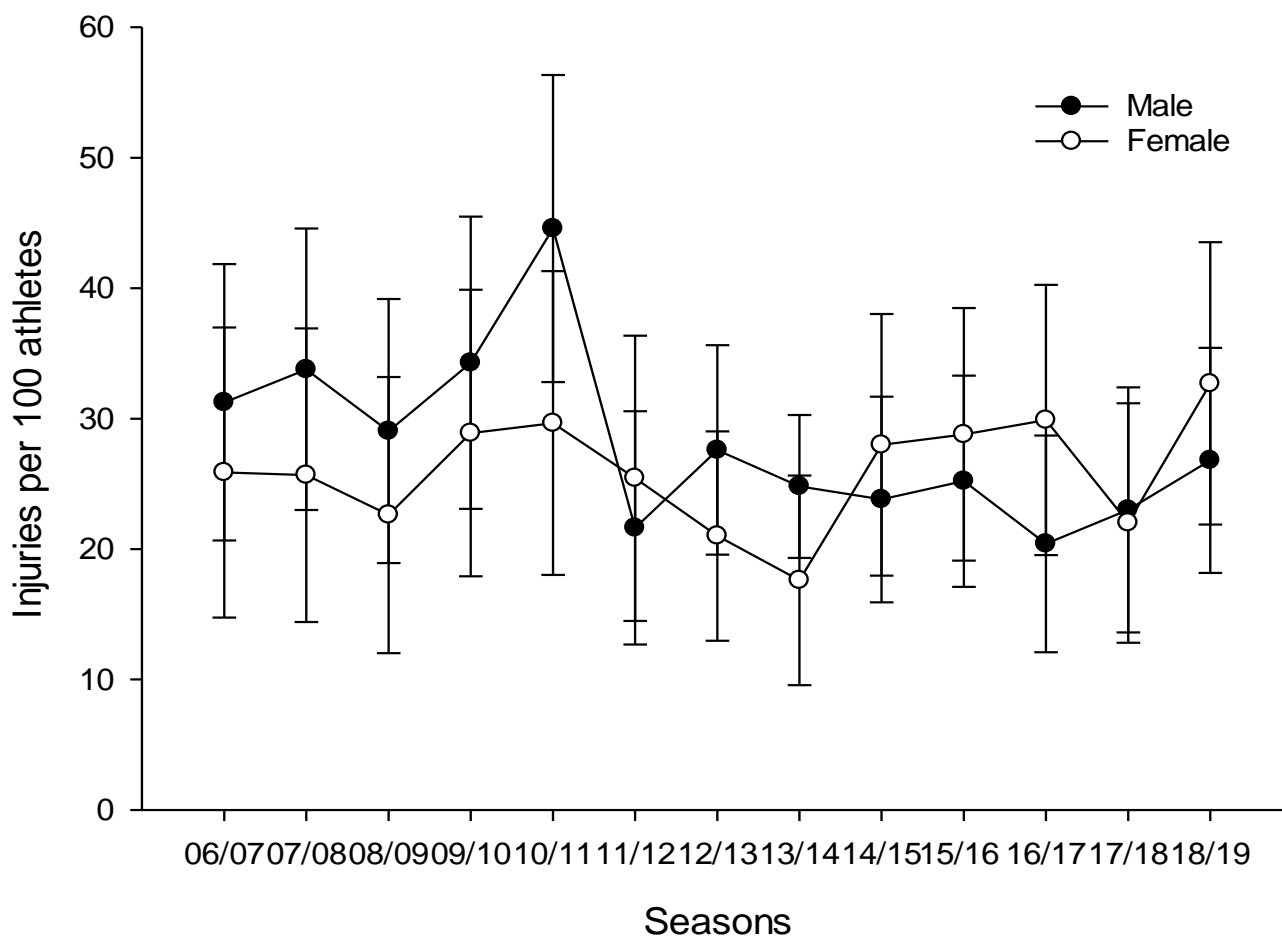


Figure 3. Injury incidence, expressed as injuries per 100 athletes (with 95% confidence intervals), for time-loss injuries reported among males versus females for each of the 13 seasons (2006-19) in alpine skiing.

## Alpine skiing, World Cup

Time-loss injuries in WC races (n= 382)

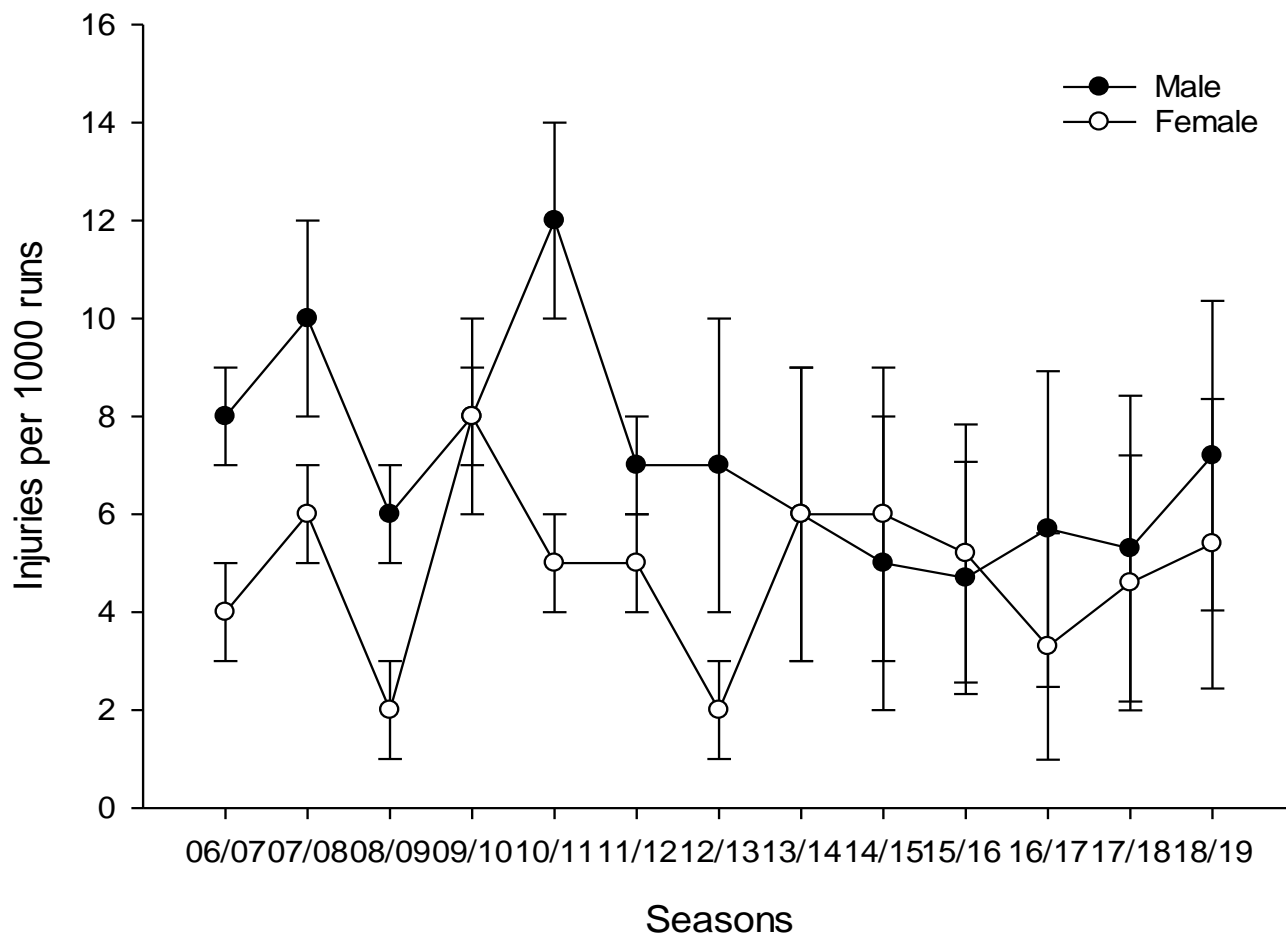


Figure 4. Time-loss injury incidences in WC races, expressed as the number of injuries per 1000 runs (with 95% confidence intervals) among females and males for each of the 13 seasons (2006-19).

## Freestyle skiing

All injuries (n= 1263)

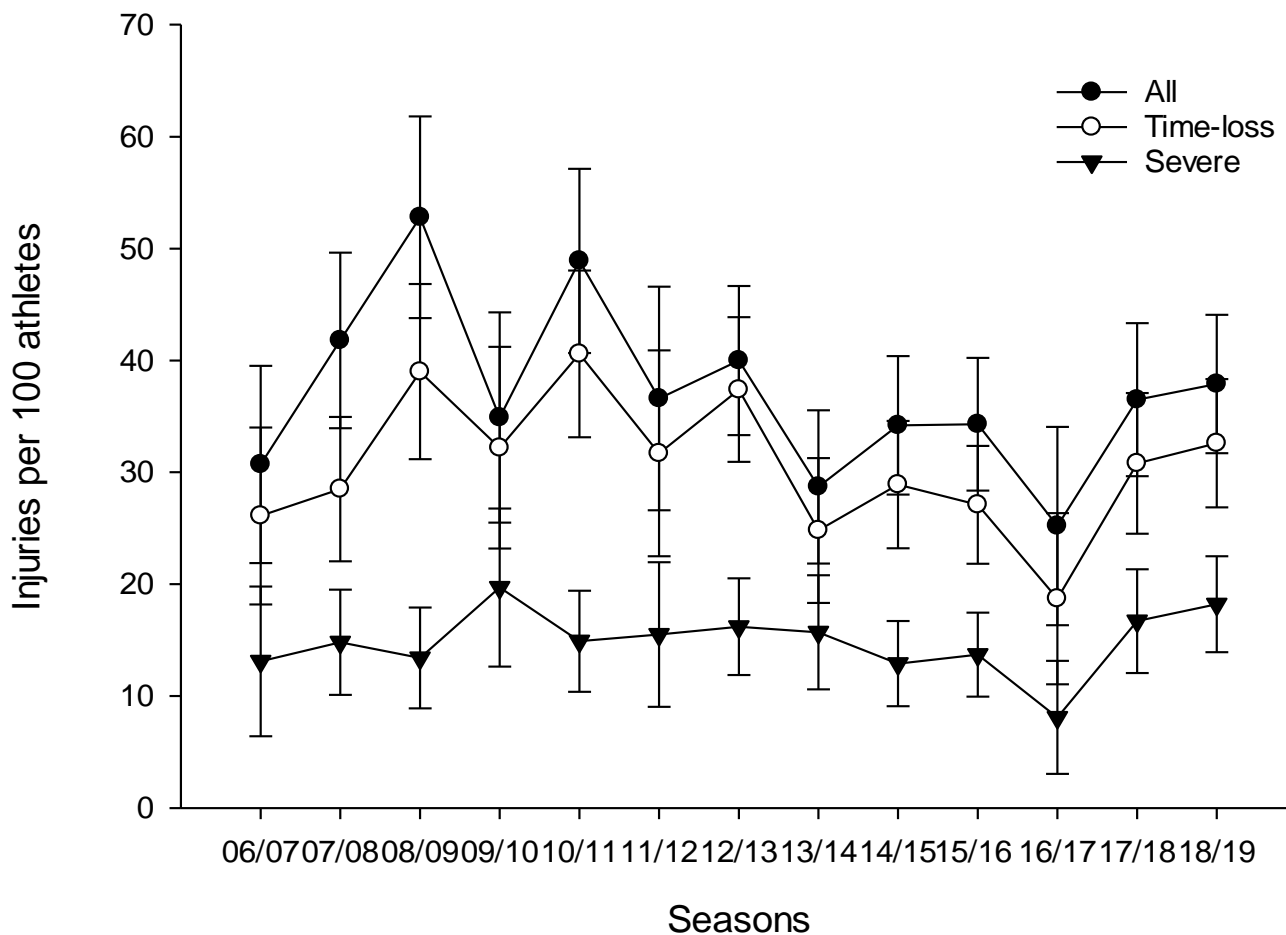


Figure 5. Injury incidence, expressed as injuries per 100 athletes (with 95% confidence intervals), for all injuries, time-loss injuries and severe injuries, reported for each of the 13 seasons (2006-19) in freestyle skiing.

## Freestyle skiing

Time-loss injuries (n=1144)

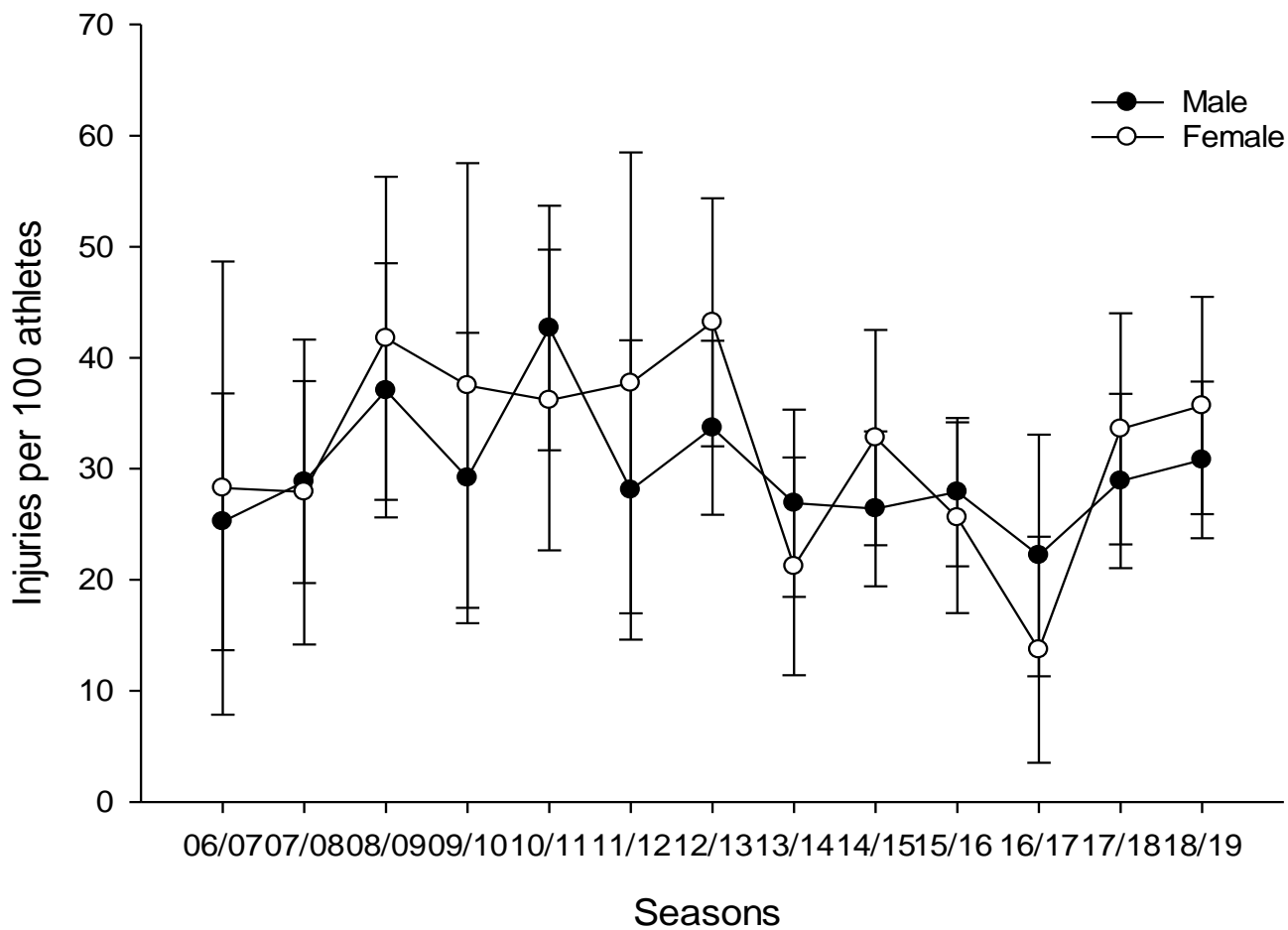


Figure 6. Injury incidence, expressed as injuries per 100 athletes (with 95% confidence intervals), for time-loss injuries reported among males versus females for each of the 13 seasons (2006-19) in freestyle skiing.

# Snowboarding

All injuries (n=1276)

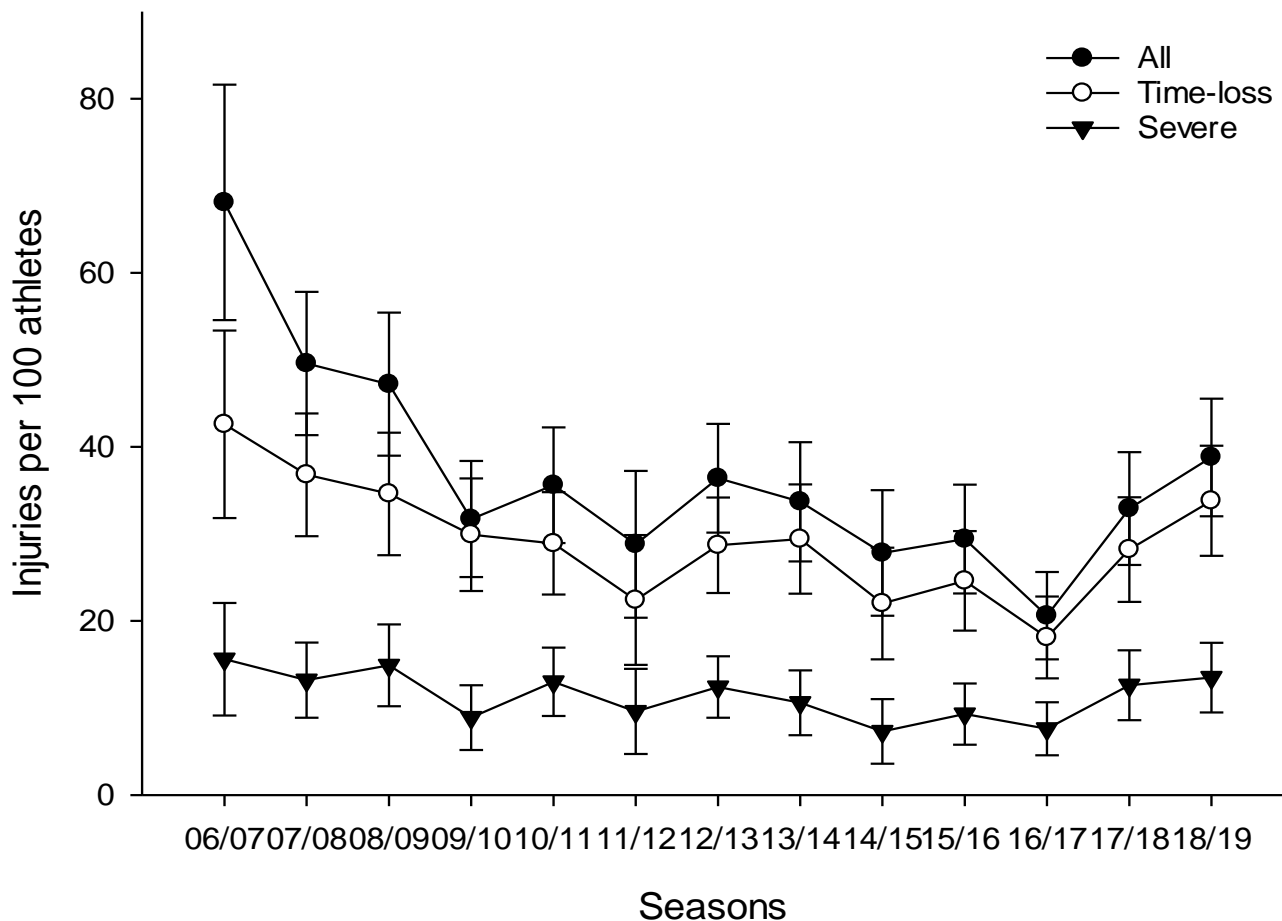


Figure 7. Injury incidence, expressed as injuries per 100 athletes (with 95% confidence intervals), for all injuries, time-loss injuries and severe injuries, reported for each of the 13 seasons (2006-19) in snowboarding.

# Snowboarding

Time-loss injuries (n=1029)

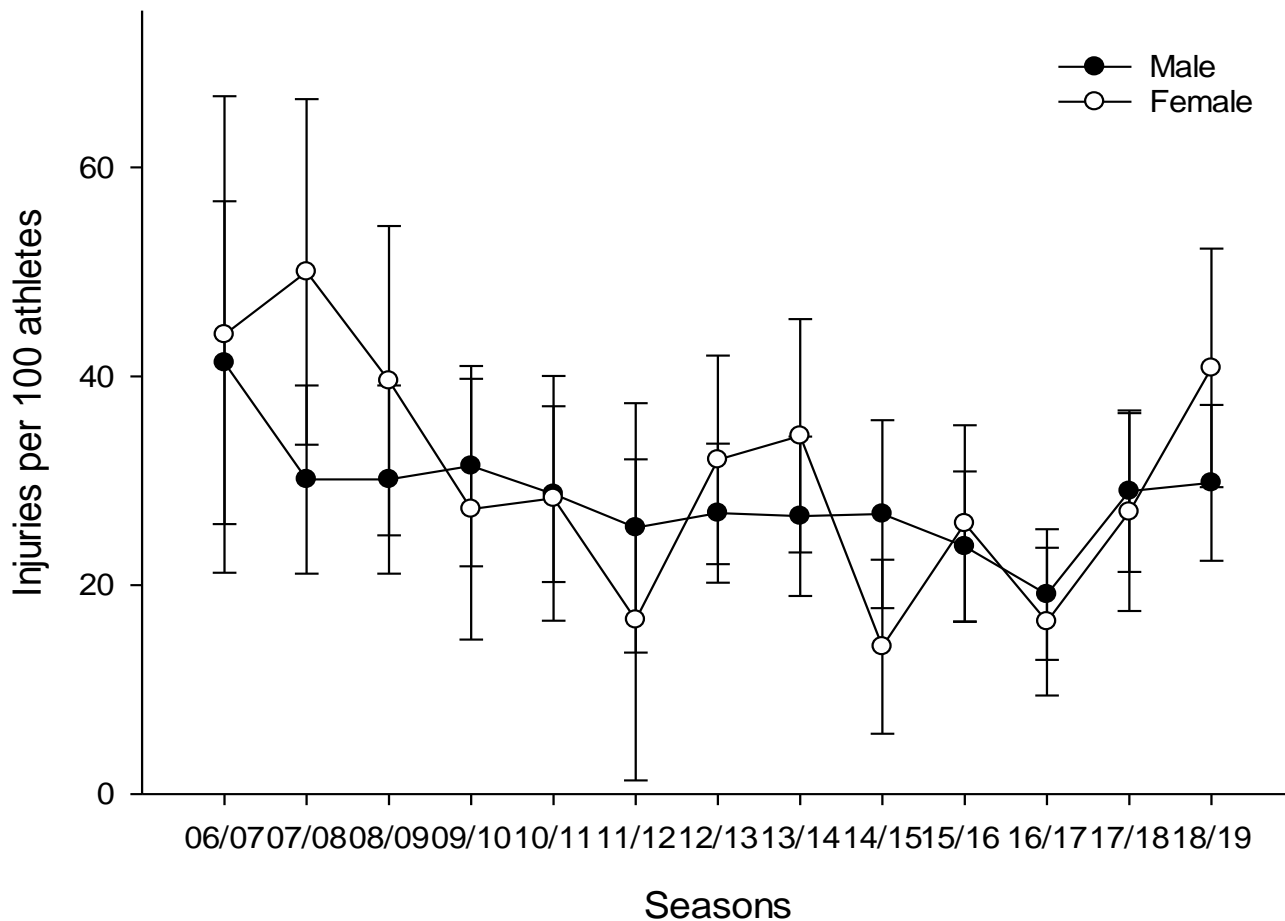


Figure 8. Injury incidence, expressed as injuries per 100 athletes (with 95% confidence intervals), for time-loss injuries reported among males versus females for each of the 13 seasons (2006-19) in snowboarding.

## Snowboard cross and ski cross

Injuries during World Cup competitions (n=416)

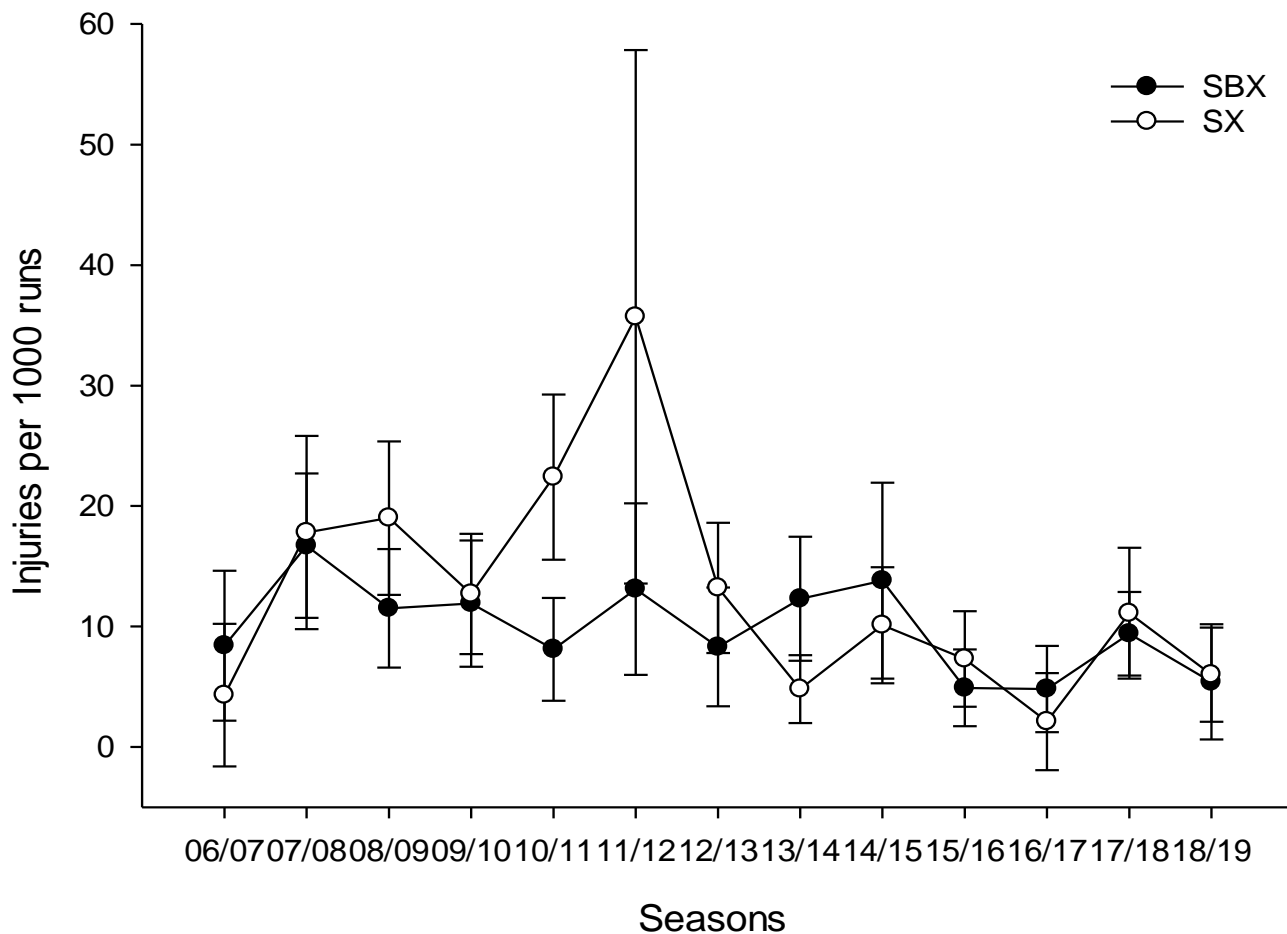


Figure 9. Injury incidence, expressed as injuries per 1000 World Cup runs (with 95% confidence intervals), for injuries reported among ski cross (n=221) and snowboard cross athletes (n=195) for each of the 13 seasons (2006-19).

## Ski and snowboard slopestyle

Injuries during World Cup competitions (n=72)

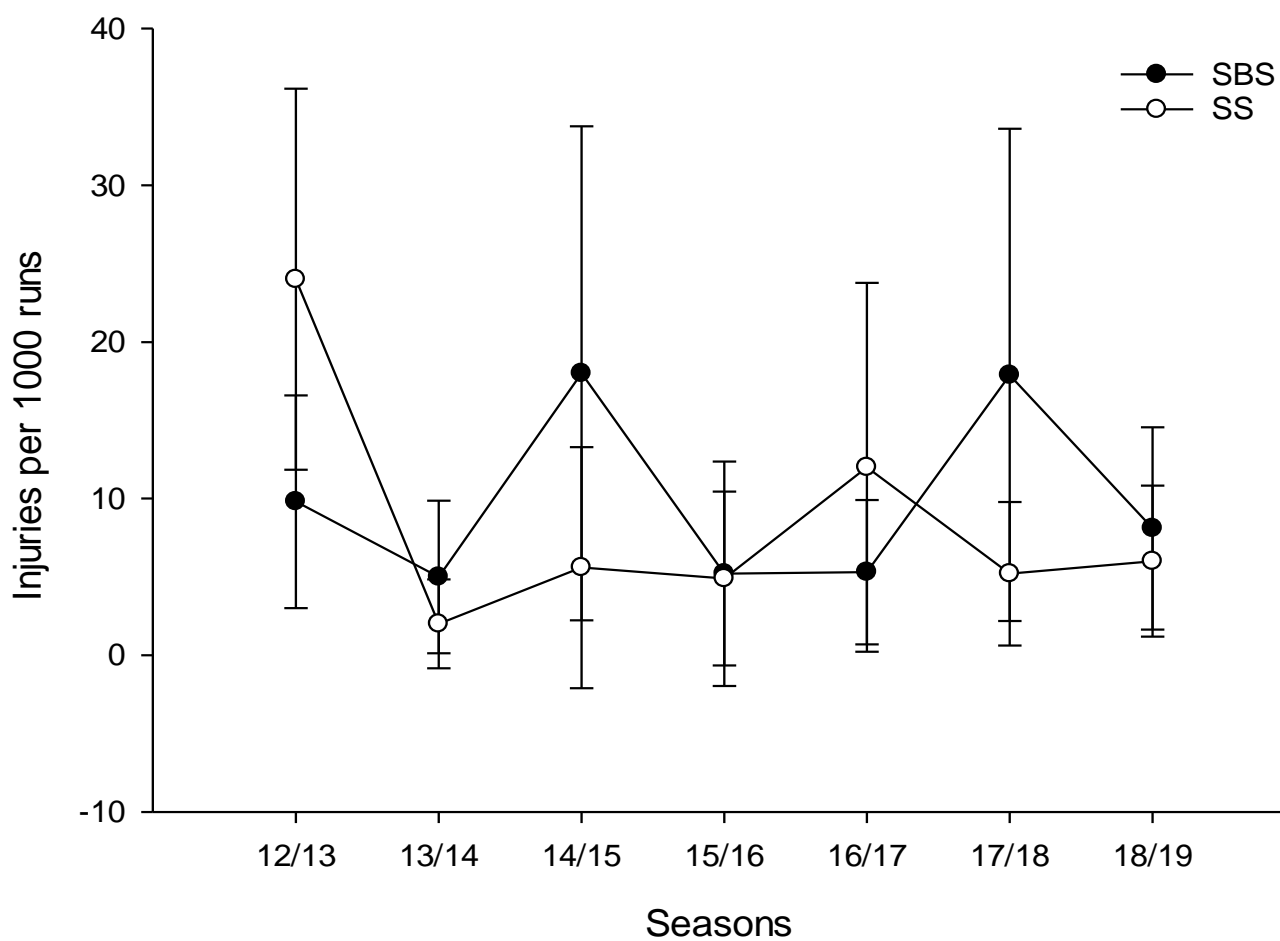


Figure 10. Injury incidence, expressed as injuries per 1000 World Cup runs (with 95% confidence intervals), for injuries reported among ski slopestyle (n=37) and snowboard slopestyle (n=35) athletes for 7 seasons (2012-19).



## Ski cross

Injuries during World Cup competitions (n= 221)

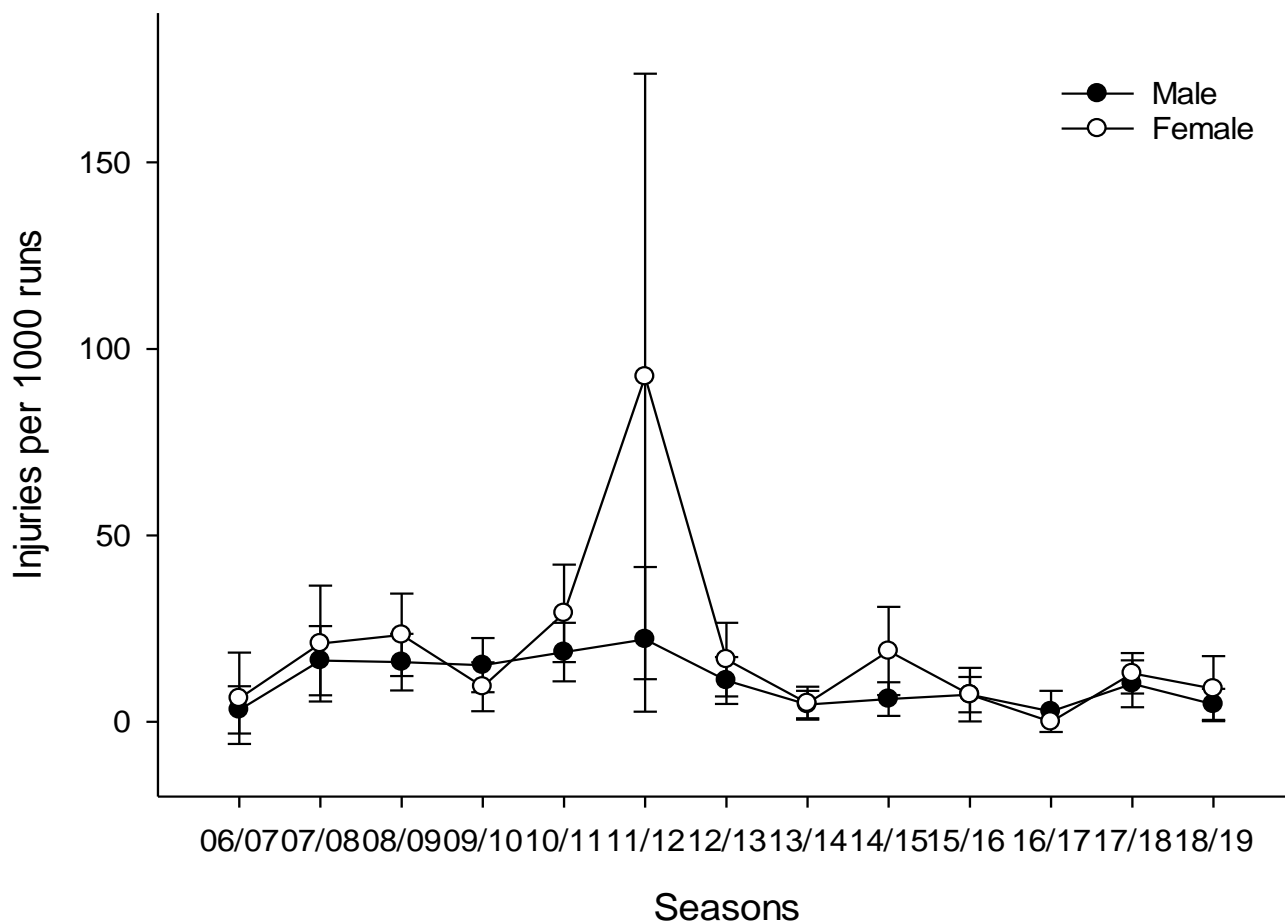
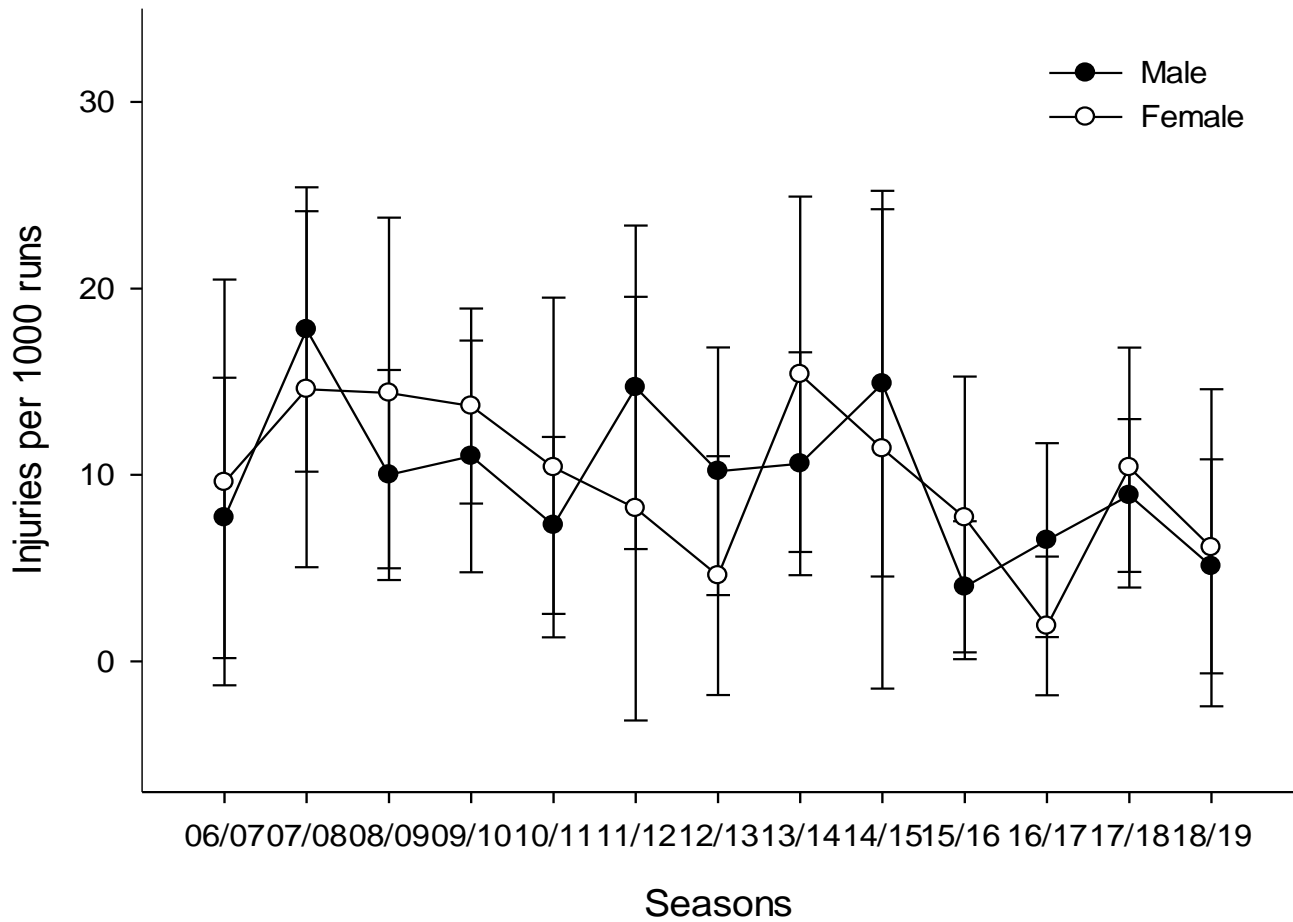


Figure 11. Injury incidence, expressed as injuries per 1000 World Cup runs (with 95% confidence intervals), for injuries reported among males (n=124) versus females (n=97) for each of the 13 seasons (2006 – 2019) in ski cross.

## Snowboard cross

Injuries during World Cup competitions (n= 195)



*Figure 12.* Injury incidence, expressed as injuries per 1000 World Cup runs (with 95% confidence intervals), for injuries reported among males (n=127) versus females (n=68) for each of the 13 seasons (2006-19) in snowboard cross.

## Ski jumping

Injuries during all in-season training and competitions (n=89)

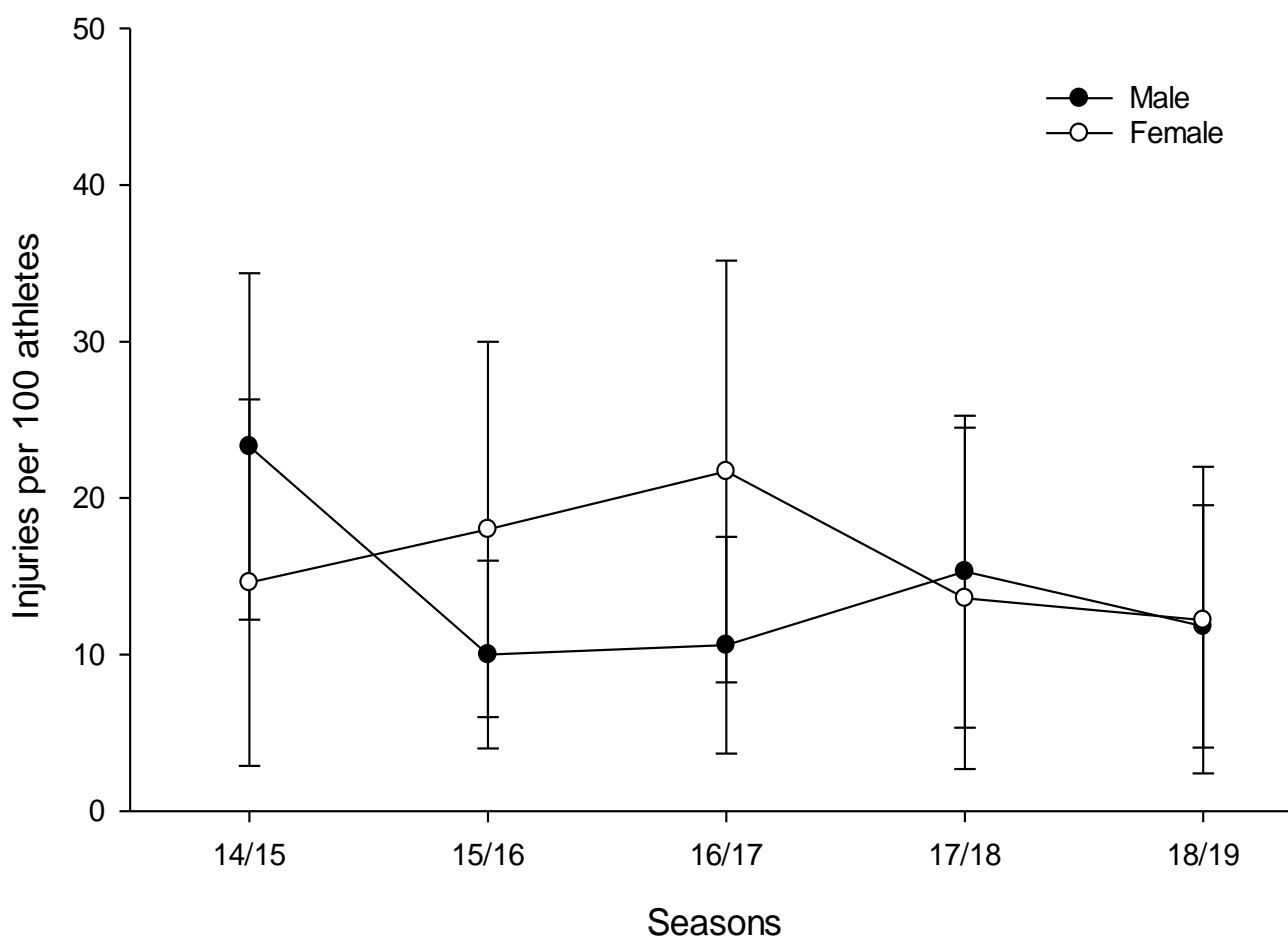


Figure 13. Injury incidence, expressed as injuries per 100 athletes (with 95% confidence intervals), for injuries reported among males versus females for each of the 5 seasons (2014–19) in ski jumping.

## Ski jumping

Injuries during World Cup, World Ski Championship and Olympic competitions (n= 42)

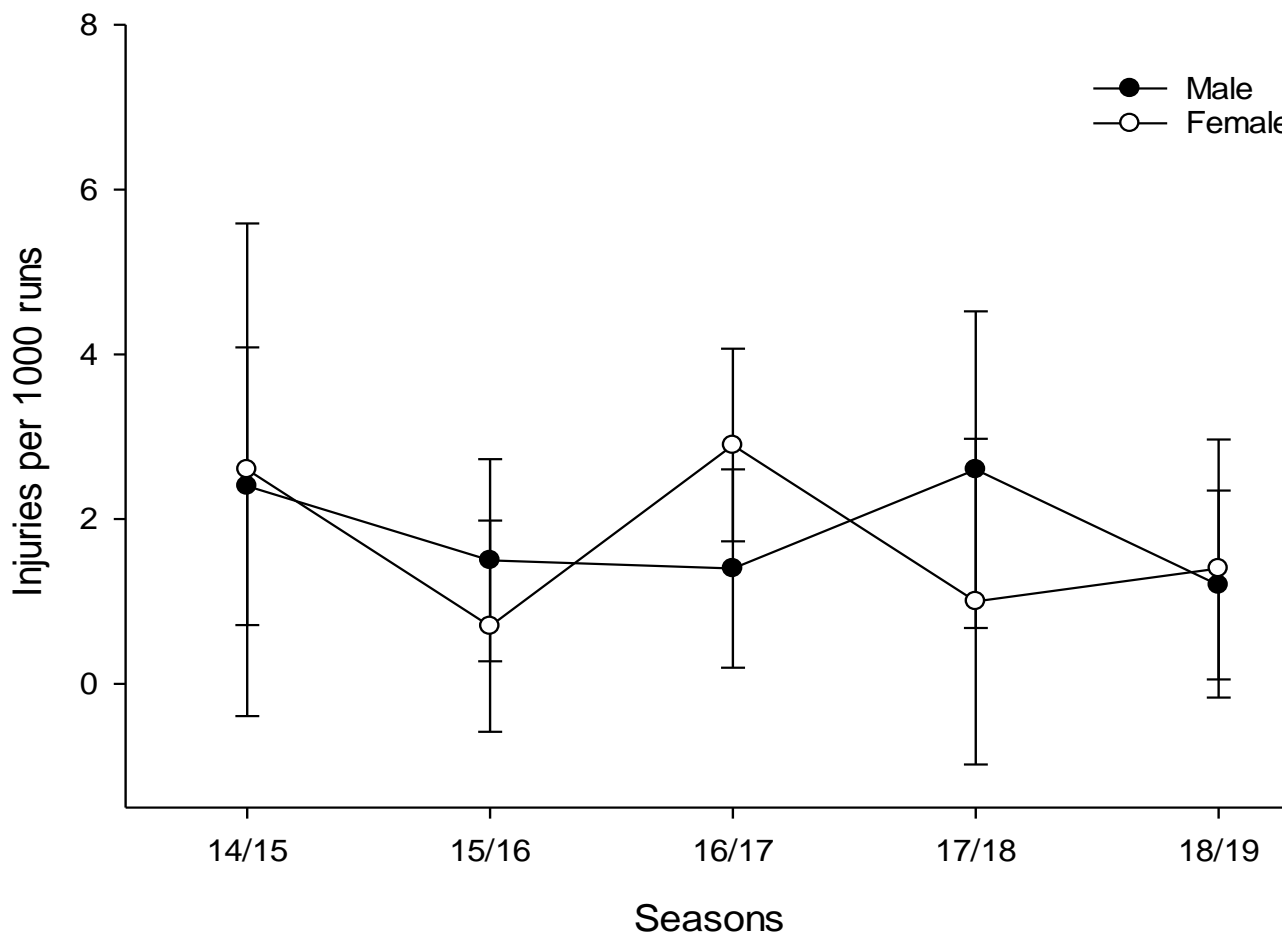


Figure 14. Injury incidence, expressed as injuries per 1000 runs (with 95% confidence intervals), for injuries reported among males versus females for each of the 5 seasons (2014–19) in ski jumping.

## Injury circumstances

### All injuries 2006-19

Table 2. The total number of injuries (with percentages) in the FIS disciplines (n=3950), reported through all 13 seasons (2006-19), regarding injury circumstances, expressed as type of activity when the injury occurred. \*Alpine skiing European Cup includes data from 6 seasons (2013-19), †Ski Jumping includes data from 5 seasons only (2014-19).

Activity	Alpine skiing	Alpine skiing	Freestyle skiing	Snowboarding	Ski Jumping†	Total, n (%)
	World Cup	European Cup*				
World Cup	422 (39.0)	0 (0)	337 (26.7)	289 (22.6)	37 (41.6)	1085 (27.5)
European Cup	0 (0)	84 (35.1)	0 (0)	0 (0)	0 (0)	84 (2.1)
World Ski/Snowboard Championships	38 (3.5)	0 (0)	54 (4.3)	36 (2.9)	4 (4.5)	132 (3.4)
Olympic Winter Games	16 (1.4)	0 (0)	19 (1.5)	26 (2.0)	1 (1.1)	62 (1.6)
FIS competitions	77 (7.1)	57 (23.9)	38 (3.0)	64 (5.0)	4 (4.5)	240 (6.1)
Other competitions	3 (0.3)	7 (2.9)	125 (9.9)	136 (10.7)	1 (1.1)	272 (6.7)
Training (on and off snow)	527 (48.7)	91 (38.1)	690 (54.6)	710 (55.6)	42 (47.2)	2060 (52.2)
Info missing	0 (0)	0 (0)	0 (0)	15 (1.2)	0 (0)	15 (0.4)
<b>Total</b>	<b>1083 (100)</b>	<b>239 (100)</b>	<b>1263 (100)</b>	<b>1276 (100)</b>	<b>89 (100)</b>	<b>3950 (100)</b>

## Injury severity

### All injuries 2006-19

Table 3. The total number of injuries (with percentages) in the FIS disciplines (n=3950), reported through all 13 seasons (2006-19), regarding injury severity, expressed as days of absence from full participation in training and competition. \*Alpine skiing European Cup includes data from 6 seasons (2013-19), †Ski Jumping includes data from 5 seasons only (2014-19).

Absence	Alpine skiing World Cup	Alpine skiing European Cup*	Freestyle skiing	Snowboarding	Ski Jumping†	Total, n (%)
No absence	160 (14.8)	27 (11.3)	199 (15.7)	235 (18.4)	27 (30.3)	648 (16.4)
1-3 days	92 (8.5)	13 (5.4)	115 (9.1)	122 (9.6)	11 (12.4)	353 (9.0)
4-7 days	118 (10.9)	22 (9.2)	133 (10.5)	177 (13.9)	10 (11.2)	460 (11.6)
8-28 days	248 (22.9)	54 (22.6)	271 (21.5)	292 (22.9)	15 (16.9)	880 (22.3)
>28 days	448 (41.3)	116 (48.6)	501 (39.7)	409 (32.0)	26 (29.2)	1500 (38.0)
Info missing	17 (1.6)	7 (2.9)	44 (3.5)	41 (3.2)	0 (0)	109 (2.7)
Total	1083 (100)	239 (100)	1263 (100)	1276 (100)	89 (100)	3950 (100)

## Injury type

### All injuries 2006-19

Table 4. The total number of injuries (with percentages) in the FIS disciplines (n=3950), reported through all 13 seasons (2006-19), regarding injury type. \*Alpine skiing European Cup includes data from 6 seasons (2013-19), †Ski Jumping includes data from 5 seasons only (2014-19).

Injury type	Alpine skiing	Alpine Skiing	Freestyle skiing	Snowboarding	Ski jumping†	Total, n (%)
	World Cup	European Cup				
Fracture/bone stress	248 (22.9)	76 (31.8)	284 (22.5)	345 (27.0)	11 (12.4)	964 (24.4)
Joint/ligament	510 (47.1)	107 (44.8)	548 (43.4)	431 (33.8)	44 (49.4)	1640 (41.5)
Muscle/tendon	118 (10.9)	22 (9.2)	118 (9.4)	147 (11.5)	17 (19.1)	422 (10.7)
Contusion	67 (6.2)	10 (4.2)	110 (8.7)	150 (11.7)	6 (6.8)	343 (8.7)
Skin/laceration	30 (2.8)	2 (0.8)	10 (0.8)	11 (0.9)	2 (2.2)	55 (1.4)
Nervous system /concussion	89 (8.2)	21 (8.8)	162 (12.8)	162 (12.7)	6 (6.8)	440 (11.1)
Other	13 (1.2)	1 (0.4)	22 (1.7)	20 (1.6)	2 (2.2)	58 (1.5)
Info missing	8 (0.7)	0 (0)	9 (0.7)	10 (0.8)	1 (1.1)	28 (0.7)
<b>Total</b>	<b>1083 (100)</b>	<b>239 (100)</b>	<b>1263 (100)</b>	<b>1276 (100)</b>	<b>89 (100)</b>	<b>3950 (100)</b>

## Injury location

### All injuries 2006-19

Table 5. The total number of injuries (with percentages) in the FIS disciplines (n=3950), reported through all 13 seasons (2006-19), regarding injury location, expressed as body part injured. \*Alpine skiing European Cup includes data from 6 seasons (2013-19), <sup>α</sup>Ski Jumping includes data from 5 season only (2014-19).

Body part injured	Alpine skiing	Alpine skiing	Freestyle skiing	Snowboarding	Ski jumping <sup>α</sup>	Total, n (%)
	World Cup	European Cup*				
Head/face	102 (9.4)	21 (8.8)	179 (14.2)	169 (13.5)	8 (9.0)	479 (12.1)
Neck, cervical spine	8 (0.7)	0 (0)	18 (1.4)	20 (1.6)	1 (1.1)	47 (1.2)
Shoulder, clavicle	66 (6.1)	12 (5.0)	152 (12.0)	183 (14.3)	3 (3.4)	416 (10.5)
Upper arm	7 (0.6)	1 (0.4)	7 (0.5)	13 (1.0)	0 (0)	28 (0.7)
Elbow	6 (0.6)	2 (0.8)	23 (1.8)	28 (2.2)	1 (1.1)	60 (1.5)
Forearm	5 (0.5)	1 (0.4)	8 (0.6)	17 (1.3)	1 (1.1)	32 (0.8)
Wrist	13 (1.2)	7 (2.9)	28 (2.2)	59 (4.6)	3 (3.4)	110 (2.8)
Hand, finger, thumb	105 (9.7)	32 (13.4)	79 (6.3)	74 (5.6)	0 (0)	290 (7.3)
Chest (sternum, ribs, upper back)	18 (1.7)	4 (1.7)	50 (4.0)	60 (4.7)	1 (1.1)	133 (3.4)
Abdomen	5 (0.5)	1 (0.4)	6 (0.5)	9 (0.7)	0 (0)	21 (0.6)
Lower back, pelvis, sacrum	100 (9.2)	20 (8.4)	88 (7.0)	137 (10.7)	8 (9.0)	353 (8.9)
Hip, groin	23 (2.1)	4 (1.7)	57 (4.5)	42 (3.3)	8 (9.0)	134 (3.4)
Thigh	23 (2.1)	3 (1.3)	18 (1.4)	13 (1.0)	0 (0)	57 (1.5)
Knee	447 (41.3)	86 (36.0)	405 (32.1)	205 (16.1)	37 (41.6)	1180 (29.9)
Lower leg, Achilles tendon	97 (9.0)	23 (9.6)	47 (3.7)	37 (2.9)	3 (3.4)	207 (5.2)
Ankle	42 (3.8)	17 (7.1)	67 (5.3)	143 (11.2)	13 (14.6)	282 (7.1)
Foot, heel, toe	15 (1.4)	5 (2.1)	29 (2.3)	67 (5.3)	1 (1.1)	117 (3.0)
Other body parts	1 (0.1)	0 (0)	2 (0.2)	0 (0)	1 (1.1)	4 (0.1)
<b>Total</b>	<b>1083 (100)</b>	<b>239 (100)</b>	<b>1263 (100)</b>	<b>1276 (100)</b>	<b>89 (100)</b>	<b>3950 (100)</b>



## Injury location versus injury severity

### Alpine skiing, World Cup (n=1083)

Table 6. The total number of injuries reported in World Cup alpine skiing through all 13 seasons (2006-19) regarding injury location (rows) versus injury severity (columns). Injury location is expressed as body part injured, and injury severity is expressed as days of absence from full participation in training and competition

Body part injured	No absence	1-3 days	4-7 days	8-28 days	>28 days	Info missing	Total, n (%)
Head/face	15	7	13	31	32	4	102 (9.4)
Neck, cervical spine	2	1	2	1	2	0	8 (0.7)
Shoulder, clavicle	17	6	11	12	18	2	66 (6.1)
Upper arm	1	0	1	2	3	0	7 (0.6)
Elbow	0	3	0	1	2	0	6 (0.6)
Forearm	1	1	0	0	3	0	5 (0.5)
Wrist	3	3	3	2	1	1	13 (1.2)
Hand, finger, thumb	44	15	13	24	8	1	105 (9.7)
Chest (sternum, ribs, upper back)	4	2	4	4	4	0	18 (1.7)
Abdomen	1	0	0	1	3	0	5 (0.5)
Lower back, pelvis, sacrum	13	17	24	28	15	3	100 (9.2)
Hip, groin	3	7	2	5	6	0	23 (2.1)
Thigh	4	2	1	10	6	0	23 (2.1)
Knee	35	18	31	82	276	5	447 (41.3)
Lower leg, Achilles tendon	13	5	5	24	51	0	98 (9.0)
Ankle	4	4	8	14	11	1	42 (3.9)
Foot, heel, toe	0	1	0	7	6	0	14 (1.3)
Other body parts	0	0	0	0	1	0	1 (0.1)
<b>Total</b>	<b>160 (14.8)</b>	<b>92 (8.5)</b>	<b>118 (10.9)</b>	<b>248 (22.9)</b>	<b>448 (41.3)</b>	<b>17 (1.6)</b>	<b>1083 (100)</b>

## Alpine skiing, European Cup (n=239)

Table 7. The total number of injuries reported in European Cup alpine skiing through all 6 seasons (2013-19) regarding injury location (rows) versus injury severity (columns). Injury location is expressed as body part injured, and injury severity is expressed as days of absence from full participation in training and competition

Body part injured	No absence	1-3 days	4-7 days	8-28 days	>28 days	Info missing	Total, n (%)
Head/face	4	1	5	4	7	0	21 (8.8)
Neck, cervical spine	0	0	0	0	0	0	0 (0)
Shoulder, clavicle	3	2	1	2	3	1	12 (5.0)
Upper arm	0	1	0	0	0	0	1 (0.4)
Elbow	0	0	0	1	1	0	2 (0.8)
Forearm	0	0	0	1	0	0	1 (0.4)
Wrist	2	0	0	2	3	0	7 (2.9)
Hand, finger, thumb	14	1	2	12	3	0	32 (13.4)
Chest (sternum, ribs, upper back)	0	2	1	0	0	1	4 (1.7)
Abdomen	0	0	1	0	0	0	1 (0.4)
Lower back, pelvis, sacrum	2	2	5	6	4	1	20 (8.4)
Hip, groin	0	1	1	0	1	1	4 (1.7)
Thigh	0	0	0	2	1	0	3 (1.3)
Knee	1	1	4	14	64	2	86 (36.0)
Lower leg, Achilles tendon	0	2	1	4	15	1	23 (9.6)
Ankle	0	0	1	5	11	0	17 (7.1)
Foot, heel, toe	1	0	0	1	3	0	5 (2.1)
<b>Total</b>	<b>27 (11.3)</b>	<b>13 (5.4)</b>	<b>22 (9.2)</b>	<b>54 (22.6)</b>	<b>116 (48.5)</b>	<b>7 (2.9)</b>	<b>239 (100)</b>

## Freestyle skiing (n=1263)

Table 8. The total number of injuries reported in freestyle skiing through all 13 seasons (2006-19) regarding injury location (rows) versus injury severity (columns). Injury location is expressed as body part injured, and injury severity is expressed as days of absence from full participation in training and competition

Body part injured	No absence	1-3 days	4-7 days	8-28 days	>28 days	Info missing	Total, n (%)
Head/face	16	19	35	64	35	10	179 (14.2)
Neck, cervical spine	7	3	1	1	5	1	18 (1.4)
Shoulder, clavicle	20	11	17	39	59	6	152 (12.0)
Upper arm	0	0	0	1	6	0	7 (0.6)
Elbow	4	5	3	6	5	0	23 (1.8)
Forearm	1	2	1	0	4	0	8 (0.6)
Wrist	7	4	2	5	9	1	28 (2.2)
Hand, finger, thumb	39	7	6	12	11	4	79 (6.2)
Chest (sternum, ribs, upper back)	10	9	4	13	13	1	50 (4.0)
Abdomen	0	1	2	0	1	2	6 (0.5)
Lower back, pelvis, sacrum	20	13	10	17	26	2	88 (7.0)
Hip, groin	16	3	8	13	16	1	57 (4.5)
Thigh	7	2	1	3	4	1	18 (1.4)
Knee	24	21	22	68	259	11	405 (32.1)
Lower leg, Achilles tendon	12	5	5	8	17	0	47 (3.7)
Ankle	9	6	14	14	23	1	67 (5.3)
Foot, heel, toe	7	4	2	7	8	1	29 (2.3)
Other body parts	0	0	0	0	0	2	2 (0.2)
<b>Total</b>	<b>199 (15.8)</b>	<b>115 (9.1)</b>	<b>133 (10.5)</b>	<b>271 (21.5)</b>	<b>501 (39.6)</b>	<b>44 (3.5)</b>	<b>1263 (100)</b>

## Snowboarding (n=1276)

Table 9. The total number of injuries reported in snowboarding through all 13 seasons (2006-19) regarding injury location (rows) versus injury severity (columns). Injury location is expressed as body part injured, and injury severity is expressed as days of absence from full participation in training and competition

Body part injured	No absence	1-3 days	4-7 days	8-28 days	>28 days	Info missing	Total, n (%)
Head/face	21	21	42	49	27	9	169 (13.3)
Neck, cervical spine	7	3	0	4	4	2	20 (1.6)
Shoulder, clavicle	33	16	27	36	68	3	183 (14.3)
Upper arm	1	0	0	2	10	0	13 (1.0)
Elbow	9	2	2	4	11	0	28 (2.2)
Forearm	1	0	4	1	11	0	17 (1.3)
Wrist	22	6	10	10	10	1	59 (4.6)
Hand, finger, thumb	30	11	8	15	6	4	74 (5.8)
Chest (sternum, ribs, upper back)	12	9	6	15	16	2	60 (4.7)
Abdomen	0	2	3	3	1	0	9 (0.7)
Lower back, pelvis, sacrum	35	17	20	32	31	2	137 (10.7)
Hip, groin	9	6	7	12	7	1	42 (3.3)
Thigh	4	2	2	1	4	0	13 (1.0)
Knee	17	11	17	43	109	8	205 (16.1)
Lower leg, Achilles tendon	3	1	3	3	24	3	37 (2.9)
Ankle	13	11	21	46	49	3	143 (11.2)
Foot, heel, toe	18	4	5	16	21	3	67 (5.3)
<b>Total</b>	<b>235 (18.4)</b>	<b>122 (9.6)</b>	<b>177 (13.9)</b>	<b>292 (22.9)</b>	<b>409 (32.0)</b>	<b>41 (3.2)</b>	<b>1276 (100)</b>

## Ski jumping (n=89)

Table 10. The total number of injuries reported in ski jumping through all 5 seasons (2014-19) regarding injury location (rows) versus injury severity (columns). Injury location is expressed as body part injured, and injury severity is expressed as days of absence from full participation in training and competition.

Body part injured	No absence	1-3 days	4-7 days	8-28 days	>28 days	Info missing	Total, n (%)
Head/face	0	1	4	2	1	0	8 (9.0)
Neck, cervical spine	0	0	0	1	0	0	1 (1.1)
Shoulder, clavicle	1	0	1	0	1	0	3 (3.4)
Upper arm	0	0	0	0	0	0	0 (0)
Elbow	0	1	0	0	0	0	1 (1.1)
Forearm	0	1	0	0	0	0	1 (1.1)
Wrist	1	0	0	1	1	0	3 (3.4)
Hand, finger, thumb	0	0	0	0	0	0	0 (0)
Chest (sternum, ribs, upper back)	0	0	0	1	0	0	1 (1.1)
Abdomen	0	0	0	0	0	0	0 (0)
Lower back, pelvis, sacrum	3	0	2	0	3	0	8 (9.0)
Hip, groin	3	0	2	2	1	0	8 (9.0)
Thigh	0	0	0	0	0	0	0 (0)
Knee	11	4	0	6	16	0	37 (41.6)
Lower leg, Achilles tendon	3	0	0	0	0	0	3 (3.4)
Ankle	3	4	1	2	3	0	13 (14.6)
Foot, heel, toe	1	0	0	0	0	0	1 (1.1)
Other body parts	1	0	0	0	0	0	1 (1.1)
<b>Total</b>	<b>27 (30.3)</b>	<b>11 (12.4)</b>	<b>10 (11.2)</b>	<b>15 (16.9)</b>	<b>26 (29.2)</b>	<b>0 (0)</b>	<b>89 (100)</b>

## Alpine disciplines

World Cup injuries (n=476), 13 seasons

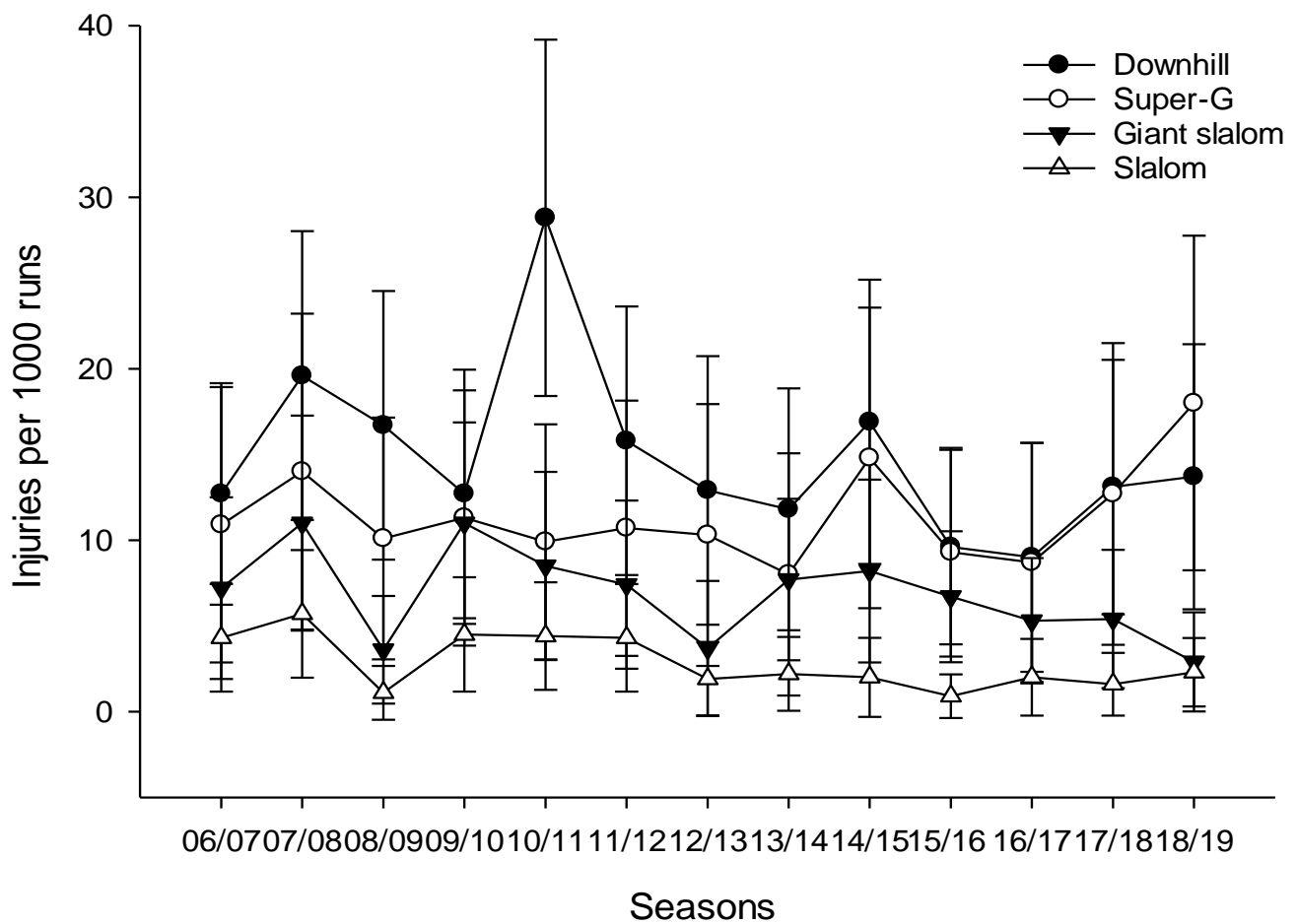


Figure 15. Injury incidence, expressed as number of injuries per 1000 runs (with 95% confidence intervals), for all injuries reported in World Cup races for each of the 13 seasons (2006-19) in the different alpine disciplines.

## Alpine skiing

Injuries to the knee (n=447) & ACL (n=168), 13 seasons

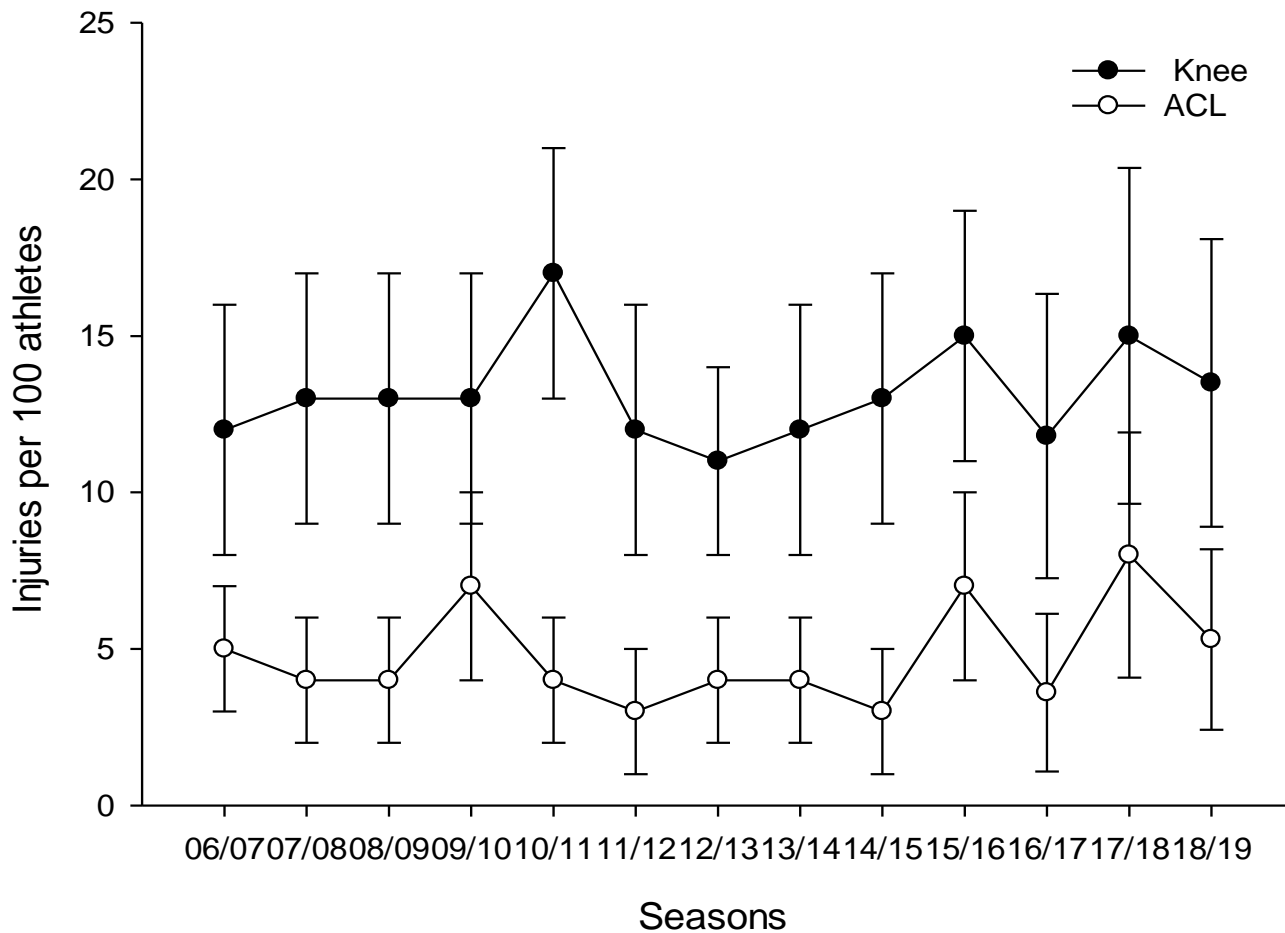


Figure 16. Injury incidence, expressed as number of injuries per 100 World Cup athletes (with 95% confidence intervals), for injuries to the knee and ACL only, among males and females, reported through all 13 seasons (2006-19) in alpine skiing.

## Alpine skiing

World Cup injuries to the knee (n=212) & ACL (n=80), 13 seasons

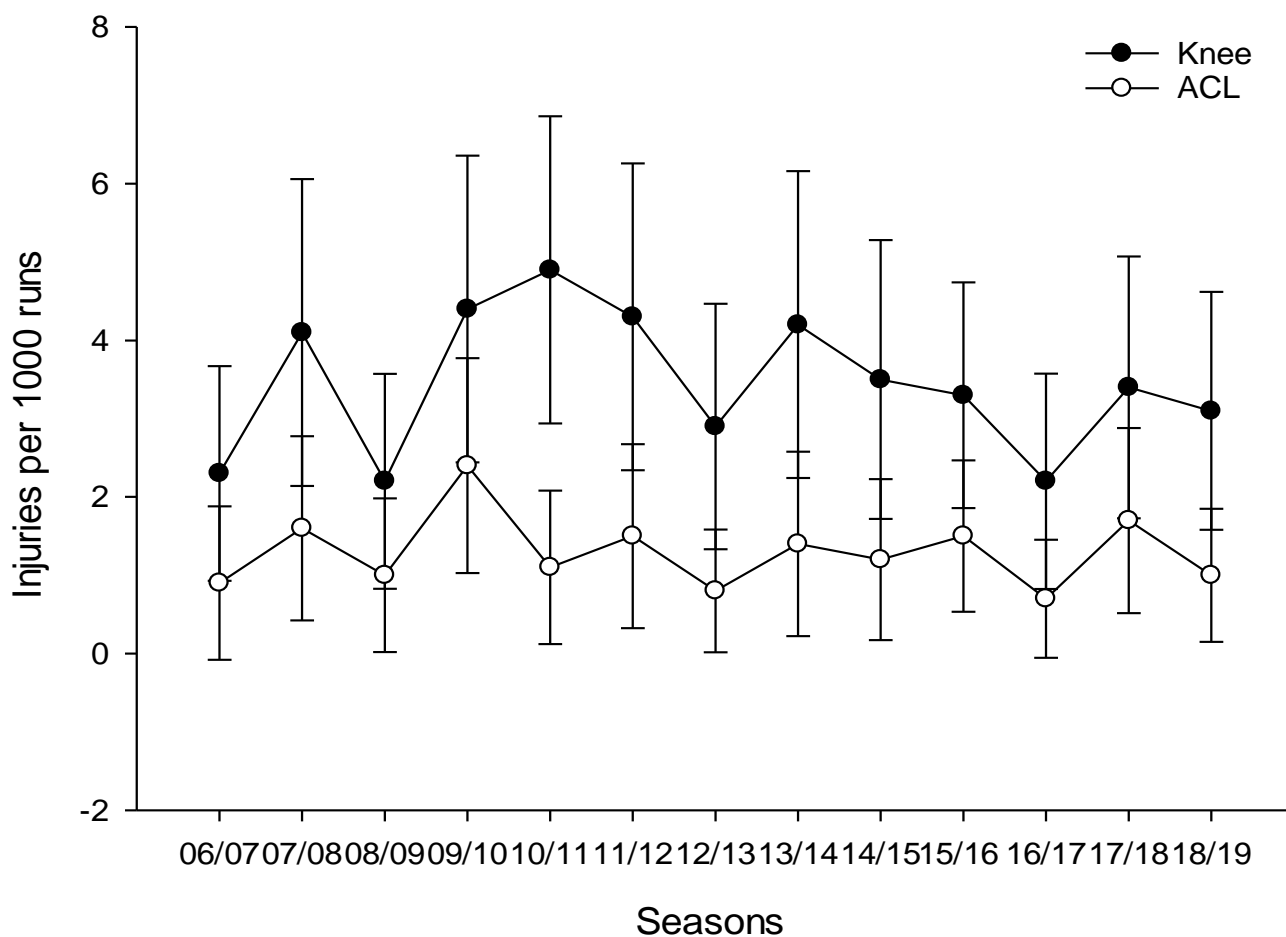


Figure 17. Injury incidence, expressed as number of injuries per 1000 World Cup runs (with 95% confidence intervals), for injuries to the knee and ACL only, among males and females, reported in World Cup races through all 13 seasons (2006-19) in alpine skiing.



## Alpine European Cup

All injuries during training and competition (n=239)

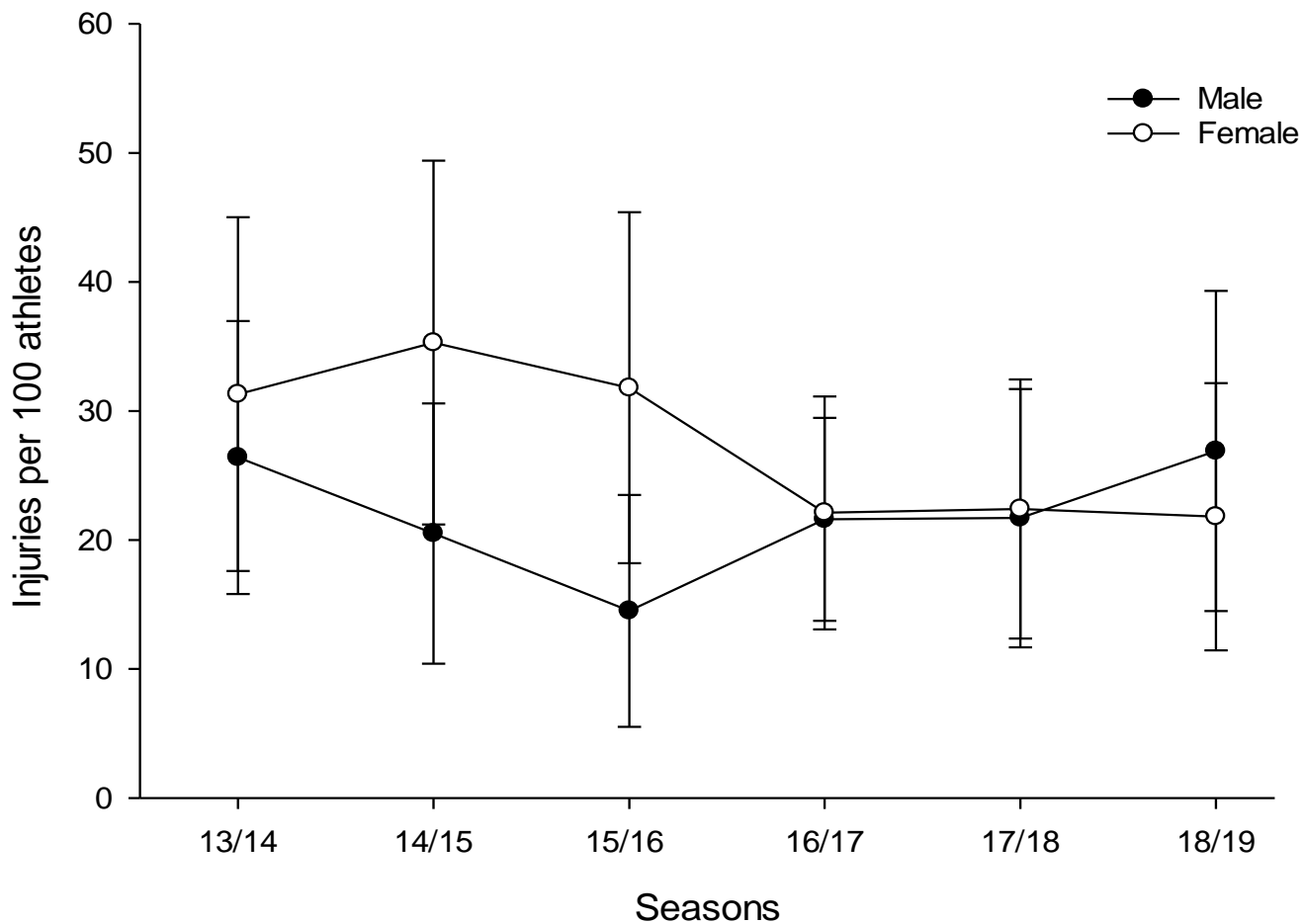


Figure 18. Injury incidence, expressed as injuries per 100 athletes (with 95% confidence intervals), for injuries reported among males versus females for each of the 6 seasons (2013-19) in the European Cup.

## Alpine European Cup

All injuries during European Cup competitions (n=85)

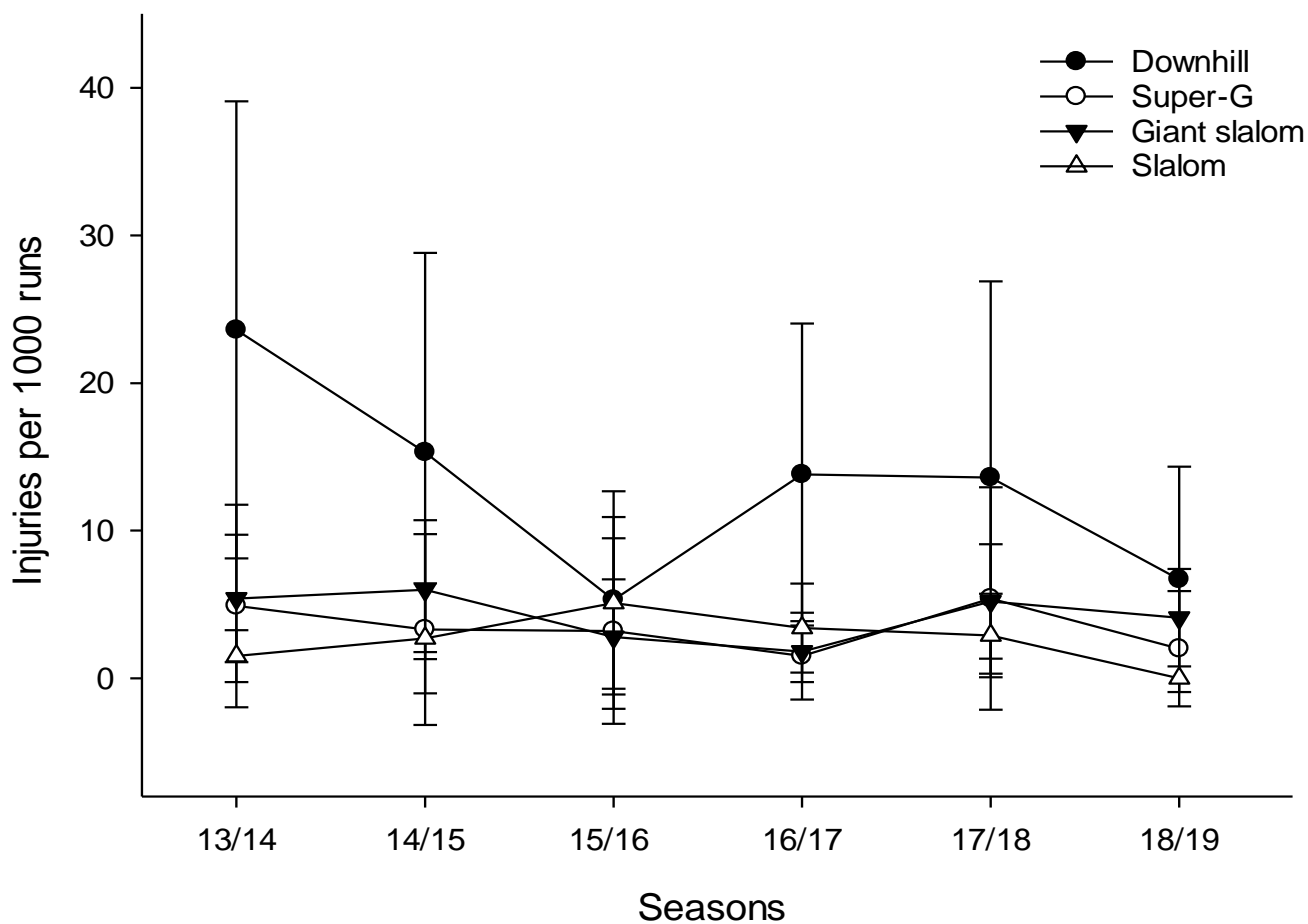


Figure 19. Injury incidence, expressed as number of injuries per 1000 runs (with 95% confidence intervals), for all competition injuries reported throughout the 2013-19, European Cup seasons, in the different alpine disciplines.

## Alpine World Cup and European Cup Time-loss injuries

All time-loss injuries during World Cup competitions (n=382) vs. European Cup competitions (n=72)

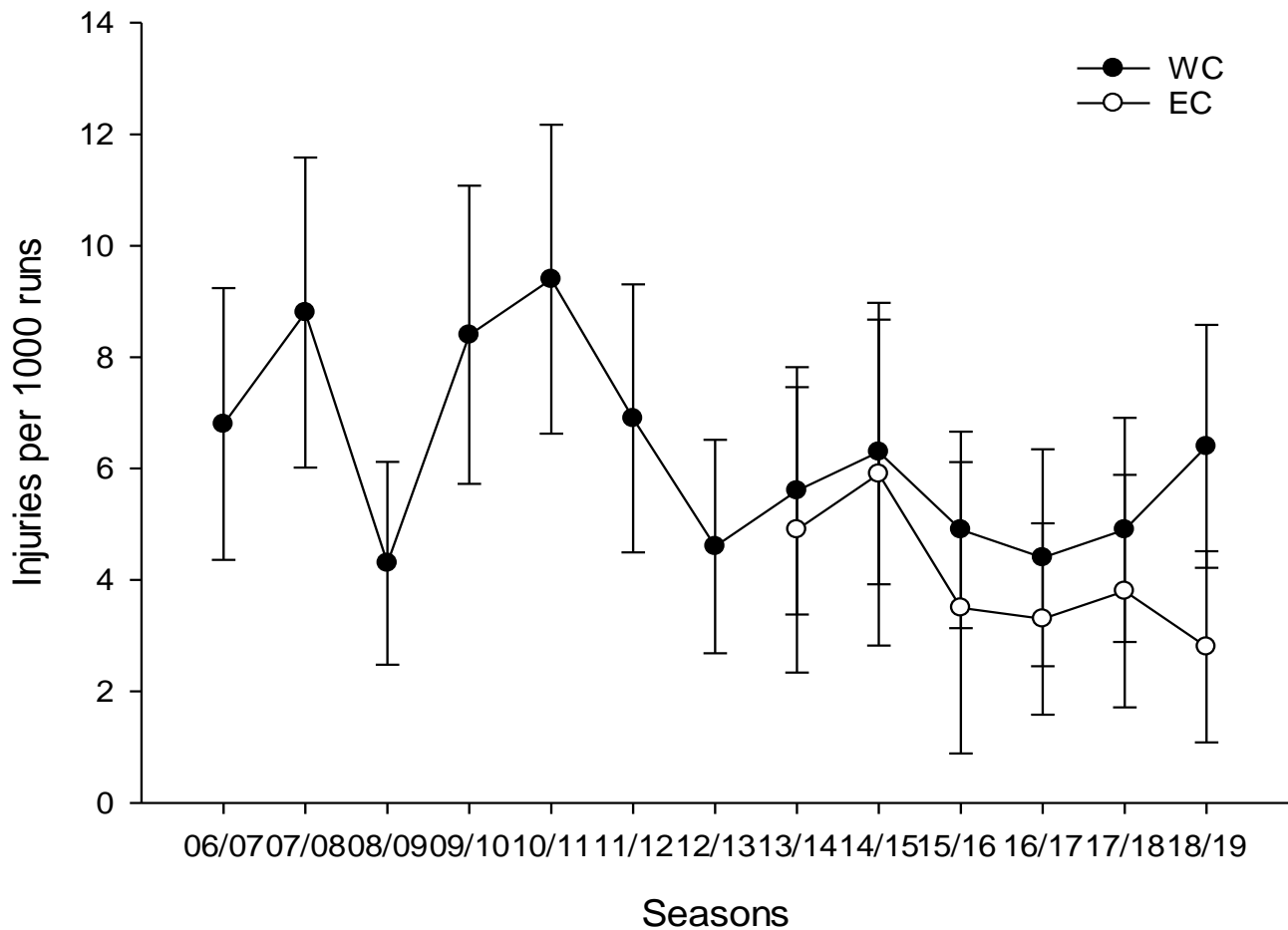


Figure 20. Time-loss injuries (absence from training or competition  $\geq 1$  day) expressed as number of injuries per 1000 runs in World Cup competitions (n=382) vs. European Cup competitions (n=72), (with 95% confidence intervals). Note: World Cup data are from 13 seasons (2006-19) while European Cup data are from 6 seasons only (2013-19).

## Knee injuries in World Cup and European Cup

All knee injuries during alpine World Cup competitions (n=212) vs. European Cup competitions (n=32)

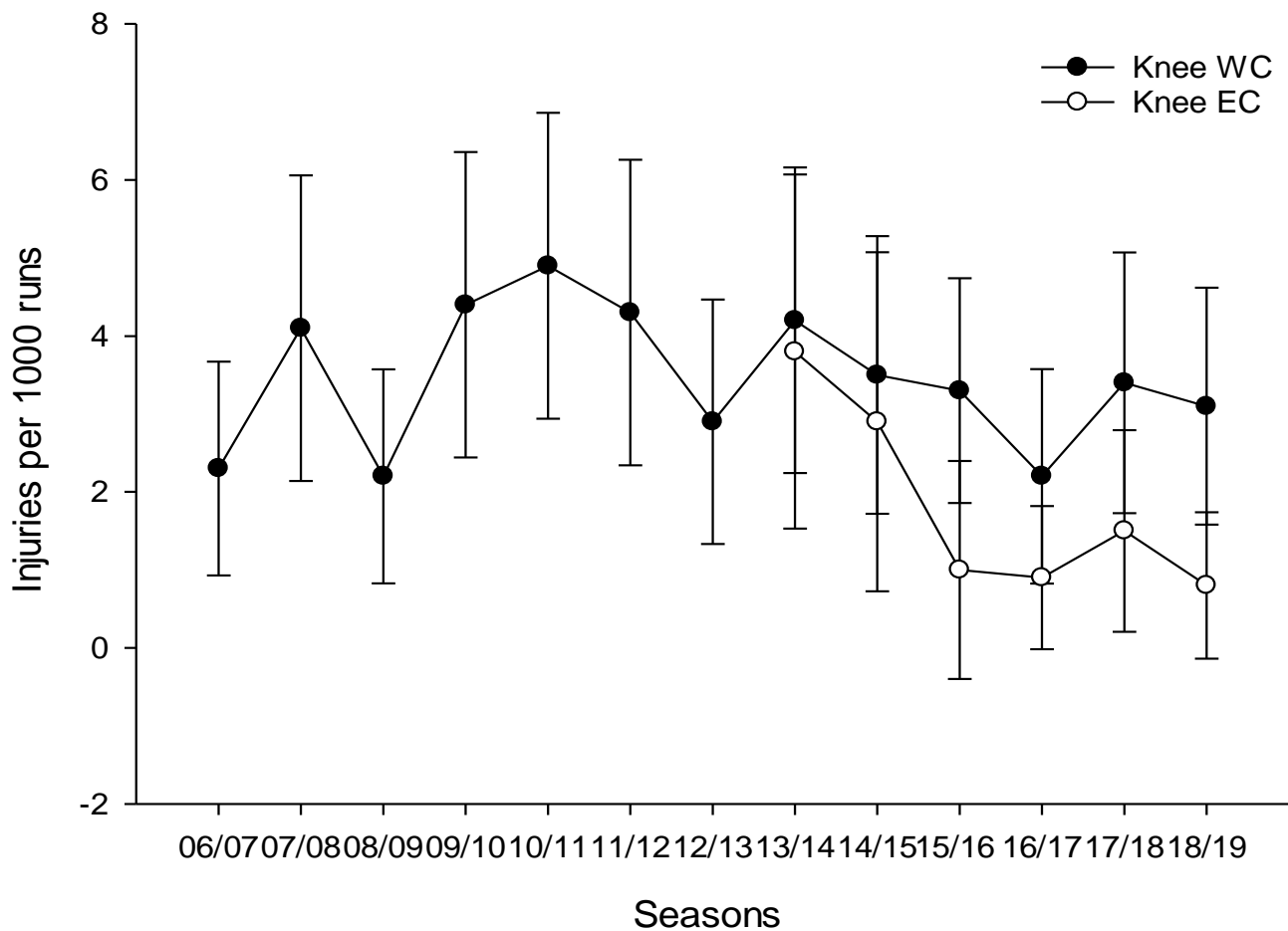


Figure 21. Knee injuries, expressed as number of injuries per 1000 runs, in World Cup competitions vs. European Cup competitions (with 95% confidence intervals). Note: World Cup data are from 13 seasons (2006-19) while European Cup data are from 6 seasons only (2013-19).

## ACL injuries in World Cup and European Cup

All ACL total rupture injuries during alpine World Cup competitions (n=80) vs. European Cup competitions (n=19)

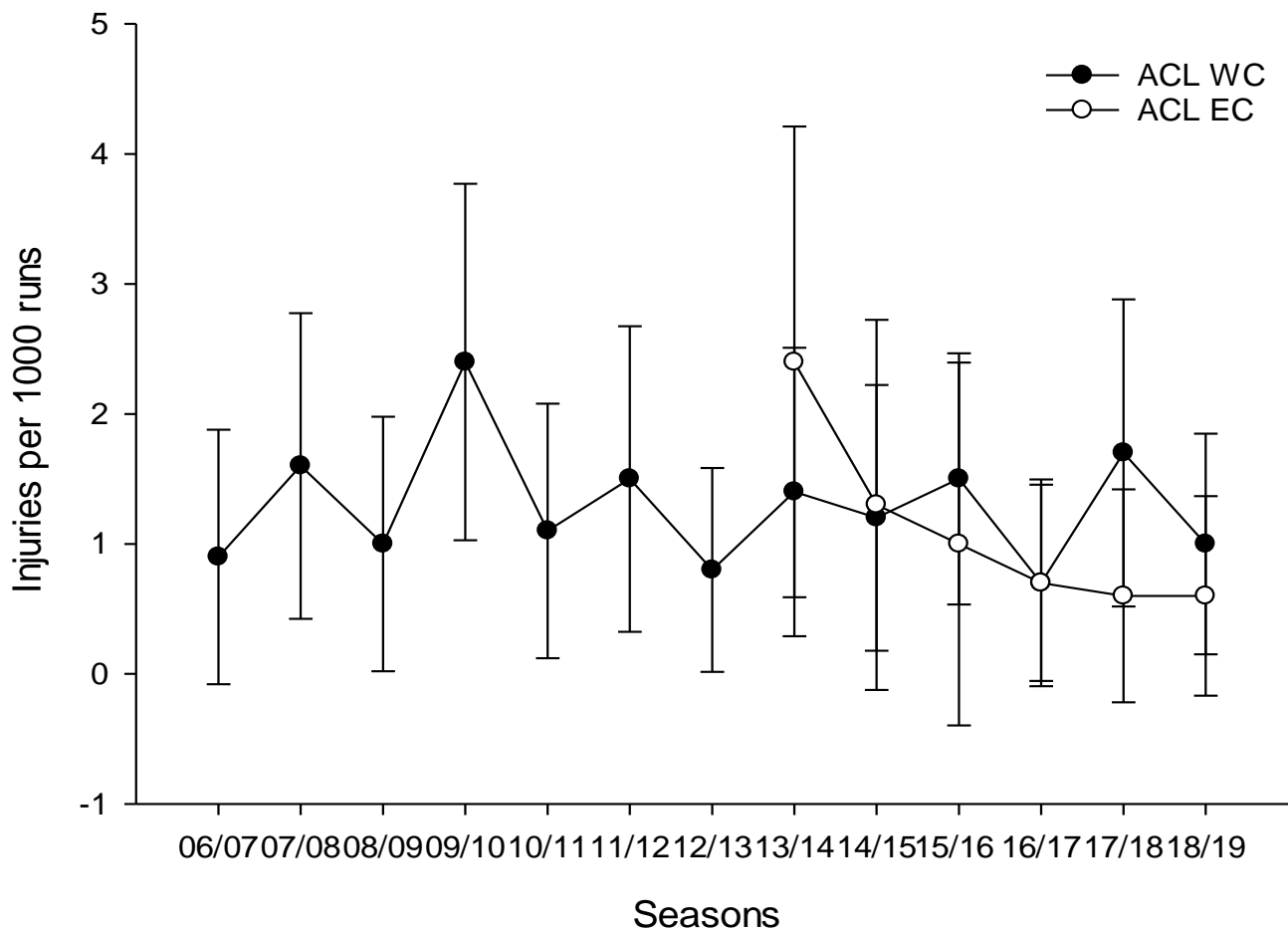


Figure 22. ACL total rupture injuries, expressed as number of injuries per 1000 runs, in World Cup competitions vs. European Cup competitions (with 95% confidence intervals). Note: World Cup data are from 13 seasons (2006-19) while European Cup data are from 6 seasons only (2013-19).

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