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1 **The impact of COVID-19 related disruption on injury rates in elite men's domestic cricket**

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16

17 **ABSTRACT**

18 This study aimed to investigate the impact of COVID-19 enforced prolonged training disruption and  
19 shortened competitive season, on in-season injury and illness rates. Injury incidence and percent  
20 proportion was calculated for the 2020 elite men’s senior domestic cricket season and compared to a  
21 historical average from five previous regular seasons (2015 to 2019 inclusive). The injury profile for  
22 the shortened 2020 season was generally equivalent to what would be expected in a regular season,  
23 except for a significant increase in medical illness as a proportion of time loss (17% compared to  
24 historic average of 6%) and in-season days lost (9% compared to historic average of 3%) due to  
25 COVID-19 related instances (most notably precautionary isolation due to contact with a confirmed or  
26 suspected COVID-19 case). There was a significant increase in the proportion of in-season days lost  
27 to thigh injuries (24% compared to 9%) and a significant decrease in the proportion of days lost to  
28 hand (4% compared to 12%) and lumbar spine (7% compared to 21%) injuries. These findings  
29 enhance understanding of the impact prolonged period of training disruption and shortened season can  
30 have on cricket injuries and the challenges faced by practitioners under such circumstances.

31

32 **Practical implications**

- 33
- 34 • These findings highlight the unique challenges faced by sport practitioners managing the  
35 disruption to player availability in a global pandemic, mostly related to players self-  
36 isolating due to close contact with a suspected or positive COVID-19 case, with only a few  
37 players testing positive for the disease.
  - 38 • Knowledge of where remote training maybe somewhat limited in the extent it can  
39 adequately prepare players physically for the demands of a competitive season. This allows  
40 practitioners to focus on areas where remote training is less effective, to overcome these  
41 shortcomings. The results would suggest in this context, these are activities that can help  
42 achieve high intensity training loads and the exact loads and forces demanded by full cricket  
specific skills training.

43 **INTRODUCTION**

44 In late 2019, ‘coronavirus disease 2019’ (COVID-19) was declared a pandemic by the World Health  
45 Organisation (WHO), with millions of cases worldwide. To reduce transmission, many countries went  
46 into emergency lockdown, with all major sports competitions suspended or cancelled from early March  
47 2020 [1].

48 The England and Wales Cricket Board (ECB) domestic cricket season was scheduled to start on April  
49 12<sup>th</sup> 2020, with pre-season preparations underway from January. This was suspended when the UK went  
50 into lockdown on March 23<sup>rd</sup> 2020 [2]. The season restarted on August 1<sup>st</sup> 2020, behind closed doors  
51 with a reduced fixture schedule and two (instead of the usual three) competition formats: a one-off first-  
52 class (4-Day) tournament named the ‘Bob Willis Trophy’ and a reduced T20 tournament. The annual  
53 One-Day (50 over) tournament was cancelled. As a result, there was prolonged disruption to training  
54 and the usual pre-season preparations could not be completed. Players kept in regular contact with sport  
55 practitioners at their club and trained remotely. There has been noted concerns on the impact such  
56 training disruption may have on the maintenance of key physical qualities (e.g., strength, power, high-  
57 speed running ability, acceleration, deceleration and change of direction) and injury risk in team contact  
58 sports [3], which are also valid for non-contact team sports like cricket.

59 For a regular domestic cricket season, injury surveillance in Australia [4] and England and Wales [5],  
60 has produced generally consistent findings. There is greater risk with the shorter one-day competition  
61 formats (e.g., One-day and T20 cricket) compared to the longer multi-day first-class format (4-Day).  
62 Bowling is generally the activity that results in the most time loss injuries [4-5]. However, this was not  
63 found for domestic T20 in England and Wales, where fielding was the activity that resulted in the most  
64 time loss injuries between the 2010-2018 seasons [5]. Consistently, the thigh (most notably hamstring  
65 injuries) has been found to be the body region with the highest time loss injury incidence, and the lumbar  
66 spine (often stress fractures) results in the most days lost [4-5].

67 Lumbar spine stress fractures are sustained during bowling [6-8], and the International Cricket Council  
68 (ICC) highlights the increased risk of injury for fast bowlers returning to play after a period of enforced  
69 time-out and restricted access to elite facility training [9]. The International Cricket Council  
70 recommends bowlers undertake a minimum of 8 weeks’ progressive preparation to physically condition  
71 themselves for match intensity and bowling volumes [9], as research has shown a period of in-activity  
72 (due to rehabilitation in the study) can reduce bone density in the affected area [10]. However, it was  
73 recognised that for most bowlers, such time would not be available due to the shortened return to cricket  
74 and condensed schedule in 2020. Therefore, following consultation with First-Class County Cricket  
75 Clubs Science and Medicine teams, the England and Wales Cricket Board outlined the ‘Bowling Injury  
76 Risk Mitigation’ strategy that provided guidance to limit in-season exposure by reducing the total overs  
77 bowled on a match day from 96 to 90 overs, and during the first innings to 120 overs. The aim of the

78 strategy was to reduce the likelihood that individual bowlers would be exposed to workload levels that  
79 would increase injury risk.

80 It is unclear what impact the prolonged training disruption, irregular pre-season preparations, a  
81 shortened domestic cricket season and bowling injury risk reduction measures would have on injury  
82 rates. Given the rare context of the 2020 season, the aim of this study was to investigate the impact of  
83 these factors on injury and illness rates. This will aid our understanding of how such disruptions  
84 influence injury risk and help guide practice for any future disruptions of this nature.

85

## 86 **METHODS**

87 This prospective cohort study included all registered male players from the 18 First-Class County  
88 Cricket (FCCC) clubs in England and Wales ( $n = 403$  registered at the start of the season) during the  
89 shortened domestic competition season (August 1<sup>st</sup> to October 5<sup>th</sup> 2020).

90 The 2020 injury data was compared to a historical average calculated from previous regular seasons  
91 (April-September; 2015 to 2019 inclusive). Five seasons was deemed a reasonable number to provide  
92 a meaningful comparison, whilst also being recent enough to encapsulate the current structure of the  
93 2020 domestic season (COVID related measures aside). Injuries for all registered players at the start of  
94 each season (mean  $n = 401$  players) were included from the first day of the competitive season (in April  
95 2015 to 2019) to September 30<sup>th</sup> each year.

96 Players provided informed written consent for their data to be routinely collected and analysed by  
97 England and Wales Cricket Board and a University research partner, arranged in conjunction with the  
98 players' union, The Professional Cricketers Association'. This was done at the time of annual  
99 registration and reviewed if there were any significant process or contractual changes at the start of pre-  
100 season. Ethics approval was obtained from the University of Bath, Research Ethics Approval  
101 Committee for Health (REACH) [reference: EP 17/18 111].

102 All medical complaints (injury or illness) were recorded by FCCC club's medical staff on a purpose-  
103 built central online medical records system: Profiler (The Profiler Corporation, New Zealand, 2015-  
104 2016 inclusive), and Cricket Squad (The Sports Office, UK, 2017-2020). To improve compliance, the  
105 England and Wales Cricket Board mandates consistent standards for injury and medical record-keeping  
106 for the domestic game through the annual Cricket Science and Medicine Audit. The injury location,  
107 activity and diagnosis for each complaint is recorded based on the Orchard Sports Injury Classification  
108 System Version 10 [11], with updated bespoke England and Wales Cricket Board COVID-19 codes for  
109 the 2020 season.

110 The term 'medical complaint' adopted by this study is inclusive of both injury and illness in line with  
111 the updated consensus statement [12]. In line with these guidelines, for time loss (TL) complaints,

112 FCCC club medical staff defined and recorded any injury or illness that was considered to render the  
113 player unavailable for match selection, regardless of whether a match was scheduled on the day(s) the  
114 player was unavailable. The medical attention injury definition was also adopted from the updated  
115 consensus for non-time loss (NTL) injuries, with ‘any health-related condition that required medical (or  
116 medical staff) attention and had the potential to affect cricket training or playing’ [12].

117 Due to the differing duration of the 2020 season to previous regular seasons, standardised injury  
118 measures were calculated. An injury incidence unit was used and applied retrospectively for injuries  
119 sustained during competitive matches:

- 120 • Match injury incidence includes all new and recurring match injuries [12] reported for all  
121 phases (batting, bowling and fielding). It considers only injuries occurring during major  
122 matches<sup>12</sup> and is provided for each competition format and activity at time of injury with  
123 the unit of injuries per 1,000 days play [4-5].

124 An in-season medical complaint incidence unit of new and recurring time loss and non-time loss  
125 complaints per 100 players proposed in the updated consensus, which allows all complaints (e.g., match  
126 and training) to be included in one measure [12], was not deemed suitable for this study. It was  
127 inappropriate to calculate and compare in-season complaint incidence between the differing time  
128 periods or extrapolate the incidence for the shortened 2020 season to an annual incidence rate, as it led  
129 to over-estimation. No complaint unit proposed in the updated consensus (for all injuries combined),  
130 appropriately accommodates the unique context of the 2020 season. Similarly, in-season injury  
131 prevalence as suggested by the consensus [12], which presents the percentage of players unavailable on  
132 any given day calculated from the number of in-season days was not suitable due to the reduced number  
133 of days of the 2020 season. Therefore, to enable match and training complaints to be included and  
134 compared equivalently, the percent proportion for each complaint type was calculated from the total  
135 number of time loss complaints, in-season days lost, non-time loss and total complaints. This approach  
136 has been used in previous cricket injury surveillance studies conducted before the updated consensus,  
137 in the West Indies [13] and New Zealand [14]. The percent proportion was also calculated for body  
138 region injured (for injuries from all problem types excluding illness) and is presented for the 2020  
139 season, the historical average, and the proportional difference between the two.

140 Incidence and percent proportion are presented for the 2020 season (with 95% Poisson confidence  
141 intervals [CI]) and summarised for previous seasons with descriptive statistics (mean and 95% CI). The  
142 match injury incidence for 2020 season was compared to the historic average and a percentage change  
143 was calculated. Significant differences were interpreted if the 95% confidence intervals (CIs) of  
144 individual categories did not overlap. For any significant differences, a further breakdown is provided  
145 with a count of complaints and/or in-season days lost for Orchard code and activity at time of complaint  
146 (as applicable).

147

148 **RESULTS**

149 A total 506 1<sup>st</sup> XI days were played in 2020, 63% lower than the historical average (mean = 1364 days)  
150 across all competition formats (Table 1). Throughout the 2020 season 312 medical complaints were  
151 recorded, with 191 non-time loss and 121 time loss medical complaints resulting in 1,899 in-season  
152 days lost.

153 Table 1: Total number of 1<sup>st</sup> XI days played for each competition format from 2015-2020, with a historic  
154 average (for 2015 to 2019) and percentage change

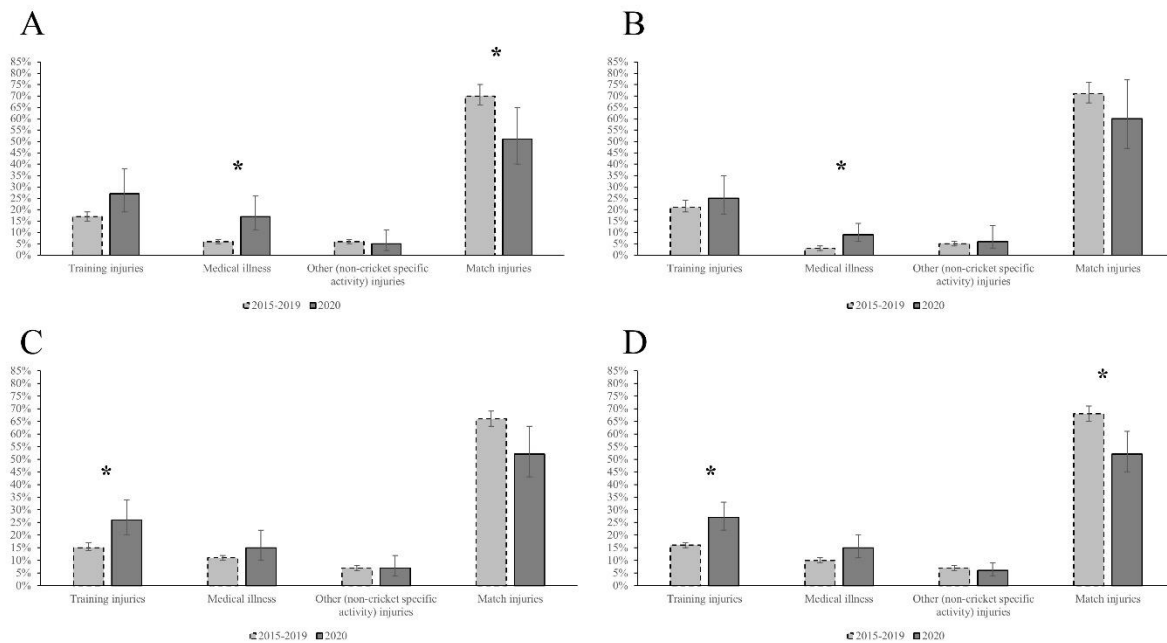
	2015	2016	2017	2018	2019	Mean (95% CI)	2020	% Change
First-Class days played	1070	1092	934	870	884	970 (943, 998)	330	-66%
T20 days played	252	250	248	254	222	245 (232, 259)	176	-28%
One-Day days played	146	154	148	144	152	149 (139, 160)	0	-100%
<b>Total</b>	<b>1468</b>	<b>1496</b>	<b>1330</b>	<b>1268</b>	<b>1258</b>	<b>1364 (1332, 1397)</b>	<b>506</b>	<b>-63%</b>

155

156 Match time loss, non-time loss, and total injury incidence was higher in 2020 compared to the historic  
157 average for First-Class cricket but lower for T20 (Supplementary table 1). However, none of the  
158 differences between the 2020 season and the historic average were statistically significant, with no  
159 substantial variation in incidence rates across seasons (Supplementary table 2).

160 Overall, for both formats combined (Supplementary table 3) and specifically for the first-class  
161 competition (Supplementary table 4), bowling had the highest match time loss injury incidence for both  
162 the 2020 season and historic average, with little difference between the rates. Fielding was the activity  
163 with the highest match non-time and total injury incidence for 2020 and the historic average, with  
164 slightly higher incidence rates in 2020. For T20 cricket (Supplementary table 5), batting was the activity  
165 that resulted in the most time loss injuries in 2020. Fielding was the activity that resulted in the most  
166 match non-time loss injuries both in 2020 and the historic average. None of the differences in match  
167 injury incidence rates (for any format) were statistically significant.

168 Medical illness as a proportion of time loss medical complaints and in-season days lost was significantly  
169 higher for the 2020 season, up 10% and 6% (respectively) compared to the historical average (Figure  
170 1). A further breakdown of time loss medical illness is provided in supplementary table 6. Most medical  
171 illness time loss during the 2020 season was COVID-19 related as a result of precautionary isolation  
172 due to contact with a suspected or confirmed COVID-19 case (79 in-season days lost from 8 time loss  
173 complaints). Only a small number of positive COVID-19 tests were recorded during the season (49 in-  
174 season days lost from 3 time loss complaints).



175

176 Figure 1: The percentage of time loss (A), in-season days lost (B), non-time loss (C) and total (D) complaints by  
 177 problem type for 2020 and 2015-2019. \* Denotes statistically significant difference with alpha of 0.05.

178

179 A significant increase in training injuries as a proportion of non-time loss (+ 12%) and total injuries (+  
 180 16%) was also observed for the 2020 season compared to the historic average. Match injuries as a  
 181 proportion of time loss (-19%) and all injuries (-16%) saw a significant decrease in 2020 compared to  
 182 the historical average (Figure 1). A breakdown of injury problem type by season is provided in  
 183 supplementary table 7.

184 During training, being hit by the ball/other whilst batting was the activity resulting in the most non-time  
 185 loss injuries (Supplementary table 8). According to the Orchard codes recorded for training injuries,  
 186 shoulders had the highest total injury count with 1 time loss and 4 non-time loss training injuries  
 187 (Supplementary table 9).

188 The only body region that saw a significant increase in 2020 compared to the historical average was  
 189 thigh injuries as a proportion of in-season days lost, up 15% in 2020 (Table 2). The other significant  
 190 differences were a decrease for the 2020 season for both hand (-8%) and lumbar spine (-14%) injuries  
 191 in comparison to the historical average.

192 A further breakdown of time loss thigh injuries is provided with the Orchard code (Supplementary table  
 193 10) and activity at time of injury (Supplementary table 11). Rectus femoris strain was the injury that  
 194 resulted in the most in-season days lost (137 days) followed by biceps femoris strain grade 1-2 (93  
 195 days). The thigh injury activity that resulted in the most in-season days lost was the delivery stride or  
 196 follow-through when bowling (185 in-season days from 6 time loss [TL] injuries), followed by diving



197 Table 2: The percentage of in-season days lost, time loss, non-time loss and total injuries for body region injured

198 *Note: Significant differences highlighted in bold*

	% Of TL injuries			% In-season days lost			% Of NTL injuries			% Of all injuries		
	2020 (95% CI)	2015-2019 Mean (95%CI)	Difference	2020 (95% CI)	2015-2019 Mean (95%CI)	Difference	2020 (95% CI)	2015-2019 Mean (95%CI)	Difference	2020 (95% CI)	2015-2019 Mean (95%CI)	Difference
Abdomen	9% (5, 17)	10% (8, 12)	-1%	13% (7, 25)	10% (8, 12)	3%	6% (3, 11)	4% (3, 5)	3%	7% (4, 11)	6% (5, 7)	1%
Ankle	7% (3, 15)	9% (8, 11)	-3%	12% (6, 25)	10% (8, 12)	2%	8% (5, 14)	9% (8, 10)	-1%	8% (5, 12)	9% (8, 10)	-2%
Buttock and Pelvis	0% (0, 0)	1% (1, 2)	-1%	0% (0, 0)	1% (1, 2)	-1%	2% (1, 5)	1% (1, 1)	1%	2% (1, 5)	1% (1, 1)	0%
Chest	1% (0, 7)	1% (1, 2)	0%	0% (0, 0)	1% (1, 2)	-1%	0% (0, 0)	2% (1, 3)	-2%	0% (0, 0)	2% (2, 3)	-1%
Elbow	2% (1, 8)	1% (1, 2)	1%	0% (0, 0)	2% (1, 4)	-1%	7% (4, 13)	3% (2, 4)	4%	5% (3, 9)	2% (2, 3)	3%
Foot	5% (2, 12)	4% (3, 5)	1%	10% (4, 24)	5% (4, 7)	5%	3% (1, 7)	5% (4, 6)	-2%	4% (2, 7)	5% (4, 6)	-1%
Forearm	0% (0, 0)	0% (0, 0)	0%	0% (0, 0)	0% (0, 0)	0%	2% (1, 5)	2% (1, 3)	1%	2% (1, 5)	1% (1, 1)	0%
Hand	7% (3, 15)	14% (12, 16)	-7%	<b>4% (2, 8)</b>	<b>12% (10, 14)</b>	<b>-8%</b>	15% (10, 22)	14% (12, 16)	1%	12% (8, 17)	14% (13, 15)	-2%
Head	7% (3, 15)	6% (5, 8)	1%	4% (2, 8)	2% (2, 3)	2%	14% (9, 21)	9% (8, 10)	5%	11% (8, 16)	8% (7, 9)	4%
Hip and Groin	8% (4, 16)	6% (5, 8)	2%	4% (2, 8)	4% (3, 5)	-1%	8% (5, 14)	5% (4, 6)	3%	8% (5, 12)	5% (4, 6)	3%
Knee	7% (3, 15)	6% (5, 8)	1%	11% (5, 23)	7% (6, 9)	4%	6% (3, 11)	10% (9, 11)	-3%	6% (4, 10)	8% (7, 9)	-2%
Lower Leg	7% (3, 15)	7% (6, 9)	0%	7% (3, 15)	7% (6, 9)	1%	6% (3, 12)	6% (5, 7)	0%	6% (4, 10)	6% (5, 7)	0%
Lumbar Spine	10% (5, 19)	13% (11, 15)	-3%	<b>7% (4, 13)</b>	<b>21% (18, 24)</b>	<b>-14%</b>	5% (3, 10)	8% (7, 9)	-3%	7% (4, 11)	10% (9, 11)	-3%
Neck	0% (0, 0)	1% (1, 2)	-1%	0% (0, 0)	1% (1, 2)	-1%	2% (1, 6)	3% (2, 4)	-1%	1% (0, 3)	2% (2, 3)	-1%
Shoulder	5% (2, 12)	6% (5, 8)	-1%	2% (1, 5)	6% (5, 8)	-4%	7% (4, 12)	7% (6, 8)	1%	6% (4, 10)	6% (5, 7)	0%
Thigh	22% (14, 23)	13% (11, 15)	9%	<b>24% (16, 36)</b>	<b>9% (8, 10)</b>	<b>15%</b>	6% (3, 11)	9% (8, 10)	-3%	12% (8, 17)	10% (9, 11)	2%
Thoracic Spine	4% (2, 11)	1% (1, 2)	3%	2% (1, 5)	1% (1, 2)	1%	2% (1, 6)	2% (2, 3)	0%	3% (1, 6)	2% (2, 3)	1%
Wrist	0% (0, 0)	1% (1, 2)	-1%	0% (0, 0)	2% (1, 3)	-2%	0% (0, 0)	2% (1, 3)	-2%	0% (0, 0)	2% (2, 3)	-2%

199 *Note: Significant differences highlighted in bold*

200

201

202 when fielding (53 days/2 TL loss injuries) and running between wickets when batting (53 days/4 TL  
203 injuries). The other activities that resulted in days lost from thigh injuries predominantly involved  
204 running; when fielding (46 days/5 TL injuries), bowling (31 days/1 TL injury) and training (14 days/1  
205 TL injury).

206 In relation to hand time loss injuries a total of 68 in-season days were lost from 7 injuries in 2020,  
207 compared to the mean total from 2015 to 2019 of 780 days from 36 injuries (Supplementary table 12).  
208 For lumbar spine injuries, a total of 119 in-season days were lost from 10 injuries in 2020, compared to  
209 the mean total of 1,376 days from 33 time loss injuries (Supplementary table 13). There were no lumbar  
210 spine stress fractures recorded in the 2020 season.

211

## 212 **DISCUSSION**

213 This study described the injury and illness data of the shortened 2020 domestic cricket season in  
214 England and Wales following a disrupted training and pre-season period due to the enforced national  
215 lockdown during a global pandemic. The injury profile for the 2020 season was generally equivalent to  
216 what would be expected in a regular season, except for an increase in medical illness as a proportion of  
217 time loss and in-season days lost, due to COVID-19 related instances (most notably precautionary  
218 isolation). There was also a significant increase in the proportion of in-season days lost to thigh injuries,  
219 and a significant decrease in the proportion of days lost to hand and lumbar spine injuries compared to  
220 the historical average.

221 The absolute number of medical complaints was lower in 2020 compared to previous seasons, which  
222 was expected due to reduced cricket exposure. The significant increase in the proportion of time loss  
223 and in-season days lost to medical illness was driven by players isolating after close contact with a  
224 suspected or positive COVID-19 case. There were only three players who tested positive for COVID-  
225 19 during the season, but clubs still had the unique challenge of managing disruption to player  
226 availability for those needing to isolate as a precaution.

227 Sports science and medicine practitioners at the First-Class County Cricket clubs kept in contact with  
228 players during lockdown and continued to advise and guide their training, enabling players to maintain  
229 some form of physical conditioning and preparedness ready for the start of the competitive season.  
230 However, it may be that some aspects of training are not as effective for physical conditioning when  
231 done remotely. While there was a high number of hamstring injuries recorded during the 2020 season,  
232 there was also a high number of time loss (and days lost to) quadriceps injuries, with the absolute  
233 number of 'rectus femoris strains' recorded equivalent to what has been found in previous seasons,  
234 despite considerably less competitive exposure in 2020. The lack of structured team training may limit  
235 the extent players are able to adequately achieve high intensity training loads (such as high-speed  
236 running) and complete cricket-specific activities [9]. It can be challenging for practitioners to reproduce

237 remotely, the exact loads and forces demanded by skills training. Training individually also may reduce  
238 the competitive edge that naturally occurs between players in a structured team training environment.  
239 As such, the physical conditioning benefits these activities usually provide are missed, and  
240 consideration needs to be given by practitioners as to how these shortcomings can be overcome if  
241 players are required to train remotely again in the future. However, it is also important to note causality  
242 cannot be inferred and the increase in proportion of days lost to thigh injuries in the 2020 season may  
243 be more pronounced due to the decrease in days lost to other injuries, most notably lumbar spine  
244 injuries.

245 During a regular season, most days are lost to lumbar spine injuries, often related to stress fractures  
246 because of bowling [4-5,8]. The relative lack of days lost to lumbar spine injuries in 2020 may be a  
247 result of the limited competitive exposure from the condensed season. The England and Wales Cricket  
248 Board also set the 'Bowling Injury Risk Mitigation' strategy to cap and limit the number of overs  
249 bowled to help manage workloads following the prolonged training disruption. This made it less likely  
250 for bowlers to be exposed to workload levels that would increase injury risk. It is unclear if such a  
251 strategy to cap the number of overs bowled would be as effective during a regular season with a full  
252 fixture schedule. However, the results from this study are encouraging and it may be a useful future  
253 preventative strategy that warrants further consideration and if possible, research.

254 Comparing seasons with different time periods is limited due to the reduced sample of injuries for the  
255 shortened season. Given the unique context of 2020, it was only possible to draw data from this single  
256 season for comparison to previous regular seasons in the study. As such, the findings may just be a  
257 consequence of natural variation as opposed to any true change, which may explain the lack of  
258 significant differences between 2020 and previous seasons. The nature of this study makes it difficult  
259 for future research to investigate these findings further and as such, the results should perhaps not be  
260 interpreted on statistical significance alone, but also considering the likelihood these findings are  
261 meaningful for injury burden and player welfare. It is also worth acknowledging only in-season injuries  
262 were included in the study, missing any pre-season injuries that may have impacted player availability  
263 and injury rates when the competitive season starts. The pre-season injury profile remains unknown in  
264 this context and may differ to the type of injuries observed in-season, which warrants further exploration  
265 in future research. Another limitation of the current study is not using the proposed injury incidence  
266 units from the updated consensus for the combined injury measures, potentially limiting the extent to  
267 which the findings can be compared to other cricket playing populations. However, given the nature of  
268 the 2020 season and how the pandemic has affected countries around the world differently, providing  
269 findings that can be generalised to other cricket playing populations internationally may not be useful.  
270 Instead, it is hoped that the general themes that emerged from the findings will still be of use to  
271 practitioners in other cricket contexts.

272

## 273 CONCLUSION

274 This study described injury data of the shortened 2020 domestic cricket season in England and Wales  
275 and compared it with that of previous seasons. Although there was significant disruption to player  
276 availability because of COVID-19 related instances (most notably precautionary isolation), injury  
277 profiles were generally similar for 2020 compared to what would be expected during a regular season.  
278 The significantly high proportion of days lost to thigh injuries may suggest some aspects of training are  
279 not as effective for physical conditioning when done remotely during a period of training disruption  
280 without access to elite facilities usually afforded by the club. Substantially fewer lumbar spine stress  
281 fractures were also recorded in 2020, which may be associated with reduced exposure. However, in  
282 both instances, direct causality cannot be inferred. These findings can enhance understanding of the  
283 impact this historic prolonged period of training disruption and shortened season had on injuries and  
284 the challenges faced by practitioners for any future such occurrences.

285

## 286 Conflict of Interest

287 The authors declare no conflict of interest.

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## SUPPLEMENTARY TABLES

Supplementary table 1: Match time loss, non-time loss and total injury incidence (per 1,000 days play) for competition format with the % change between the 2020 season and historic average

	TL injury incidence (per 1,000 days play)			NTL injury incidence (per 1,000 days play)			Total injury incidence (per 1,000 days play)		
	2020 (95% CI)	2015-2019 Mean (95%CI)	%Change	2020 (95% CI)	2015-2019 Mean (95%CI)	%Change	2020 (95% CI)	2015-2019 Mean (95%CI)	%Change
First-class	81.8 (56.1, 119.3)	69.5 (62.4, 77.4)	18%	154.5 (117.4, 203.3)	133.0 (123.0, 143.8)	16%	236.4 (189.4, 295.1)	202.5 (190.1, 215.7)	17%
T20	130.7 (86.9, 196.7)	152.5 (132.1, 176.1)	-14%	164.8 (114.5, 237.2)	183.4 (160.9, 209.0)	-10%	295.5 (225.2, 387.8)	336.0 (305.0, 370.1)	-12%

*Note: Significant differences highlighted in bold*

Supplementary table 2: Match time loss, non-time loss and total injury incidence (per 1,000 days play) for each season (2015 to 2020) by competition format

	2015	2016	2017	2018	2019	2020
<b>Time loss injury incidence per 1,000 days play (95% CI)</b>						
Test (4-Day)	67.3 (53.4, 84.8)	51.3 (39.5, 66.7)	76.0 (60.2, 95.9)	71.3 (55.6, 91.5)	81.4 (64.6, 102.6)	81.8 (56.1, 119.3)
T20	150.8 (109.7, 207.2)	116.0 (80.6, 166.9)	145.2 (104.7, 201.3)	161.4 (118.8, 219.2)	189.2 (139.8, 256.0)	130.7 (86.9, 196.7)
<b>Non-time loss injury incidence per 1,000 days play (95% CI)</b>						
Test (4-Day)	81.3 (65.9, 100.3)	109.9 (91.9, 131.4)	146.7 (124.1, 173.4)	169.0 (143.8, 198.7)	158.4 (134.2, 186.9)	154.5 (117.4, 203.3)
T20	123.0 (86.5, 174.9)	188.0 (141.3, 250.2)	153.2 (111.5, 210.5)	263.8 (207.6, 335.2)	189.2 (139.8, 256.0)	164.8 (114.5, 237.2)
<b>Total injury incidence per 1,000 days play (95% CI)</b>						
Test (4-Day)	148.6 (127.2, 173.6)	161.2 (139.1, 186.9)	222.7 (194.4, 255.1)	240.2 (209.7, 275.1)	239.8 (209.6, 274.4)	236.4 (189.4, 295.1)
T20	273.8 (216.3, 346.7)	304.0 (242.8, 380.6)	298.4 (237.6, 374.8)	425.2 (352.1, 513.5)	378.4 (305.5, 486.6)	295.5 (225.2, 387.8)

Supplementary table 3: Match time loss, non-time loss and total injury incidence (per 1,000 days play) for activity at time of injury for First-Class and T20 competition formats combined

	TL injury incidence (/1,000 days play)			NTL injury incidence (/ 1,000 days play)			Total injury incidence (/1,000 days play)		
	2020 (95% CI)	2015-2019 Mean (95%CI)	%Change	2020 (95% CI)	2015-2019 Mean (95%CI)	%Change	2020 (95% CI)	2015-2019 Mean (95%CI)	%Change
Batting	31.6 (19.4, 51.6)	20.8 (17.5, 24.8)	52%	39.5 (25.5, 61.2)	38 (33.3, 43.3)	4%	71.1 (51.3, 98.6)	58.8 (52.9, 65.3)	21%
Bowling	35.6 (22.4, 56.5)	33.2 (28.9, 38.1)	7%	27.7 (16.4, 46.8)	36.9 (32.4, 42.1)	-25%	63.2 (44.7, 89.4)	70.1 (63.7, 77.1)	-10%
Fielding	27.7 (16.4, 46.8)	25 (21.3, 29.4)	11%	65.2 (46.4, 91.7)	47.9 (42.6, 53.8)	36%	92.9 (69.8, 123.6)	72.8 (66.3, 80.0)	28%
Warm Up	0.0 (0.0, 0.0)	2.3 (1.4, 3.9)	-100%	4.0 (1.0, 16.0)	3.6 (2.4, 5.4)	11%	4.0 (1.0, 16.0)	6.0 (4.3, 8.3)	-33%
Wicket keeping	0.0 (0.0, 0.0)	3.1 (2.0, 4.9)	-100%	4.0 (1.0, 16.0)	6.0 (4.3, 8.3)	-33%	4.0 (1.0, 16.0)	9.1 (7.0, 11.8)	-56%

Note: Significant differences highlighted in bold

Supplementary table 4: Match time loss, non-time loss and total injury incidence (per 1,000 days play) for activity at time of injury with the % change for First-Class cricket

	TL injury incidence (/1,000 days play)			NTL injury incidence (/ 1,000 days play)			Total injury incidence (/1,000 days play)		
	2020 (95% CI)	2015-2019 Mean (95%CI)	%Change	2020 (95% CI)	2015-2019 Mean (95%CI)	%Change	2020 (95% CI)	2015-2019 Mean (95%CI)	%Change
Batting	18.2 (8.2, 40.5)	16.5 (13.2, 20.6)	10%	42.4 (25.1, 71.6)	36.2 (31.1, 42.1)	17%	60.6 (39.1, 93.9)	52.7 (46.5, 59.7)	15%
Bowling	39.4 (22.9, 67.9)	31.1 (26.5, 36.5)	27%	33.3 (18.4, 60.1)	38.1 (32.9, 44.1)	-13%	72.7 (48.7, 108.5)	69.2 (62.1, 77.1)	5%
Fielding	21.2 (10.1, 44.5)	15.6 (12.4, 19.6)	36%	57.6 (36.7, 90.3)	40.1 (34.8, 46.2)	44%	78.8 (53.7, 115.7)	55.6 (49.3, 62.7)	42%
Warm Up	0.0 (0.0, 0.0)	1.7 (0.9, 3.4)	-100%	6.1 (1.5, 24.4)	1.8 (0.9, 3.5)	239%	6.1 (1.5, 24.4)	3.5 (2.2, 5.6)	74%
Wicket keeping	0.0 (0.0, 0.0)	3.1 (1.9, 5.1)	-100%	3.0 (0.4, 21.3)	7.2 (5.2, 10.0)	-58%	3.0 (0.4, 21.3)	10.3 (7.8, 13.6)	-71%

Note: Significant differences highlighted in bold

Supplementary table 5: Match time loss, non-time loss and total injury incidence (per 1,000 days play) for activity at time of injury with the % change for T20 cricket

	TL injury incidence (/1,000 days play)			NTL injury incidence (/ 1,000 days play)			Total injury incidence (/1,000 days play)		
	2020 (95% CI)	2015-2019 Mean (95%CI)	%Change	2020 (95% CI)	2015-2019 Mean (95%CI)	%Change	2020 (95% CI)	2015-2019 Mean (95%CI)	%Change
Batting	56.8 (30.6, 105.6)	37.6 (28.2, 50.2)	51%	34.1 (15.3, 75.9)	44.4 (34.0, 58.0)	-23%	90.9 (55.7, 148.4)	82.1 (67.5, 99.9)	11%
Bowling	28.4 (11.8, 68.2)	41.7 (31.7, 54.9)	-32%	17 (5.5, 52.7)	33.0 (24.2, 45.0)	-48%	45.5 (22.8, 91.0)	74.6 (60.7, 91.6)	-39%
Fielding	39.8 (19.0, 83.5)	60.9 (48.5, 76.5)	-35%	79.5 (47.1, 134.2)	77.7 (63.6, 94.9)	2%	119.3 (77.8, 183.0)	138.7 (119.3, 161.2)	-14%
Wicket keeping	0.0 (0.0, 0.0)	3.2 (1.2, 8.5)	-100%	5.7 (0.8, 40.5)	1.6 (0.4, 6.4)	256%	5.7 (0.8, 40.5)	4.8 (2.2, 10.7)	19%

Note: Significant differences highlighted in bold

Supplementary table 6: Orchard code and description for medical illness recorded ordered by time loss injury count descending for the 2020 season

Orchard code	Description	TL injury count		In-season days lost	
		2020	2015-2019 Mean	2020	2015-2019 Mean
MICI	COVID-19 Isolated as contact	8	0	79	0
MICG	COVID-19 Antigen Test Positive	3	0	49	0
MICX	COVID-19	2	0	2	0
MGDX	Diarrhoea	1	1	1	4
MGXX	Gastrointestinal Illness	1	1	2	3
MICN	COVID-19 Self isolating with symptoms - No diagnosis	1	0	8	0
MIRT	Tonsillitis	1	1	21	4
MIRU	Other upper resp tract infection	1	1	1	1
MIRX	Respiratory tract infection (bacterial or viral)	1	1	3	4
MTXX	ENT Illness including dental (excl sinusitis - see MPAL)	1	1	1	6
Total		20	6 (18)	167	22 (179)

Note: For the 2015-2019 mean, the bracketed figure indicates the mean total number of injuries and in-season days lost for that injury type



Supplementary table 7: Proportion of time loss, seasonal days lost, non-time loss and total injuries for each season (2015 to 2020) by injury problem type

	2015	2016	2017	2018	2019	2020
<b>Percentage of time loss injuries (95% CI)</b>						
Medical illness	4% (2, 8)	6% (4, 10)	5% (3, 9)	8% (5, 12)	8% (6, 12)	17% (11, 26)
Match injuries	79% (68, 91)	68% (58, 79)	74% (64, 85)	66% (57, 76)	64% (56, 73)	51% (40, 65)
Other (non-cricket specific activity) injuries	3% (1, 6)	10% (7, 15)	6% (4, 10)	6% (4, 10)	5% (3, 8)	5% (2, 11)
Training injuries	14% (10, 20)	15% (11, 21)	15% (11, 21)	19% (15, 25)	22% (18, 27)	27% (19, 38)
<b>Percentage of seasonal days lost (95% CI)</b>						
Medical illness	3% (2, 6)	3% (2, 5)	4% (2, 7)	2% (1, 3)	2% (1, 3)	9% (6, 14)
Match injuries	80% (69, 93)	63% (54, 74)	73% (63, 84)	70% (61, 81)	69% (61, 79)	60% (47, 77)
Other (non-cricket specific activity) injuries	2% (1, 4)	11% (7, 16)	6% (4, 10)	4% (2, 7)	3% (2, 5)	6% (3, 13)
Training injuries	15% (11, 21)	22% (16, 30)	18% (13, 25)	21% (16, 27)	26% (21, 32)	25% (18, 35)
<b>Percentage of non-time loss injuries (95% CI)</b>						
Medical illness	23% (18, 29)	11% (8, 15)	9% (7, 12)	9% (7, 12)	6% (4, 9)	15% (10, 22)
Match injuries	55% (48, 63)	63% (56, 71)	70% (63, 77)	67% (61, 74)	75% (67, 83)	52% (43, 63)
Other (non-cricket specific activity) injuries	8% (6, 11)	10% (7, 13)	7% (5, 10)	6% (4, 8)	6% (4, 9)	7% (4, 12)
Training injuries	14% (11, 19)	16% (13, 20)	14% (11, 18)	17% (14, 21)	13% (10, 17)	26% (20, 34)
<b>Percentage of total injuries (95% CI)</b>						
Medical illness	15% (12, 18)	9% (7, 11)	8% (6, 10)	8% (6, 10)	7% (5, 9)	15% (11, 20)
Match injuries	65% (59, 72)	65% (59, 71)	71% (65, 77)	67% (62, 73)	70% (64, 76)	52% (45, 61)
Other (non-cricket specific activity) injuries	6% (4, 8)	10% (8, 13)	7% (5, 9)	6% (5, 8)	5% (4, 7)	6% (4, 9)
Training injuries	14% (11, 17)	16% (13, 19)	14% (12, 17)	18% (15, 21)	17% (14, 20)	27% (22, 33)

Supplementary table 8: Activity at time of injury for training problem type injuries ordered by total injury count descending for the 2020 season

Activity	TL injury count		NTL injury count		Total injury count	
	2020	2015-2019 Mean	2020	2015-2019 Mean	2020	2015-2019 Mean
Bowling - Delivery stride or follow through	7	11	7	8	14	19
Batting - Hit by ball / other	2	4	10	6	12	10
(no activity recorded)	2	6	9	10	11	16
Bowling	4	3	4	6	8	9
Fielding	3	2	2	2	5	4
Training - Running	1	1	4	2	5	3
Batting - Playing shot	2	3	2	4	4	7
Training	1	1	3	4	4	5
Batting	1	1	2	3	3	3
Fielding - Throwing	0	1	3	3	3	5
Other	2	2	1	5	3	6
Bowling - Run up	1	1	1	1	2	2
Fielding - Catching	1	3	1	4	2	7
Fielding - Diving	2	1	0	1	2	2
Training - Running Drills	2	1	0	2	2	3
Bowling - Fielding off own bowling	1	1	0	0	1	1
Training - Weight training	1	2	0	1	1	4
Wicket keeping - Catching	0	0	1	0	1	0
Total	33	43 (48)	50	64 (71)	83	107 (119)

*Note: For the 2015-2019 mean, the bracketed figure indicates the mean total number of injuries for that injury type*

Supplementary table 9: Orchard code and description for training problem type injuries recorded ordered by total injury count descending for the 2020 season

Orchard code	Description	TL injury count		NTL injury count		Total injury count	
		2020	2015-2019 Mean	2020	2015-2019 Mean	2020	2015-2019 Mean
SXXX	Shoulder Injuries	1	0	4	1	5	1
HNCX	Concussion	3	0	0	0	3	0
AHHX	Heel bruising/ haematoma incl fat pad contusion	1	0	1	0	2	0
AJLX	Ankle lateral ligament sprain	2	0	0	1	2	1
GTSS	Sartorius tendon strain	2	0	0	0	2	0
GXXX	Hip and Groin Injuries	0	0	2	0	2	1
HNCN	Head Strike No Injury Detected	0	0	2	0	2	0
HZXX	Head Pain/ Injury Not Otherwise Specified ( Including headache)	0	0	2	0	2	0
KMPX	Popliteus muscle strain	1	0	1	1	2	1
LMXX	Lumbar Spine muscle and Tendon Strain/ Spasm/ Trigger Points	2	1	0	1	2	2
LXXX	Lumbar Spine Injuries	1	1	1	1	2	1
OXXX	Trunk and Abdominal Injuries	0	0	2	0	2	0
QMSX	Soleus Injury/ strain	1	1	1	1	2	1
QMYX	Calf muscle trigger points/ spasm	1	0	1	0	2	0
ADXX	Ankle Dislocation	1	0	0	0	1	0
AGPX	Posterior impingement ankle	0	0	1	0	1	1
AJLA	Anterior talofibular ligament sprain	0	1	1	3	1	4
AJLR	Lateral ligaments rupture ( grade 3 injury)	1	0	0	0	1	0
ATAT	Achilles tendinopathy	0	0	1	0	1	0
ATPS	Peroneal tendon strain	0	0	1	0	1	0
ATTT	Tibialis posterior tendinopathy	0	0	1	0	1	0

DXXX	Thoracic Spine Injuries (Incl Thoracolumbar Junction)	1	0	0	0	1	0
EGPX	Elbow posterior impingement/ synovitis	0	0	1	0	1	1
EGXX	Elbow Impingement/ Synovitis	0	0	1	0	1	0
EZXX	Elbow Pain/ Injury not otherwise specified	0	0	1	1	1	1
FHHU	Nail bed haematoma great toe	1	0	0	0	1	0
FXXX	Ankle Pain/ Injury not otherwsie specified	0	0	1	0	1	0
GGXX	Hip Joint Inflammation/ Synovitis/ Other Biomechanical Lesion	0	0	1	0	1	0
GOSX	Scrotal +/- testicular injury	0	0	1	0	1	0
GZXX	Hip/ Groin Pain Not otherwise specified	0	0	1	0	1	0
GZZX	Hip/Groin Pain undiagnosed	1	0	0	0	1	0
HLMN	Mucosal laceration not requiring suturing	0	0	1	0	1	0
HXXX	Head Injuries	0	0	1	1	1	1
KHMX	Knee MCL contusion	0	0	1	0	1	0
KTHM	Medial hamstring tendinopathy, incl pes anserine bursitis	1	0	0	0	1	0
KTPT	Patellar tendinopathy ( excl. Sinding Larsen Johansson syndrome see JTKP)	0	0	1	1	1	1
LCXX	Lumbar Disc Injury	1	0	0	1	1	1
LGXX	Lumbar Spine Facet Joint Pain/ Stiffness	1	1	0	1	1	3
LJXX	Lumbar Spine Joint Injury	0	0	1	0	1	0
LNZX	Other lumbosacral nerve injury	0	0	1	0	1	0
LSRX	Lumbar spine stress reaction	1	1	0	0	1	1
MISQ	Skin infection lower leg	0	0	1	0	1	0
NJPX	Cervical Facet joint pain/ chronic inflammation/ stiffness	0	0	1	0	1	0
OMMO	Obliques muscle strain	0	3	1	1	1	4
QHMP	Calf/ gastroc haematoma	0	0	1	0	1	0
QMXX	Lower leg muscle Injury	1	0	0	0	1	0
QXXX	Lower Leg Injuries	1	0	0	0	1	0

QYXX	Other Leg Overuse Injury	0	0	1	0	1	0
RHXX	Forearm Soft Tissue Bruising/ Haematoma	0	0	1	1	1	2
SAAX	AC joint arthritis	0	0	1	0	1	0
SGSX	Subacromial impingement	0	0	1	0	1	1
SHXX	Shoulder Soft Tissue Bruising/ Haematoma	0	0	1	0	1	0
SMLX	Latissimus Dorsi muscle injury	1	0	0	0	1	0
THMX	Thigh muscle haematoma	1	0	0	0	1	0
TKXX	Thigh Laceration/ Abrasion	1	0	0	0	1	0
TMAL	Adductor longus strain	1	0	0	0	1	0
TMQS	Rectus femoris strain	0	0	1	1	1	1
TXXX	Thigh Injuries	1	0	0	0	1	0
WHFX	Finger bruising/ haematoma	0	0	1	2	1	3
WHHX	Hand bruising/ haematoma	0	0	1	0	1	1
WHXX	Wrist and Hand Soft Tissue Bruising/ Haematoma	1	0	0	0	1	1
WJFX	Finger joint sprain ( PIP and DIP joints)	0	0	1	1	1	1
WKHV	Palmar hand laceration/ abrasion	1	0	0	0	1	0
WKXX	Wrist and Hand Laceration/ Abrasion	0	0	1	0	1	0
WTFG	Trigger Finger	0	0	1	0	1	0
Total		33	15 (48)	50	24 (71)	83	38 (119)

*Note: For the 2015-2019 mean, the bracketed figure indicates the mean total number of injuries for that injury type*

Supplementary table 10: Orchard code and description for thigh time loss injuries ordered by in-season days lost descending for the 2020 season

Orchard code	Description	TL Injury Count		In-season Days Lost	
		2020	2015-2019 Mean	2020	2015-2019 Mean
TMQS	Rectus femoris strain	5	5	137	79
TMHB	Biceps femoris strain grade 1 - 2	5	10	93	188
TMAL	Adductor longus strain	1	2	42	32
TMHR	Grade 3 hamstring strain	1	1	31	54
TXXX	Thigh Injuries	2	1	26	17
TMAX	Adductor strain	2	1	20	10
TKXX	Thigh Laceration/ Abrasion	1	0	16	0
TMHS	Semimembranosus/ tendinosis strain (grade 1 - 2)	1	5	16	82
TMHX	Hamstring strain	2	4	15	101
THMX	Thigh muscle haematoma	1	0	14	0
TMXX	Thigh Muscle strain/ Spasm/ Trigger Points	1	1	3	4
Total		22	28 (33)	413	566 (641)

*Note: For the 2015-2019 mean, the bracketed figure indicates the mean total number of injuries and in-season days lost for that injury type*

Supplementary table 11: Activity at time of injury for thigh injuries ordered by in-season days lost for the 2020 season

Activity at time of injury	TL Injury Count		In-season Days Lost	
	2020	2015-2019 Mean	2020	2015-2019 Mean
Bowling - Delivery stride or follow through	6	7	185	203
Fielding - Diving	2	2	53	55
Batting - Running between wickets	4	5	53	103
Fielding - Running	5	5	46	67
Bowling - Run up	1	3	31	56
Training - Running	1	1	14	4
Other	1	1	14	5
Bowling - Fielding off own bowling	1	0	14	0
Bowling	1	3	3	41
Total	22	26 (33)	413	534 (641)

*Note: For the 2015-2019 mean, the bracketed figure indicates the mean total number of injuries and in-season days lost for that injury type*

Supplementary table 12: Orchard code and description for hand time loss injuries ordered by in-season days lost descending for the 2020 season

Orchard code	Description	TL Injury Count		In-season Days Lost	
		2020	2015-2019 Mean	2020	2015-2019 Mean
WKHV	Palmar hand laceration/ abrasion	1	1	20	6
WFPX	Fractured thumb	1	1	18	22
WJWX	Wrist sprain/ jarring (radiocarpal joint)	1	0	13	0
WHXX	Wrist and Hand Soft Tissue Bruising/ Haematoma	1	1	6	7
WTED	Little finger extensor tendon rupture	1	0	6	0
WJPM	Thumb MCP joint sprain (incl radial and ulnar collat lig)	1	0	4	3
WKXX	Wrist and Hand Laceration/ Abrasion	1	0	1	1
Total		7	3 (36)	68	38 (780)

*Note: For the 2015-2019 mean, the bracketed figure indicates the mean total number of injuries and in-season days lost for that injury type*



Supplementary table 13: Orchard code and description for lumbar spine time loss injuries ordered by in-season days lost descending for the 2020 season

Orchard code	Description	TL Injury Count		In-season Days Lost	
		2020	2015-2019 Mean	2020	2015-2019 Mean
LGXX	Lumbar Spine Facet Joint Pain/ Stiffness	2	4	50	95
LCXX	Lumbar Disc Injury	2	2	25	89
LXXX	Lumbar Spine Injuries	2	3	25	31
LMXX	Lumbar Spine muscle and Tendon Strain/ Spasm/ Trigger Points	3	4	13	94
LSRX	Lumbar spine stress reaction	1	2	6	150
Total		10	16 (33)	119	458 (1376)

*Note: For the 2015-2019 mean, the bracketed figure indicates the mean total number of injuries and in-season days lost for that injury type*