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Original research

Winter breaks: How do they affect injuries in field hockey?

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ABSTRACT

Objectives: The Irish Hockey League (IHL) introduced an eight-week winter break for the first time in the 2018/2019 season. We evaluated the effects of this eight-week break by comparing injury outcome metrics in the 2018/2019 (winter break) season and the 2017/2018 (no winter break) season.
Design: Prospective cohort study.
Methods: Each season was split into three distinct periods: period one consisted of the first nine weeks of each season; period two, weeks ten to 18; and period three, the final weeks. For the 2018/2019 season, the winter break was implemented in period two (weeks 10 to18). Relative risk with 95 % CI and injury incidence (1000*h*) were compared across the two seasons.
Results: Overall, 173 and 150 injuries we incurred during the 2017/2018 (no winter break) and 2018/2019 (winter break season) seasons respectively. Compared to 2017/2018 season, total injury incidence rate, injury severity, and injury burden were all significantly higher in period three during the 2018/2019 season (i.e., following the winter break). Furthermore, injured athletes had a 2.5-times higher relative risk of sustaining an injury after the winter break. Relative risks of 15.3 and 21.4 were observed for lower back injuries and fractures after the winter break, when compared with no break.
Conclusions: Although fewer injuries were incurred during the 2018/2019 season, significantly more injuries were sustained in the period after the implementation of the winter break when compared to the corresponding period during the 2017/2018 season.

Practical Implications

- It is imperative that clubs prepare athletes for the second half of the season to ensure that they do not become de-conditioned.
- In order to avoid the resulting fixture congestion from the winter break, it may be necessary for the National Governing Body to extend the duration of the season.
- This study provides coaches, athletes, and practitioners with a breakdown of the absolute risk of injuries across three periods over two seasons. This will assist in the development of future training programmes to prevent injuries after the winter break.
- Ensuring consistent levels of match fitness and conditioning throughout the winter break through occasional friendly matches may assist in reducing the spike in loading upon the resumption of games.
- Future research studies are vital to further the findings of this study. This should include a study to investigate the rates of injury at various points across the season to assess the impact of particular contextual factors.

1. Introduction

Match and training injuries in field hockey occur at a rate between 7.8 and 11.8 injuries per thousand exposure hours (1000 h),[1–3] and have a burden, i.e., number of days with injury symptoms per thousand exposure hours, of 121.0 days/1000 h[4]. Although most epidemiological studies of injury in field hockey to date have been conducted in tournament settings, longitudinal studies are becoming increasingly common[5,6]. In Ireland, field hockey is an amateur sport generally played recreationally. However, the ten teams competing in the Irish Hockey League (IHL), the top level of competition in Ireland, are made up of a range of athletes from community-based players to Olympians.[7] In recent years, the National Governing Body for field hockey in Ireland, Hockey Ireland, had come under increased pressure to introduce a mid-season winter break. Some of the reasons cited included allowing players a period of recovery mid-season, ensuring minimal overlap of the field hockey and indoor hockey seasons, and reducing exposure to inclement weather during the period. In 2018, it was announced that an eight-week mid-season winter break would be introduced.[8] During this period, no matches organised by Hockey Ireland were to be scheduled.

Although welcomed by both athletes and coaches, the winter break was introduced into the 2018/2019 season relatively untested with

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respect to the impact that it may have on subsequent injury rates. One study in soccer highlighted that the rates and burden of injury increased when there was no structured winter break implemented.[9] In contrast to this, however, there are also reports of higher incidences of particular injuries, such as to the ankle following a winter break,[10] as well as during shortened winter breaks.[11] However, these studies were undertaken in elite professional athletes, where medical supports and sport science facilities are present, and injured athletes continue to train under close monitoring. In amateur and community-based athletes, these supports are often lacking. This could result in athletes becoming deconditioned and losing match fitness, possibly leading to an increased rate and burden of injuries in the period after the winter break. In contrast, separating the indoor and field hockey seasons decreased the number of matches that athletes were participating in, potentially decreasing athletes' risk of sustaining an injury.

To date, no study has investigated the impact of a winter break on amateur athletes with respect to the rate and burden of injuries. For this reason, the primary aim of the present study was to assess the effect of the introduction of a winter break in the IHL on injury rates and absolute risk. This was achieved through three main objectives: (1) to report and compare the incidence rates and burden of injuries across three pre-defined time periods during the 2017/2018 and 2018/2019 seasons; (2) to contrast the absolute risk of injury between the two seasons; and (3) to investigate the differences in injury characteristics between the two seasons.

2. Methods

Ethical approval for this study was received from the Human Research Ethics Committee, University College Dublin.

An injury was defined as any physical complaint sustained by a player during a field hockey match or field hockey training, irrespective of the need for medical attention or time-loss from field hockey related activities. An injury that resulted in a player receiving attention from a healthcare professional was referred to as a medical attention injury, and those injuries that resulted in a player being unable to take a full part in future field hockey training or matches were referred to as time-loss injuries. This definition was adopted from the consensus statement for soccer[12] and explained to all participants prior to the commencement of the data collection period, to ensure clarity on what constituted an injury. An injury was determined to be recovered when the player no longer reported any injury-related symptoms, e.g., pain. Severity was therefore defined as the duration between the date in which the injury was incurred and the date in which the athlete no longer reported injury-related symptoms, reported in days. A recurrent injury was an injury sustained by an athlete that was of the same type and to the same body site as an index injury.

This prospective, observational study was undertaken across two full IHL seasons, the first of which ran from September 2017 to May 2018 and the second from September 2018 to May 2019. All male field hockey athletes over the age of 18 were eligible for inclusion. Invitations were sent to each of the ten clubs competing in the IHL each season, explaining the rationale and objectives of the study. With the permission of the club, each athlete was subsequently contacted to obtain informed consent.

Participating athletes were enrolled onto an online electronic reporting system for data collection purposes.[13] Using this system, athletes had the ability to self-report the date on which the injury was incurred, as well as the date that they were no longer suffering from injury-related symptoms. Other injury characteristics such as location, type, and mechanism (non-contact, contact with stick or ball, contact with another player), as well as whether they had sustained the injury during training or match-play were also collected. The electronic reporting system sent daily prompts to the athletes via email, to record new injuries and to provide an update on existing injuries. As athletes cannot accurately self-report a diagnosis when no professional medical attention has been sought, non-contact injuries self-reported by athletes was categorised as "pain". A second method of data collection was used, whereby each club's designated physiotherapist was contacted weekly, in order to collect further details on medical attention and time-loss injuries, as well as a method of corroborating injuries which had been self-reported by the athlete. The head coach of each team was also contacted on a weekly basis to provide details on training exposure, i.e., duration and number of athletes attending each training session for the preceding week. Match exposure was obtained from the official Hockey Ireland website.[8,14]

For analysis purposes, both the 2017/2018 (no winter break) and 2018/2019 (winter break) seasons were split into three specific time periods. Period one consisted of the first nine weeks of each season; period two, weeks ten to 18; and period three, the final weeks. For the 2018/2019 season, the winter break was implemented in period two (weeks 10–18), giving pre-, during-, and post-winter break intervals for comparison with the 2017/2018 season.

Match exposure was calculated as the number of players on the pitch, per team, multiplied by the duration of a match in hours,[15] e.g., 11 players*1.1 h. Training exposure was calculated as the number of athletes at each session, multiplied by the duration of the training session, e.g., 18 players*1.5 h. The overall incidence of injury was reported for each of the three time periods per thousand combined exposure hours (/1000 h) and burden of injury as the severity per thousand exposure hours (/1000 h). Similarly, the mean severity of injury was reported for each of the three time periods as days. Mixed ANOVA, followed by post-hoc Tukey method tests were used to assess the level of significance in the difference of these variables each season across the three time periods. Absolute risk was calculated for each of the classifications of injury (all physical complaints, medical attention, time-loss) and new/recurrent injury, as well as the location, type, and mechanism of injury and playing position in each time-period across the two seasons. This was calculated as the number of athletes in each subgroup divided by the total number of athletes, i.e., the number of athletes who suffered a hamstring injury divided by the overall number of athletes. Relative risk and 95 % CI were calculated according to Altman, 1991.[16] When zero caused problems with calculations of the relative risk, 0.5 was added to all cells, as per the Haldane method.[17] Absolute risk difference (ARD) was calculated for selected results, to better illustrate the risk of injury in the context of a group. The X^2 statistic was used to calculate the level of significance in the distribution of injuries between the types of injury, location of injury, and mechanism of injury, between the seasons.

3. Results

One-hundred and eighty-eight athletes were included from eight field hockey clubs in Ireland over the two-year study period. During the 2017/2018 season, 149 athletes were recruited from seven teams. However, one of these clubs was relegated from the league for the 2018/2019 season, with one further club gaining promotion. This led to 146 athletes from seven clubs being included for the 2018/2019 season. As such, 70 % of teams participated in this study, each season. However, only the 149 athletes who participated in this study for the full two-season surveillance period were included for analysis, to ensure consistent exposure and subsequent risk of injury. Of the athletes included in this study, 12 were goalkeepers (8.1 %), 49 were defenders (32.9 %), 36 were midfielders (24.2 %), and 52 were forwards (34.9 %). Athletes had a mean age of 27 years (SD = 5; range: 18–40). Mean height and weight were recorded as 182 cm (range: 170–194) and 80 kg (range: 64–95) respectively.

In total, 30,005 player exposure hours were recorded across the two seasons, of which 12,591 exposure hours (1951 match-hours; 10,640 training-hours) were recorded in the 2017/2018 season and 17,414 h (2,188 match-hours; 15,226 training-hours) were recorded in the

Table 1
The injury incidence rate, injury severity, and injury burden of injury across the three specified time periods for the 2017/2018 (no winter break) and 2018/2019 (winter break) seasons.

	Injury incidence rate (/1000 h)			Injury severity (days)			Injury burden (/1000 h)		
	2017/2018	2018/2019	p-value	2017/2018	2018/2019	p-value	2017/2018	2018/2019	p-value
Period 1	23.6 (19.6, 28.4)	9.9 (7.5, 13.1)	<0.05	12.1	11.2	0.07	286.1 (273.2, 299.5)	110.1 (102.5, 120.0)	0.06
Period 2	10.8 (7.8, 14.9)	2.0 (0.9, 4.1)	<0.05	12.4	29.9	0.06	133.9 (122.9, 146.0)	58.6 (51.4, 66.8)	0.07
Period 3	4.4 (3.1, 6.3)	11.3 (9.2, 13.8)	<0.05	6.8	15.6	<0.05	29.9 (26.1, 34.2)	175.5 (167.5, 183.8)	<0.05

2018/2019 season. In total, 25,866 player-training hours and 4139 player-match hours were recorded.

In total, 292 injuries occurred over the two-season study period (9.7/1000 h). Of these, 155 injuries were incurred during the 2017/2018 (no winter break) season, with the remaining 137 injuries being sustained during the 2018/2019 (winter break) season; resulting in overall injury incidence rates of 12.3 and 7.9/1000 h, respectively. Of the 149 athletes participating in this study, 99 sustained at least one injury in total (AR = 66.4 %). This gave rise to 99 new injuries and 193 subsequent injuries, of which 51 were recurrent. Thirty-eight different athletes sustained at least one injury in both the 2017/2018 and 2018/2019 seasons.

Table 1 details the injury incidence rate, injury severity, and injury burden across the three time-periods for each of the two seasons. Compared to the 2017/2018 (no break) season, the injury incidence rate was significantly lower during 2018/2019 (winter break) season for both period one and two (23.6 and 10.8/1000 h vs 9.9 and 2.0/1000 h, respectively), but significantly higher in period three (4.4/1000 h vs 11.3/1000 h). While there was no significant difference in injury severity or injury burden between seasons during periods one and two, both injury severity and injury burden were significantly higher during period three of the 2018/2019 (winter break) season.

Fig. 1 details the absolute risk of sustaining an injury across the three time periods in each of the two seasons. Overall, athletes had a 2.5 times higher relative risk (ARI = 23.6 %) of sustaining an injury in period three during 2018/2019 (winter break) season, compared to the same time-period during the 2017/2018 (no winter break) season, including a 2.5-times greater relative risk of a medical attention injury (ARI = 20.2 %) and a 2.6-times greater relative risk of a time-loss injury (ARI = 14.6 %).

Tables 2a and 2b provides details on the relative risk of sustaining an injury to a particular body location across the three time-periods over the course of the two seasons. The distribution of the locations of injuries sustained by field hockey athletes was significant (X^2 = 365.7, $p < 0.01$). During the 2018/2019 (winter break) season, athletes had a 15.3-times higher relative risk of incurring lower back and head/face injuries (ARI = 4.8 %), and a 7.1-times higher relative risk of a lower leg injury in period three (ARI = 4.2 %) than in the corresponding period in the precious season.

The most frequently reported injury locations across the study period were the hamstring, the hip/groin, and the knee. These injury locations had a relative risk of 2.0 (ARI = 5.6 %), 2.4 (2.8 %) and 1.6 (ARI = 1.4 %) during period three of the 2018/2019 (winter break) season than in the corresponding period in the previous season.

Tables 2a and 2b also provides details regarding the relative risk of sustaining particular types of injuries across the three time-periods over the course of the two seasons. The distribution of the types of injury sustained by field hockey athletes was significant (X^2 = 441.8, $p < 0.01$). During the 2018/2019 (winter break) season, athletes had a 21.4- and 9.2-times higher relative risk of sustaining fracture (ARI = 6.8 %) and laceration-type (ARI = 2.7 %) injuries respectively in period three than in the corresponding period in the previous season.

The most frequently reported injury types across the study period were muscle strains, pain and contusions. These injury types had a relative risk of 2.5 (ARI = 11.1 %), 2.3 (ARI = 4.1 %) and 3.1 (ARI = 5.5 %) during period three of the 2018/2019 (winter break) season when compared with period three of the 2017/2018 (no winter break) season.

Table 3 provides details on the relative risk of incurring injury through particular mechanisms across the three time-periods over the course of the two seasons. The distribution of the mechanisms of injury sustained by field hockey athletes was significantly different between the seasons (X^2 = 325.2, $p < 0.01$). During the 2018/2019 (winter break) season, athletes had a 6.1- and 3.9-times higher relative risk of sustaining injuries through contact with another player (ARI = 3.4 %) and contact with an object (ARI = 11.8 %) respectively in period three than in the same period in the precious season.

Non-contact was the most frequently reported mechanism of injury across the study period. This mechanism had a relative risk of

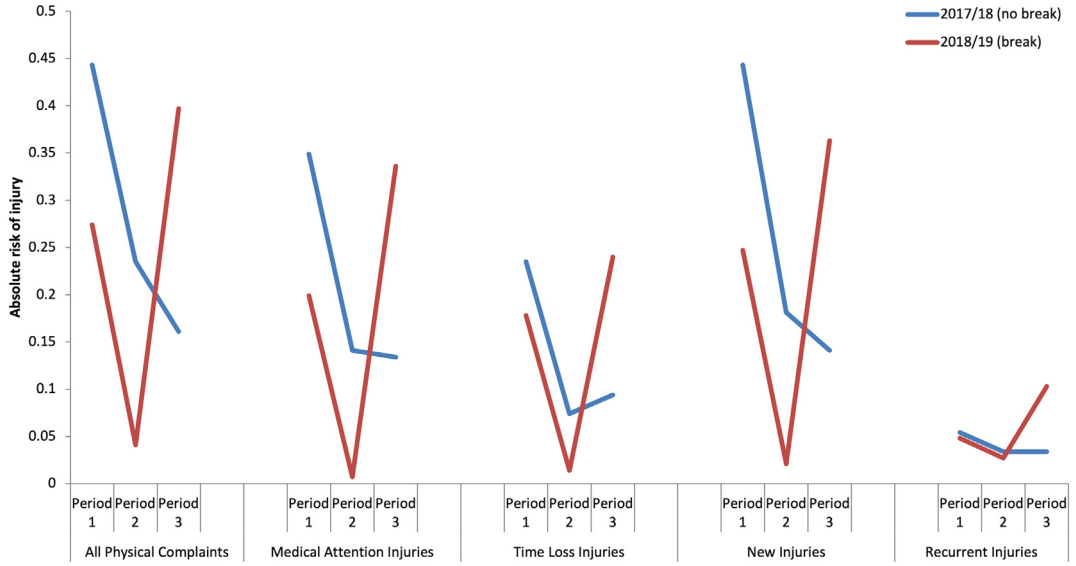

Fig. 1. The absolute risk of all new and recurrent injuries across the three time periods for the 2017/2018 and 2018/2019 seasons.

Table 2a
The relative risk of injury stratified by injury location across the three time periods for the 2017/2018 (no winter break) and 2018/2019 (winter break) seasons.

	2017/2018			2018/2019		
	Period 1	Period 2	Period 3	Period 1	Period 2	Period 3
Injury location						
Abdomen	4.90 (0.24–101.20)	0.98 (0.02–49.07)	0.98 (0.02–49.07)	0.20 (0.01–4.22)	1.02 (0.02–51.09)	1.02 (0.02–51.09)
Ankle	2.16 (0.77–6.05)	6.86 (0.36–131.66)	0.20 (0.02–1.66)	0.46 (0.17–1.30)	0.15 (0.01–2.80)	5.10 (0.60–43.15)
Elbow	0.98 (0.02–49.07)	0.98 (0.02–49.07)	0.20 (0.01–4.05)	1.02 (0.02–51.09)	1.02 (0.02–51.09)	5.10 (0.25–105.38)
Foot/Toe	0.98 (0.02–49.07)	2.94 (0.12–71.59)	1.47 (0.25–8.67)	1.02 (0.02–51.09)	0.33 (0.01–7.95)	0.65 (0.11–3.85)
Forearm	4.90 (0.24–101.20)	0.98 (0.02–49.07)	0.33 (0.01–7.95)	0.20 (0.01–4.22)	1.02 (0.02–51.09)	3.06 (0.13–74.54)
Hamstring	1.71 (0.74–3.96)	14.70 (0.85–255.08)	0.49 (0.22–1.11)	0.58 (0.25–1.35)	0.07 (0.00–1.18)	2.04 (0.90–4.62)
Hand/finger/thumb	0.49 (0.09–2.63)	2.94 (0.12–71.59)	0.16 (0.02–1.34)	2.04 (0.38–10.97)	0.34 (0.01–8.28)	6.12 (0.75–50.24)
Head/face	1.37 (0.45–4.22)	4.90 (0.24–101.20)	0.07 (0.00–1.13)	0.73 (0.24–2.24)	0.20 (0.01–4.22)	15.31 (0.88–265.59)
Hip/groin	1.54 (0.61–3.86)	2.45 (0.48–12.43)	0.42 (0.11–1.59)	0.65 (0.26–1.63)	0.39 (0.08–1.99)	2.38 (0.63–9.03)
Knee	3.18 (1.06–9.54)	6.86 (0.85–55.06)	0.59 (0.14–2.42)	0.31 (0.10–0.94)	0.15 (0.02–1.17)	1.63 (0.40–6.71)
Lower back	2.69 (0.88–8.27)	0.98 (0.20–4.78)	0.07 (0.00–1.13)	0.37 (0.12–1.14)	1.02 (0.21–4.97)	15.31 (0.88–265.59)
Lower leg	3.00 (0.83–10.86)	1.96 (0.18–21.38)	0.14 (0.02–1.12)	0.34 (0.09–1.23)	0.51 (0.05–5.57)	7.14 (0.89–57.35)
Neck/cervical spine	2.94 (0.12–71.59)	0.98 (0.02–49.07)	0.33 (0.01–7.95)	0.34 (0.01–8.28)	1.02 (0.02–51.09)	3.06 (0.13–74.54)
Pelvis/sacrum/glute	0.98 (0.06–15.52)	0.98 (0.02–49.07)	0.98 (0.20–4.78)	1.02 (0.06–16.16)	1.02 (0.02–51.09)	1.02 (0.21–4.97)
Quadriceps	2.94 (0.31–27.94)	0.98 (0.02–49.07)	0.20 (0.02–1.66)	0.34 (0.04–3.23)	1.02 (0.02–51.09)	5.10 (0.60–43.15)
Shoulder/clavicle	2.45 (0.48–12.43)	2.94 (0.12–71.59)	0.20 (0.01–4.05)	0.41 (0.08–2.07)	0.34 (0.01–8.28)	5.10 (0.25–105.38)
Sternum/ribs	0.33 (0.03–3.10)	4.90 (0.24–101.20)	2.94 (0.12–71.59)	3.06 (0.32–29.10)	0.20 (0.01–4.22)	0.34 (0.01–8.28)
Upper arm	2.94 (0.12–71.59)	0.98 (0.02–49.07)	0.98 (0.02–49.07)	0.33 (0.01–7.95)	1.02 (0.02–51.09)	1.2 (0.02–51.09)
Upper back	4.90 (0.24–101.20)	0.98 (0.02–49.07)	2.94 (0.12–71.59)	0.20 (0.01–4.22)	1.02 (0.02–51.09)	0.34 (0.01–8.28)
Wrist	6.86 (0.36–131.66)	0.98 (0.02–49.07)	0.49 (0.09–2.63)	0.15 (0.01–2.80)	1.02 (0.02–51.09)	2.04 (0.38–10.97)

Appropriate interpretation of relative risk is important to ensure that the results are truly understood. Relative risk refers to the risk of injury during a particular period compared to the same period in the other season.

2.0 (ARI = 14.0 %) during period three of the 2018/2019 (winter break) season when compared with the corresponding period of the previous season.

Table 4 provides details of the relative risk of incurring an injury stratified by playing position across the three time-periods over the course of the two seasons. The distribution of the injuries incurred by field hockey athletes by playing position was significantly different between seasons ($X^2 = 34.2$, $p < 0.01$). During the 2018/2019 (winter break) season, defenders and goalkeepers had a 4.1- (ARI = 39.4 %) and 3.0-times (ARI = 16.7 %) higher relative risk of sustaining an injury in period three than in the same period of the previous season.

Forwards sustained the highest number of injuries across the study period. They had a relative risk of injury of 1.9 (ARI = 15.4 %) during period three of the 2018/2019 (winter break) season than in the corresponding period of the previous season.

4. Discussion

This study compared the incidence rates and absolute risk of injuries following the introduction of a winter break in the top field hockey league in Ireland, with those of the previous season where no winter break was implemented. During the 2017/2018 (no winter break season), 173 injuries were incurred, resulting in an overall injury incidence rate of 11.8/1000 h. This was compared to 150 injuries (overall injury incidence rate = 7.6/1000 h) during the 2018/2019 (winter break) season. Injury incidence, severity, and burden were all significantly higher during period three of the 2018/2019 (winter break) season – the period after the winter break. In fact, athletes had a 2.5-times higher relative risk of sustaining an injury after the implementation of the winter break compared to the same time-period during the 2017/2018 (no winter break) season (ARI = 23.6 %). Interestingly, research has shown conflicting results in football, whereby one study reported the burden and incidence of severe injuries was higher with no winter break,[9] but others have shown an increased risk of injuries after the winter break.[10]

Prior to discussing the findings of this paper, a brief introduction to the structure of the field hockey season in Ireland is warranted to provide further contextual information to this study. Both the 2017/2018 and 2018/2019 seasons comprised of an 18-match IHL season, as well as a national cup competition, comprising of up to five further matches depending on progression in the tournament. Further to this, each region in Ireland had to two cup competitions, further adding to the match-load. Typically, field hockey teams were scheduled to play one match per week, usually on a Saturday. However, on occasion, teams play a further match mid-week or on a Sunday, resulting in a "double

Table 2b
The relative risk of injury stratified by injury type across the three time periods for the 2017/2018 (no winter break) and 2018/2019 (winter break) seasons.

	2017/2018			2018/2019		
	Period 1	Period 2	Period 3	Period 1	Period 2	Period 3
Abrasion	4.90 (0.24–101.20)	0.98 (0.02–49.07)	0.98 (0.02–49.07)	0.20 (0.01–4.22)	1.02 (0.02–51.09)	1.02 (0.02–51.09)
Concussion	0.65 (0.11–3.85)	2.94 (0.12–71.59)	0.20 (0.01–4.05)	1.53 (0.26–9.03)	0.34 (0.01–8.28)	5.10 (0.25–105.38)
Contusion	3.27 (1.35–7.90)	14.70 (0.85–255.08)	0.33 (0.11–0.99)	0.31 (0.13–0.74)	0.07 (0.00–1.18)	3.06 (1.01–9.27)
Fracture	2.94 (0.31–27.94)	6.86 (0.36–131.66)	0.05 (0.00–0.79)	0.34 (0.04–3.23)	0.15 (0.01–2.80)	21.43 (1.27–362.37)
Laceration	4.9 (0.24–101.20)	2.94 (0.12–71.59)	0.11 (0.01–2.00)	0.20 (0.01–4.22)	0.34 (0.01–8.28)	9.18 (0.50–169.08)
Ligament sprain	1.54 (0.61–3.86)	10.78 (0.60–193.22)	0.55 (0.16–1.83)	0.65 (0.26–1.63)	0.09 (0.01–1.66)	1.79 (0.53–5.97)
Meniscus	8.82 (0.48–162.38)	2.94 (0.12–71.59)	0.98 (0.06–15.52)	0.11 (0.06–2.09)	0.34 (0.01–8.28)	1.02 (0.06–16.16)
Muscle strain	1.44 (0.81–2.55)	8.82 (1.13–68.74)	0.40 (0.21–0.77)	0.69 (0.39–1.23)	0.11 (0.01–0.88)	2.51 (1.29–4.86)
Nerve injury	4.90 (0.24–101.20)	2.94 (0.12–71.59)	4.90 (0.24–101.20)	0.20 (0.01–4.22)	0.34 (0.01–8.28)	0.20 (0.01–4.22)
Pain	1.18 (0.52–2.64)	1.22 (0.34–4.47)	0.45 (0.16–1.25)	0.85 (0.38–1.91)	0.82 (0.22–2.98)	2.25 (0.80–6.30)
Tendinopathy	5.88 (0.72–48.24)	0.98 (0.06–15.52)	0.49 (0.09–2.63)	0.17 (0.02–1.40)	1.02 (0.06–16.16)	1.96 (0.36–10.54)

Appropriate interpretation of relative risk is important to ensure that the results are truly understood. Relative risk refers to the risk of injury during a particular period compared to the same period in the other season.

Table 3
The relative risk of injury stratified by mechanism across the three time periods for the 2017/2018 and 2018/2019 seasons.

	2017/2018			2018/2019		
	Period 1	Period 2	Period 3	Period 1	Period 2	Period 3
Non-contact	1.57 (1.04–2.38)	3.53 (1.35–9.25)	0.49 (0.30–0.80)	0.64 (0.42–0.96)	0.28 (0.11–0.74)	2.04 (1.26–3.32)
Contact with object	2.29 (1.08–4.82)	6.86 (0.85–55.06)	0.26 (0.11–0.61)	0.44 (0.21–0.92)	0.15 (0.02–1.17)	3.91 (1.64–9.33)
Contact with player	1.22 (0.50–3.02)	10.78 (0.60–193.22)	0.16 (0.02–1.34)	0.82 (0.33–2.01)	0.09 (0.01–1.66)	6.12 (0.75–50.24)

Appropriate interpretation of relative risk is important to ensure that the results are truly understood. Relative risk refers to the risk of injury during a particular period compared to the same period in the other season.

weekend". This was particularly prevalent after the winter break, given the need to play the same number of matches over a shorter period of time.

Although the increased injury incidence rate after the winter break is concerning, it is somewhat counterbalanced by the fewer injuries observed overall in the 2018/2019 (winter break) season. Although not statistically significant, injury incidence rate, severity, and burden across the 2018/2019 (winter break) season were all lower compared to the 2017/2018 (no winter break) season. This is largely explained by fewer injuries occurring while the winter break was taking place (2.0/1000 h), an injury incidence rate significantly lower than the 10.8/1000 h recorded during the same time-period of the 2017/2018 (no winter break) season. It should be noted however, that the incidence rate and burden of injury in period one of the 2017/2018 (no winter break) season appears to be abnormally high when compared with the 2018/2019 (winter break) season (injury incidence rate: 23.6 vs 9.9/1000 h; injury burden: 286.1 vs 110.1/1000 h), pushing up the overall incidence during the 2017/2018 (no winter break) season. However, the significantly higher relative risk of injury after the winter break is of prime concern. Athletes incurred a higher number of most of the injuries that are typically associated with non-contact mechanisms, such as hamstring strains and other muscle injuries. In fact, the relative risk of incurring a non-contact injury was two times higher after the winter break during the 2018/2019 (winter break) season when compared with the corresponding time-period during the 2017/2018 (no winter break) season (ARI = 14.0 %). There are several potential reasons for this. Despite introducing this eight-week pause, the season was not extended to account for the need to fulfil the same number of fixtures over a shorter period of time,[8,14] which is likely to have led to a greater concentration of fixtures being played in the available time. It has been documented in the past that fixture congestion may have a negative effect on injury rates.[18] Furthermore, the sudden spike in match and training load following a period of rest may have resulted in an increase in the incidence rate of non-contact injuries.[19] This may be particular important given the amateur nature of field hockey in Ireland, due to their lack of infrastructure.[20] Teams may not have the financial resources or staffing expertise to fully benefit from a winter break. As a result, athletes may become deconditioned due to a lack of matches. Interestingly, the relative risk of sustaining contact injuries was also higher after the winter break (RR = 3.69; ARI = 15.2 %). Although it is difficult to understand why this is the case, one possibility is that increased levels of fatigue due to fixture congestion might result in a lower playing standard. This could lead to poor ball control, subsequently causing contact injuries.

There were some interesting differences in the relative risk of sustaining particular injuries after the winter break. As previously highlighted, the increased number of injuries sustained by athletes after the winter break are likely to have occurred due to several reasons. For example, due to the increased levels of fixture congestion, athletes had less recovery time between matches and training sessions. Furthermore, athletes may continue to play despite being injured due to the matches being deemed more important towards the latter stages of the season.[21] Taking time off from field hockey related activities due to injury would result in more matches being missed. Although athletes were at an increased relative risk of sustaining all injury types to all injury sites after the winter break, there were particularly important injuries to note. Muscle strains, particularly to the hamstring muscle group, are the most frequently reported injuries in field hockey,[2] also causing the most significant injury burden.[4] Worryingly, athletes were at a 2.5-times greater relative risk of suffering a muscle strain injury after the winter break (ARI = 11.1 %). This included a 2.0-times greater relative risk of sustaining an injury to the hamstring (ARI = 5.6 %). Muscle strain injuries occur at higher rates during episodes of fatigue.[22] Although the efficacy of interventions, such as eccentric hamstring strengthening, to prevent muscle injuries has been proven in the past,[23] their effectiveness in a real-life context is questionable.[24] In fact, a warm-up strategy developed specifically for field hockey, aimed at reducing the incidence and severity of injury, proved somewhat unsuccessful.[25] In this regard, it has been hypothesised that understanding the context in which injuries occur in a sport may assist in informing strategies of prevention.[26,27] Indeed, improving preparedness post-winter break, clubs and athletes may be able to prevent this sharp increase in muscle strain injury rates. Athletes were also at greater relative risk of sustaining injuries to the lower back after the winter break (ARI = 4.8 %). Field hockey is played in a unique position, whereby athletes will often run and play the ball in a flexed position. Prolonged exposure to this position is likely to be the cause for athletes' increased risk of sustaining these injuries after the winter break.[28]

There is no doubting the importance of, and potential for, the introduction of the winter break in field hockey in Ireland, as highlighted for football.[9] In theory, a winter break provides athletes with a period of rest, allowing an uninterrupted indoor hockey season, and avoidance

Table 4
The relative risk of injury stratified by playing position across the three time periods for the 2017/2018 and 2018/2019 seasons.

	2017/2018			2018/2019		
	Period 1	Period 2	Period 3	Period 1	Period 2	Period 3
Goalkeeper	2.00 (0.45–8.94)	3.00 (0.13–67.06)	0.33 (0.04–2.77)	0.50 (0.11–2.23)	0.33 (0.01–7.45)	3.00 (0.36–24.92)
Defender	1.78 (0.96–3.29)	3.91 (1.18–12.97)	0.24 (0.11–0.54)	0.56 (0.30–1.04)	0.26 (0.08–0.85)	4.09 (1.84–9.07)
Midfielder	1.50 (0.89–2.52)	5.33 (0.69–41.32)	0.43 (0.21–0.92)	0.67 (0.40–1.13)	0.15 (0.02–1.13)	1.80 (0.86–3.75)
Forward	1.54 (0.89–2.68)	4.91 (1.13–21.35)	0.52 (0.25–1.06)	0.65 (0.37–1.13)	0.20 (0.05–0.89)	1.92 (0.94–3.93)

Appropriate interpretation of relative risk is important to ensure that the results are truly understood. Relative risk refers to the risk of injury during a particular period compared to the same period in the other season.

of poor winter weather associated with the region. There is also evidence to suggest that they reduce injury rates in sport.[9] This study highlights some important implications for the future of the winter break in field hockey.

Although the overall number of injuries decreased in the 2018/2019 (winter break) season, there should be concern regarding the significantly increased relative risk and absolute risk increase of injury after the winter break. As well as allowing a period of rest, it is imperative that clubs prepare athletes for the second half of the season to ensure that they do not become de-conditioned. Furthermore, in order to avoid the resulting fixture congestion from the winter break, it may be necessary for the National Governing Body to extend the duration of the season.

This study provides coaches, athletes, and practitioners with a breakdown of the absolute risk of injuries across three periods over two seasons. This will assist in the development of future training programmes to prevent injuries after the winter break. For example, ensuring consistent levels of match fitness and conditioning throughout the winter break through occasional friendly matches may assist in reducing the spike in loading upon the resumption of games. This may assist in reducing the relative risk of sustaining non-contact injuries after the winter break.

It is important to note certain limitations when interpreting the results of this study. Firstly, although it was deemed to be the most relevant injury definition for the aims of this study, there are some potential shortcomings with the implementation of an all physical complaints injury definition. Although every effort was made to ensure that all injuries were collected using two methods of data collection, it cannot be guaranteed that full compliance was observed. Furthermore, there has been some debate in the past as to the reliability of such a definition. Secondly, as a result of this definition, it was not possible to obtain a definitive diagnosis for all injury types. Where this was not possible, injury type was deemed to be “pain”. Furthermore, although the focus of this study was the introduction of the winter break, other factors outside of the scope of this study may have also contributed to athletes' risk of sustaining an injury. For example, changes related to the league or participating players may place athletes at greater risk of injury. Such factors were not considered in this study. However, we implore future studies to investigate other factors that may influence injury risk from season to season. Finally, we employed relative risk as a reporting metric for this study. Appropriate interpretation of relative risk is important to ensure that the results are truly understood. Relative risk refers only to the risk of injury relative to the control group,[29] i.e., the 2017/2018 season in this study. In order to account for this, we have also provided the absolute risk increase of injury, when reported in-text.

5. Conclusion

Although fewer injuries occurred overall during the 2018/2019 (winter break) season, significantly more injuries were sustained in the period after the winter break. In fact, athletes had a 2.5-times higher risk of injury after the winter break compared to the same time-period during the 2017/2018 (no winter break) season (ARI = 23.6 %). The lower leg and ankle were the injury locations with the highest relative risk after the winter break, while muscle strains and contusions had the highest relative risk of all injury types, when compared to the 2017/2018 (no winter break) season. Further studies investigating the impact of the winter break on injury rates in field hockey are required. This will be particularly important as athletes and clubs adapt to the situation and learn how to take advantage of the benefits of a winter break.

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Declaration of Interest Statement

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Appendix A. Supplementary data

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