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ORIGINAL ARTICLE

Injury rate in elite principal team sports after COVID-19 Lockdown: A literature review

ELITE SPORTS / PREVENTION / SPORTS INJURY / TEAM MANAGEMENT

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Abstract

Background: In 2020 many people, including professional sportsmen, were in quarantine for many months around the world. Professional sport team players change the modality of training. So, it is indispensable to understand the performance modifications after lockdown.

Methods: A search was conducted on the main international databases considering the studies

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conducted in team sports.

Results: The studies show a higher injuries incidence in basketball, in futsal and in American football after lockdown. However, there are conflicting data about soccer, in which only incidence about muscular injuries is generally higher.

Conclusions: Lockdown generally increases injuries, above all at the resumption of competitions. It is important give players a sufficient time to recover the athletic condition.

Riepilogo

Background: Nel 2020 molte persone, inclusi gli atleti professionisti, sono dovuti stare in quarantena per molti mesi, in varie parti del mondo. Gli atleti professionistici di sport di squadra hanno dovuto cambiare la modalità di allenamento. Perciò, è indispensabile capire i cambiamenti negli indici di infortunio dopo il lockdown.

Metodi: Una ricerca è stata condotta sui principali database condotti nei prinicipali campionati di sport di squadra.

Risultati: Gli studi considerati mostrano un'incidenza maggiore dopo il lockdown nella pallacanestro, nel futsal e nel football americano. Tuttavia, emergono dati contrastanti nel calcio, dove solo gli infortuni muscolari sono generalmente maggiori.

Conclusioni: Il lockdown generalmente ha aumentato gli infortuni, pressochè in tutte le competizioni. È importante dare ai giocatori un sufficiente tempo per recuperare la condizione atletica.

Parole Chiave: Sport di Squadra, Covid-19, Coronavirus, Infortuni, Prestazione

Introduction

In December 2019, a novel coronavirus, termed "SARS-CoV-2", announced by the World Health Organization (WHO) as being responsible for the outbreak of COVID-19, was reported [1]. The first case of an unidentified form of viral pneumonia was reported in Wuhan city, Hubei province, China, in December 2019 [2]. As of 24 January 2021, the SARS Covid 2019 syndrome caused 98280844 infections and 2112750 confirmed deaths. The pandemic has led to containment measures and has inevitably had a significant impact on the Western lifestyle, overwhelming and changing, albeit only temporarily, lifestyles, work, leisure and the habits of the world we live in. The lockdown due to the COVID emergency was a critical moment with a strong impact, representing a real traumatic event for mental health of all people [3]. The Covid-19 situation gives also many economic problems for football clubs and other sport: the

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lack of public in games, caused by the prolonged closure of major Leagues in many sports around the World, damaged seriously team's finances [4]. Furthermore, the majority of people reduced their physical activity during lockdown, caused by the closure of many sport centers; also elite sportsmen reduced their training [5–7]. The performance changes considerably in team sports: the advantage of home gaming changed, and the performances in the game regarding athletic and technical parameters have collapsed [8–11]. Also, heart and psychological parameters have gotten worse after the lockdown period [12,13]. It is important to understand the similarity between lockdown and detraining: the reduction of ball training changed athletic conditioning of team sports players [14]. It is interesting to evaluate also if the lack of "special conditioning" [14] increases the injuries in the team sports like soccer. It is hypothesised that the sport detraining could increase injury incidence in sports, especially in high intensity sports. So, the aim of this study is to understand the modifications in the injury rates in soccer, volleyball, basketball, futsal and American football after the lockdown period, analyze the causes, verify if the detraining reduce incidence injuries in team sports and try to find possible solutions in such a way as to be ready for future detraining periods.

Methods

The research "soccer covid" gives 146 results on PubMed, 221 on Web of Science, 1758 on SCOPUS at 05 August 2022. The research "football covid" gives 247 results on PubMed, 377 on Web of Science, 2329 on SCOPUS at the same date. The research "futsal covid" gives 4 results on PubMed, 8 on Web of Science, 95 on SCOPUS at the same date. The research "basketball covid" gives 62 results on PubMed, 90 on Web of Science, 818 on SCOPUS at the same date. After removing duplicated results and after reading title, 185 results are considered. After reading abstracts, 34 results are considered. 10 results study the injuries in other sports, 1 study has incomplete data about number of injuries in the population of study and 8 are irrelevant studies. At the end, 15 studies are considered for the review.

Results

The Tables 1, 2, 3 show the authors, the methods, the participant and the results.

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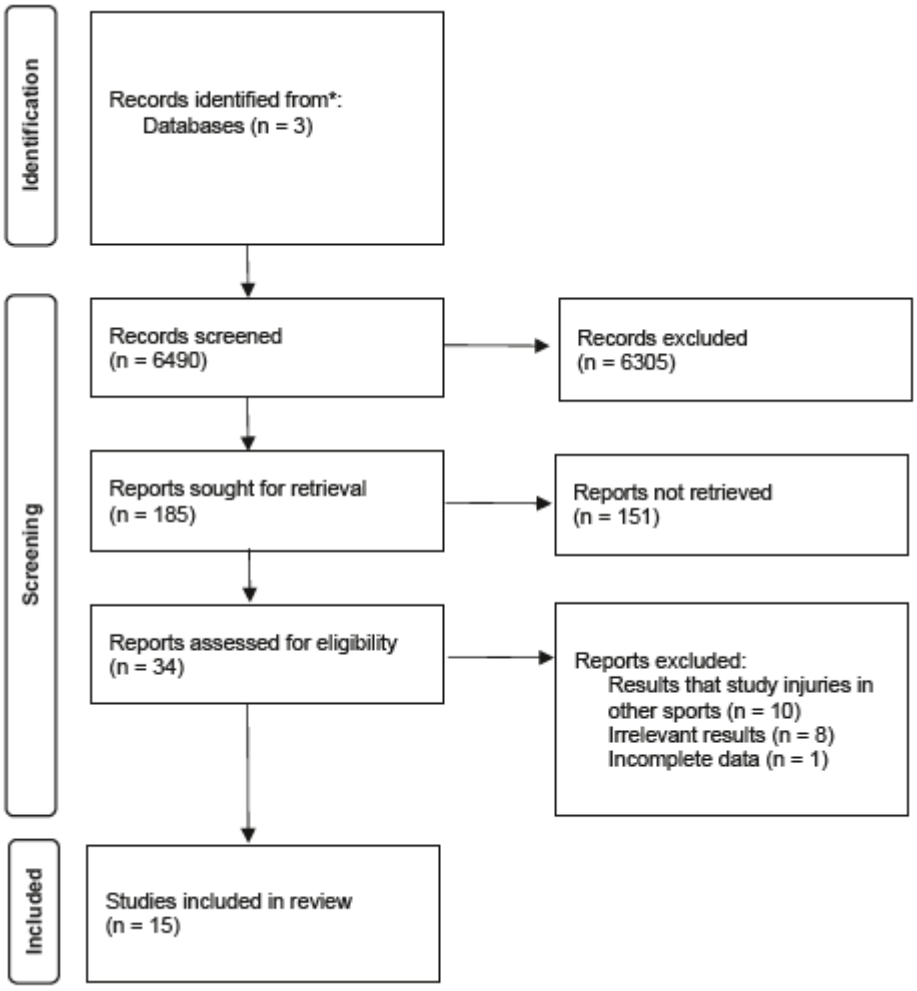

Figure 1: Diagram showing the stages of review and item selection

NFL

During the summer of 2020, the NFL suspended the 2020 preseason on July 21, 2020, making training challenging due to distancing guidelines, limited training camp roster sizes down to 80 players from the typical 90, and less formalized training. The first game played at September 10, 2020. The selected studies are these: Allahabadi [15] et al collect data about anterior cruciate ligament (ACL) tears in the National Football League (NFL) between the seasons 2013–2020. Bailey et al [16] conduce two selected studies: one study refers to the NFL's public injury database about the injury lists throughout the 2017–2020 seasons; the other study [17] analyses a period of 4 NFL seasons (2016/17 to 2020/21). Omari et al [18] report the results of publish data about NFL injuries. At the end, Patetta et al [19] report NFL players' ACL tears during preseason games and first eight regular season games played of the NFL season for the years 2015–2020 using reports from official NFL team websites (only injuries occurring during regular and preseason games), comparing four phases.

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NBA

The COVID-19 lockdown occurred since March 11th, 2020 until the Bubble, July 22nd, 2020 (first exhibition scrimmages); the Bubble is the site in which NBA players are situated for ending the Season 2019/20. Cahill et al [20] conduce a retrospective observational comparative study from the 2017/18 to 2020/21 season about the injury report during the preseason, the first 4 weeks of the regular season and playoffs from the 2017/18 through 2020/21 NBA seasons. Torres-Ronda et al [21] also conduce a retrospective study analysing the same Seasons.

Futsal

The only study about Futsal is done by Spyrou et al [22], that study thirteen elite male futsal players, competing in LNFS and Finalists of the UEFA Futsal Champions League, evaluating only non-contact lower-body injuries. The pre-lockdown injury profile was compiled from January 27th, 2020 to March 13th, 2020 (53.3 +/– 5.4 h of training and 6 matches), and the post-lockdown injuries were collected from May 12th, 2020 to June 24th, 2020 (52.9 +/– 2.8 h of training and 5 matches).

Soccer

The Serie A was suspended since the 26th matchday, at March 11, 2020, until June 22, 2020, when FIGC (Italian Football Federation, “Federazione Italiana Giuoco Calcio”) officially announced the restart of Serie A. On May 11, 2020 the teams could restart their trainings, initially individual training [23]. Marotta [23] et al investigated about muscle injuries, pre and post lockdown in the Italian Serie A in the the publicly available media-based platform Transfermarkt, http://www.transfermarkt.com, and divided injuries in severe (> 28 days), moderate (8–28 days) and minor (4–7 days) injuries; also Mazza et al [24] conduced a retrospective study about injuries (data always from Transfermarkt) in the Serie A league (training and match injuries), divided in 3 time phases of equal length. The English Premier League was suspended in March 9 and restarted on June 17. Mannino et al [25] investigated about muscular and ligamentous injuries and skeletal injuries in football players in the Premier League across three seasons: 2018/19, 2019/20, and 2020/21. Data are taken from online database.
In Spain, the Government prohibited all individuals from practicing any form of exercise outside of their own residence from 14 March, 2020. LaLiga resumed competition on 8 June of 2020 [26]. Moreno-Pérez et al [27] compared to the injury rate in the Spanish soccer league (LaLiga) between the rate of the first twenty seven matches and the last eleven matches: In the period before the suspension of the competition due to the COVID-19 pandemic (the first 27 matchdays): the Matchday 28 (first match after suspension) was the fixture with the highest number of injuries.
Bundesliga (German First League) suspended the matches from March 13, 2020 until May 16, 2020, the date of the first match (Matchday 26, the first top Europe League to resume play following the Covid-19 lockdown). Krutsch et al [28] compared the season 2019/20 with the

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previous season, also dividing the season 2019/20 in three period and comparing these with the last nine games of the season 2018/19. Seshadri et al [29] studied eighty two games played following the league suspension in Bundesliga. Thron et al [30] observed the official match data from the 2019/2020 German Bundesliga, evaluating game performance and injuries in all 306 matches (225 before Covid-19, 81 after).
Orhant et al [31] investigated time-loss injury occurrence and patterns between the first season (2020/21) completed during the Covid-19 pandemic (longer pre-season following cancellation of the 2019/20 season, a season of shorter duration, because it did not restarted after Covid-19 lockdown, so it finished at March 13, 2020, after 28 matchdays and one game not recovered), and a regular season (2018/19) in French Ligue 1 and 2 professional soccer clubs by a national injury database by each club's physician. Waldén et al [32] analyzed the data with a retrospective study about male professional players from 19 premier division teams in 12 countries that participated in the ECIS (UEFA Elite Club Injury Study) during both the 2019/20 and the 2020/21 seasons (considering only 2020).

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Authors	Publication's year	Methods	Participants	Results before lockdown	Results post lockdown
Allahabadi et al[15]	2022	**Retrospective observational comparative study** ACL tears in NFL between season 2013 to season 2020	NFL players	**Total ACL tears (total 379) per games played and II per 1000 athlete exposure:** **2013** 0.100 **2014** 0.070 **2015** 0.076 **2016** 0.071 **2017** 0.081 **2018** 0.084 **2019** 0.052 **Preseason ACL tears (total 182) per games played and II per 1000 athlete exposure:** **2013** 0.173 **2014** 0.123 **2015** 0.139 **2016** 0.125 **2017** 0.175 **2018** 0.162 **2019** 0.072 **In game ACL tears (total 197) per games played and II per 1000 athlete exposure:** **2013** 0.071 **2014** 0.049 **2015** 0.051 **2016** 0.051 **2017** 0.044 **2018** 0.053 **2019** 0.044	**Total ACL tears (total 379) per games played and II per 1000 athlete exposure:** **2020** 0.092 **Preseason ACL tears (total 182) per games played and II per 1000 athlete exposure:** **2020** 0 **In game ACL tears (total 197) per games played and II per 1000 athlete exposure:** **2020** 0.072
Bailey et al[16]	2021	**Retrospective observational comparative study** Injuries in NFL between season 2017 to season 2020 (players and reserves)	NFL players	**2017:** 799 injuries **2018:** 773 injuries **2019:** 822 injuries **II (per 1000 AE)** **2017** 7.62 **2018** 7.35 **2019** 7.82 **Average 2017–2019** 7.60	**2020:** 986 injuries **II (per 1000 AE)** **2020** 9.47
Baker et al[17]	2021	**Retrospective observational comparative study** Injuries in NFL between season 2017 to season 2020 (preseason and weeks 1-4)	NFL players	**2016:** 712 injuries (pre season 299) **2018:** 931 injuries (pre season 53) **2019:** 800 injuries (pre season 462) **2016/17 (II)** 712 (2.50) **2018/19 (II)** 931 (3.26)	**2020:** 582 injuries (pre season 0) **2019/20 (II)** 800 (2.81) **2020/21 (II)** 582 (5.4)
Omari et al[18]	2022	**Retrospective comparative study** Injuries (ACL, Achilles tendon and harmstring tendon) in NFL between season 2017 to season 2020	NFL players	**181 ACL injuries** **2017** 52 injuries **2018** 52 injuries **2019** 34 injuries **87 Achilles tendon injuries** **2017** 23 injuries **2018** 17 injuries **2019** 20 injuries **Average 2017-19** 20 injuries **633 hamstring injuries** **2017** 151 injuries **2018** 136 injuries **2019** 160 injuries **Average 2017-19** 149 injuries	**ACL injuries** **2020** 43 injuries **Achilles tendon injury** **2020** 27 injuries **Hamstring injuries** **2020** 186 injuries
Patetta et al[19]	2021	**Retrospective comparative study** **ACL tears in NFL** between season 2015 to season 2020 analyzing: the first four regular season games (2020 and 2015-2019) without preseason injuries; second, the first four regular season games (2020 and 2015-2019) including preseason (in 2020 no preseason);	NFL players	**Number ACL injuries no preseason** **2015-19 average** 6.4 ACL injuries **Number ACL injuries Through four regular season games, including preseason injuries** **2015-2019 average** 17.2 ACL injuries	**Number ACL injuries no preseason** **2020** 14 ACL injuries **Number ACL injuries Through four regular season games, including preseason injuries** **2020** 14 ACL injuries **Number ACL injuries Through eight regular season games, including preseason injuries** **2020** 19 ACL injuries

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Table 1: Results of review in NFL. ACL anterior cruciate ligament, AE athlete's exposition, II Injury Incidence (per 1000 h), NFL National Football League

Continued Table 1

Authors	Publication's year	Methods	Participants	Results before lockdown	Results post lockdown
		third, the first 8 regular season games (2020 and 2015-2019), including injuries in the four preseason games;		**Number ACL injuries Through eight regular season games, including preseason injuries 2015-2019 average** 22.8 ACL injuries	**Number ACL injuries Through eight games played, regular or preseason 2020** 19 ACL injuries
		fourth, the first 4 preseason games of 2015-2019 with the first 4 games of their respective regular seasons compared to the first 8 regular season games of 2020		**Number ACL injuries Through eight games played, regular or preseason 2015-2019 average** 17.2 ACL injuries	

Authors	Publication's year	Methods	Participants	Results before lockdown	Results post lockdown
Cahill et al[20]	**2022**	**Retrospective observational comparative study**	**NBA players**	**II preseason 2017/20 average** 1.9	**II preseason post Covid 2020/2021** 3.4
		from the 2017–18 to 2020–2021 season about the injury report:	341 players	**II first month regular season 2017/20 average** 15.2	**II first month regular season post Covid 2020/2021** 12.6
		during the preseason		**II playoffs 2017/20 average** 6.4	**II playoffs post Covid 2020/2021** 7
		during the first 4 weeks of the regular season			
		during the playoffs			
Torres-Ronda et al[21]	**2022**	**Retrospective observational comparative study**	**NBA League players**	**2017–18** 82 **games** / 821 **Unique Injuries** / 306 **Injuries Players** / 4898 **Missed Games due to Injury**	**2019–20** 72 **games** / 868 **UI** / 356 **IP** / 4356 **MG**
		from the 2017–18 to 2020–2021 season	625 players	**2018–19** 82 **games** / 901 **UI** / 339 **IP** / 4974 **MG**	**2020–21** 72 **games** / 953 **UI** / 392 **IP** / 5228 **MG**

Table 2: Results of review in NBA. II Injury Incidence (per 1000 h), IP Number of Injured Players, MG Missed Games due to Injury, NBA National Basketball Association, UI Unique Injuries v

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Authors	Publication's year	Methods	Participants	Results before lockdown	Results post lockdown
Krutsch et al[28]	2022	Retrospective comparative study between season 2019/20 and 2018/19	Bundesliga players	II 2018/19 6.9	II 2019–2020 4.64 (II in the last nine matches 4.9)
Mannino et al[25]	2021	Retrospective comparative study from the 2017–18 to 2020–2021 season about muscular injury report	English Premier league players	Muscular and ligamentous injuries 2018/2019 226 Average of games played to injury 2018/2019 5.6 Muscular and Lig. Injuries (II) 2018/2019 11.3 Muscular Injuries 2018/2019 8.7 Minutes played until Injury 2018/2019 535.8	Muscular and ligamentous injuries 2019/2020 260 – 2020/2021 289 Average of games played to injury 2019/2020 6.0 – 2020/2021 6.1 Muscular and Lig. Injuries (II) 2019/2020 13 - 2020/2021 14.5 Muscular Injuries 2019/2020 9.7 - 2020/2021 11.1 Minutes played until Injury 2019/2020 521.3 – 2020/2021 495
Marotta el al[23]	2021	Retrospective comparative study Injuries in Italian soccer league (Serie A)	Serie A players	Muscle Injuries pre lockdown (II) TOTAL 167 (16.9) Minor injuries 57 (5.76) Moderate injuries 88 (8.89) Severe injuries 22 (2.2)	Muscle Injuries post lockdown (II) TOTAL 67 (15.5) Minor injuries 22 (5.09) Moderate injuries 33 (7.63) Severe injuries 12 (2.78)

Table 3: Results of review in soccer and in futsal. ECIS Elite Club Injury Study, II Injury Incidence (per 1000 h), IR Injury Rate (per 1000 h), UEFA Union of European Football Associations

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Continued Table 3

Mazza et al[24]	**2022**	**Retrospective comparative study** Phase A: beginning of the 2019-2020 season between August 24, 2019, and October 4, 2019 (41 days); phase B period after the lockdown break between June 22, 2020, and August 2, 2020 (41 days); phase C in the 2020-2021 season between September 20, 2020, and October 31, 2020 (41 days)	**Serie A players** 763 players in phase A 748 players in phase B 567 players in phase C	**Match IR** 0.39 Phase A **Match II (%)** 9.3 Phase A	**Match IR** 0.56 Phase B / 0.51 Phase C **Match II (%)** 11.8 Phase B / 10.7 Phase C
Moreno-Pérez et al[27]	**2022**	**Retrospective comparative study** Injury rate in Spanish soccer league (LaLiga) between first 27 matches and last 11 matches	**LaLiga players** 277 players	**II Before Suspension (IIBS)** **Muscle/tendon** 2.6 IIBS **Ligament/joint/capsule** 0.8 IIBS **Bone** 0.4 IIBS **Cartilage/synovium/bursa** 0.4 IIBS **Training** 2.3 IIBS **Competition** 5.9 IIBS	**II After Resumption (IIAR)** **Muscle/tendon** 3.4 IIAR **Ligament/joint/capsule** 0.4 IIAR **Bone** 0.7 IIAR **Cartilage/synovium/bursa** 0.7 IIAR **Training** 2.5 IIAR **Competition** 21.5 IIAR
Orhant et al[31]	**2021**	**Retrospective comparative study** Injuries in Ligue 1 in the season 2018/19 and in the season 2020/21	**Ligue 1 players**	**II matches** **L1 2018/19 (901 matches)** 29.42 **L2 2018/19 (866 matches)** 22.35 **Total L1 and L2 2018/19 (1767 matches)** 25.96 **Muscular II** **L1 2018/19 (901 matches)** 13.24 **L2 2018/19 (866 matches)** 9.54 **Total L1 and L2 2018/19 (1767 matches)** 11.43	**II matches** **L1 2020/21 (856 matches)** 24.92 **L2 2020/21 (803 matches)** 19.35 **Total L1 and L2 2020/21 (1659 matches)** 22.23 **Muscular II** **L1 2020/21 (856 matches)** 10.59 **L2 2020/21 (803 matches)** 10.16 **Total L1 and L2 2020/21 (1659 matches)** 10.38
Seshadri et al[29]	**2021**	**Retrospective observational comparative study** Injury rate pre (March 13, 2020) and post (May 16, 2020) lockdown	**Bundesliga players** 537 players	**IR pre lockdown** 0.27	**IR post lockdown** 0.84
Thron et al[30]	**2021**	**Retrospective observational comparative study** Analysis of game performance and injuries pre-lockdown and post-lockdown	**Bundesliga players**	**II match pre lockdown** 0.29	**II match post lockdown** 0.28
Waldén et al[32]	**2022**	**Retrospective observational comparative study** Injury data collection: ECIS, between 2015 to 2020	**19 premier division teams in 12 UEFA countries**	**II (per 1000 h) 2015-19** 5.4 **II training 2015-19** 2.7 **II matches 2015-19** 20.8	**II (per 1000 h) total 2020** 6.0 **II training 2020** 3.5 **II matches 2020** 21.0
Spyrou et al[22]	**2022**	**Retrospective observational comparative study** Pre-lockdown period from January 27th, 2020 to March 13th, 2020 post-lockdown injuries from May 12th , 2020 to June 24th, 2020	**13 elite futsal players**	**Non-contact lower-body injuries** **IR pre lockdown** 0	**IR post lockdown** 7.73 (2.19 -13.27)

Discussion

Nine studies try to study the injuries in soccer, five in football (specifically in NFL), two in basketball (specifically in the NBA), and one in Futsal. No relevant studies found about injuries

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in volleyball. Thirteen studies give a precise value about injury rates (total or part of the season), seven studies try to understand the difference about specific injuries in a specific sport, and only one study gives the number of injuries divided into seasons without specifying injury incidence. In major sport leagues, there was only a small period of return to normal training before return to play matches, while the first part of the lockdown period consists in individual training [33–38]. Studies about the NFL and NBA investigate several factors: only one study about NFL gives the incidence injuries for the whole season, while other studies investigate about the major type of injury area and the period with the major incidence. The injury incidence in NFL generally increases in post Covid-19 season (above all in the start of the season), with a change in the period of major II (August in post Covid-19, October in normal season) and an increase of muscle injuries [15,17]; the defensive players had a statistically significant increase in injury incidence as compared to other positions, but the increase of the injury incidence is in almost all positions [16]. The unique study that analyses the whole season 2020 gives an injury incidence of 9.47 of 1000 AE [16]. Knee and upper legs have the major II [17,18].

In the NBA the major injury incidence happens during the playoffs in the Bubble (II 2017–20 average 6.4, II post-covid 7) and in the first pre-season post Covid-19, where the injury incidence is lower before the lockdown (II 2017-20 average 1.9, II post-covid 3.4): the major injury rates of muscle and tendon/ligament injuries are during the Bubble period (from July 7–21 to the end of the season) and during the Season 2020/21 [21]. During the first month of regular season the II is lower in the season 2020/21 (II 15.2) as compared to the average 2017–20 (II 12.6) [20].

In soccer, the results give conflicting data: muscular injuries are generally higher after lockdown, only the study of Marotta [23] gives a lower result; four studies give an injury incidence lower before the lockdown (for the all types of injuries), four studies give an injury incidence lower after the lockdown. Movement players have a major incidence of injuries after lockdown [27]. The period of restart after lockdown had the major injury incidence [32]. In Futsal it is difficult to understand the influence of lockdown in injury incidence: there is one study that analyzes the situation, with a small number of players.

The period after lockdown gives changes in performance, with a lower high intensity in game running [30, 39–42] and lower physical tests comparing the period before the lockdown [33–38]: the change of training and the lack of ball training with only individual training can reduce the performance and increase the risk of injuries. It is also important to consider that the athletic training increased noticeably during the lockdown period [33–38].

The only athletic individual training seems to do not balance the lack of “special training” (intended as a specific training in which strength and conditioning are used with the ball, the “situational training”), and the only individual training cannot prevent the injuries when strength and conditioning are used at maximal level. It can be a possible link between the lack of game situations and the injury incidence.

After Covid-19 lockdown, an increase of injury incidence is also found in a sport like baseball [43]. A solution for similar future situations can be the use of high intensity interval training and a major number of friendly matches for arriving to the start of the season in a good

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condition, and a major period of restart (the period of restart must be similar to the period of stop). The periods of team training after lockdown were low, based to local laws, and the consequences have been major injury incidences in many sports.
It is also interesting that only the soccer studies used web “non official” database: the studies about the NBA and the NFL used official websites or reports, and Spyrou [22] conduced his study on a futsal team, comparing directly injury incidence before and after lockdown.
So, it is indispensable to make the training similar to matches, increasing the game situations. This concept is the same of the detraining after the end of the season, with the same risks of injuries in the first games after the restart, but this time is usually lower as compared to the lockdown period.

Practical implications

The higher muscular II could penalize sport with high intensity like basketball and American football, mostly at the beginning of the resumption of the season, but a long period of preparation seems to reduce the risk of injuries; however, further studies are necessary to understand the impact of this type of detraining in soccer.

Limits: This study presents certain limitations. Some studies analyze injuries in databases like statistic websites; the studies about soccer have notable biases. In the Futsal there is only one study, with few analyzed players.

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References

1. Mohamadian, M., Chiti, H., Shoghli, A., Biglari, S., Parsamanesh, N., & Esmaeilzadeh, A. (2021). COVID-19: Virology, biology and novel laboratory diagnosis. The journal of gene medicine, 23(2), e3303.

published online on 20.06.2023
https://doi.org/10.34045/SEMS/2023/17

2. Alsharif, W., & Qurashi, A. (2021). Effectiveness of COVID-19 diagnosis and management tools: A review. Radiography (London, England : 1995), 27(2), 682-687.
3. Brusini, A., & Marco, D. (2021). Il calo delle prestazioni assistenziali durante il lockdown da Covid-19 in Italia: revisione da Pubmed. NSC Nursing 2021; 2(2): 9-33.
4. Drewes, M., Daumann, F., & Follert, F. (2021). Exploring the sports economic impact of COVID-19 on professional soccer. Soccer & Society, 22(1–2), 125-137.
5. Mon-López, D., García-Aliaga, A., Ginés Bartolomé, A., & Muriarte Solana, D. (2020). How has COVID-19 modified training and mood in professional and non-professional football players?. Physiology & behavior, 227, 113148.
6. Zago, M., Lovecchio, N., & Galli, M. (2022). Players at home: Physical activity and quality of life in 12-17 years-old football (soccer) players during the Covid-19 lockdown. International journal of sports science & coaching, 17(3), 626-636.
7. Sampson, J. A., Gibson, N., Whalan, M., & Veith, S. (2021). The COVID-19 lockdown in Australia: a case study of exercise programming in male academy football players to prepare for return to play. Science & medicine in football, 5(sup1), 38-43.
8. Almeida, C. H., & Leite, W. S. (2021). Professional football in times of COVID-19: did the home advantage effect disappear in European domestic leagues?. Biology of sport, 38(4), 693-701
9. Bilalić, M., Gula, B., & Vaci, N. (2021). Home advantage mediated (HAM) by referee bias and team performance during covid. Scientific reports, 11(1), 21558.
10. Alonso, E., Lorenzo, A., Ribas, C., & Gómez, M. Á. (2022). Impact of COVID-19 Pandemic on HOME Advantage in Different European Professional Basketball Leagues. Perceptual and motor skills, 129(2), 328-342.
11. McHill, A. W., & Chinoy, E. D. (2020). Utilizing the National Basketball Association's COVID-19 restart "bubble" to uncover the impact of travel and circadian disruption on athletic performance. Scientific reports, 10(1), 21827.
12. Cavarretta, E., D'Angeli, I., Giammarinaro, M., Gervasi, S., Fanchini, M., Causarano, A., Costa, V., Manara, M., Terribili, N., Sciarra, L., CalÒ, L., Fossati, C., Peruzzi, M., Versaci, F., Carnevale, R., Biondi-Zoccai, G., & Frati, G. (2021). Cardiovascular effects of COVID-19 lockdown in professional Football players. Panminerva medica, 10.23736/S0031-0808.21.04340-8.
13. Håkansson, A., Jönsson, C., & Kenttä, G. (2020). Psychological Distress and Problem Gambling in Elite Athletes during COVID-19 Restrictions-A Web Survey in Top Leagues of Three Sports during the Pandemic. International journal of environmental research and public health, 17(18), 6693.
14. Brusini, A. (2021). Modifications of player performance modifications in elite football in CoVid-19 lockdown: a review. Giornale Italiano di Educazione alla Salute, Sport e Didattica Inclusiva, 5(3).
15. Allahabadi, S., Gatto, A. P., & Pandya, N. K. (2022). ACL tears in the national football league from 2013 to 2020: Analysis of the 2020 season after delays and schedule changes from the early COVID-19 pandemic relative to prior seasons. Orthopaedic Journal of Sports Medicine, 10(2).
16. Bailey, E. P., Goodloe, J. B., McNeely, R. A., Traven, S. A., Woolf, S. K., & Slone, H. S. (2021). COVID-19 modifications of offseason and preseason training for NFL athletes are associated with increased risk of regular season injuries. The Physician and sportsmedicine, 1-5.
17. Baker HP, Pirkle S, Cahill M, Reddy M, Portney D, Athiviraham A. The Injury Rate in National Football League Players Increased Following Cancellation of Preseason Games Because of COVID-19. Arthrosc Sports Med Rehabil. 2021 May 28;3(4):e1147-e1154.
18. Omari AM, Paul RW, Fliegel B, Osman A, Bishop ME, Erickson BJ, Alberta FG. Effect of COVID-19 on Injury Rates and Timing in the National Football League. Orthop J Sports Med. 2022 Jun 2;10(6):23259671221098749.
19. Patetta, M., Mayo, B., Martini, O. Z., Sullivan, B., Onsen, L., & Hutchinson, M. (2021). Preseason elimination impact on anterior cruciate ligament injury in the National Football League. World

published online on 20.06.2023
https://doi.org/10.34045/SEMS/2023/17

journal of orthopedics, 12(11), 833-841.
20. Cahill, M., Baker, H. P., Lee, C., Reddy, M., Portney, D., & Athiviraham, A. (2022). The Injury Rate in NBA Players Did Not Increase Following Return to Play After the COVID-19 Stay-at-Home Order. Journal of sport rehabilitation, 31(6), 785-791.
21. Torres-Ronda, L., Gámez, I., Robertson, S., & Fernández, J. (2022). Epidemiology and injury trends in the national basketball association: Pre- and perCOVID-19 (2017–2021). PLoS ONE, 17(2), e0263354.
22. Spyrou, K., Alcaraz, P. E., Marín-Cascales, E., Herrero-Carrasco, R., Pereira, L. A., Loturco, I., & Freitas, T. T. (2022). Injury rates following the COVID-19 lockdown: A case study from an UEFA Futsal Champions League finalist. Apunts Sports Medicine, 57(1).
23. Marotta, N., de Sire, A., Gimigliano, A., Demeco, A., Moggio, L., Vescio, A., Iona, T., & Ammendolia, A. (2022). Impact of COVID-19 lockdown on the epidemiology of soccer muscle injuries in Italian Serie A professional football players. The Journal of sports medicine and physical fitness, 62(3), 356-360.
24. Mazza, D., Annibaldi, A., Princi, G., Arioli, L., Marzilli, F., Monaco, E., & Ferretti, A. (2022). Injuries During Return to Sport After the COVID-19 Lockdown: An Epidemiologic Study of Italian Professional Soccer Players. Orthopaedic journal of sports medicine, 10(6), 23259671221101612.
25. Mannino, B. J., Yedikian, T., Mojica, E. S., Bi, A., Alaia, M., & Gonzalez-Lomas, G. (2021). The COVID lockdown and its effects on soft tissue injuries in Premier League Athletes. The Physician and sportsmedicine, 1-5.
26. de Souza, D. B., González-García, J., Campo, R. L., Resta, R., Buldú, J. M., Wilk, M., & Coso, J. D. (2021). Players› physical performance in LaLiga across the season: insights for competition continuation after COVID-19. Biology of sport, 38(1), 3-7.
27. Moreno-Pérez, V., Patricios, J., Amigo de Bonet, N., Buil, M. Á., Díaz de Alda, J., Fernández-Posada, A., Gonzalo-Skok, O., Jiménez-Rubio, S., Lam, A., Lekue, J., López-Del Campo, R., López-Valenciano, A., Rodas, G., Romero-Sangüesa, J., Valencia-Murua, X., Yanguas-Leyes, X., Conde, J., & Del Coso, J. (2022). LaLiga Lockdown: Conditioning Strategy and Adaptation to In-Game Regulations during COVID-19 Pandemic Prevented an Increase in Injury Incidence. International journal of environmental research and public health, 19(5), 2920.
28. Krutsch, W., Hadji, A., Tröß, T., Szymski, D., Aus der Fünten, K., Gärtner, B., Alt, V., & Meyer, T. (2022). No increased injury incidence in the German Bundesliga after the SARS-CoV-2 virus lockdown. Archives of orthopaedic and trauma surgery, 142(7), 1571-1578.
29. Seshadri, D. R., Thom, M. L., Harlow, E. R., Drummond, C. K., & Voos, J. E. (2021). Case Report: Return to Sport Following the COVID-19 Lockdown and Its Impact on Injury Rates in the German Soccer League. Frontiers in sports and active living, 3, 604226.
30. Thron, M., Härtel, S., Woll, A., Ruf, L., Gross, T., & Altmann, S. (2021). Physical match performance and injuries in professional soccer before and after the COVID-19 break. Science & medicine in football, 5(sup1), 31-34.
31. Orhant E, Chapellier JF, Carling C. Injury rates and patterns in French male professional soccer clubs: a comparison between a regular season and a season in the Covid-19 pandemic. Res Sports Med. 2021 Oct 27:1-11.
32. Waldén, M., Ekstrand, J., Hägglund, M., McCall, A., Davison, M., Hallén, A., & Bengtsson, H. (2022). Influence of the COVID-19 Lockdown and Restart on the Injury Incidence and Injury Burden in Men's Professional Football Leagues in 2020: The UEFA Elite Club Injury Study. Sports medicine – open, 8(1), 67.
33. Campa, F., Bongiovanni, T., Trecroci, A., Rossi, A., Greco, G., Pasta, G., & Coratella, G. (2021). Effects of the COVID-19 Lockdown on Body Composition and Bioelectrical Phase Angle in Serie A Soccer Players: A Comparison of Two Consecutive Seasons. Biology, 10(11), 1175.
34. de Albuquerque Freire, L., Tannure, M., Sampaio, M., Slimani, M., Znazen, H., Bragazzi, N. L., Aedo-Muñoz, E., Sobarzo Soto, D. A., Brito, C. J., & Miarka, B. (2020). COVID-19-Related Restrictions and

published online on 20.06.2023
https://doi.org/10.34045/SEMS/2023/17

Quarantine COVID-19: Effects on Cardiovascular and Yo-Yo Test Performance in Professional Soccer Players. Frontiers in psychology, 11, 589543.

35. Grazioli, R., Loturco, I., Baroni, B. M., Oliveira, G. S., Saciura, V., Vanoni, E., Dias, R., Veeck, F., Pinto, R. S., & Cadore, E. L. (2020). Coronavirus Disease-19 Quarantine Is More Detrimental Than Traditional Off-Season on Physical Conditioning of Professional Soccer Players. Journal of strength and conditioning research, 34(12), 3316-3320.
36. Pedersen, S., Johansen, D., Casolo, A., Randers, M. B., Sagelv, E. H., Welde, B., Winther, A. K., & Pettersen, S. A. (2021). Maximal Strength, Sprint, and Jump Performance in High-Level Female Football Players Are Maintained With a Customized Training Program During the COVID-19 Lockdown. Frontiers in physiology, 12, 623885.
37. Spyrou, K., Alcaraz, P. E., Marín-Cascales, E., Herrero-Carrasco, R., Cohen, D. D., Calleja-Gonzalez, J., Pereira, L. A., Loturco, I., & Freitas, T. T. (2021). Effects of the COVID-19 Lockdown on Neuromuscular Performance and Body Composition in Elite Futsal Players. Journal of strength and conditioning research, 35(8), 2309-2315.
38. Villaseca-Vicuña, R., Pérez-Contreras, J., Merino-Muñoz, P., Aedo-Muñoz, E., González Jurado, J. A., & Zabaloy, S. (2022). Effects of COVID-19 lockdown on body composition and physical performance of elite female football players. Women in Sport and Physical Activity Journal, 30(1), 44-52.
39. García-Aliaga, A., Marquina, M., Cordón-Carmona, A., Sillero-Quintana, M., de la Rubia, A., Vielcazat, S. J., Nevado Garrosa, F., & Refoyo Román, I. (2021). Comparative Analysis of Soccer Performance Intensity of the Pre-Post-Lockdown COVID-19 in LaLiga™. International journal of environmental research and public health, 18(7), 3685.
40. Morgans, R., Orme, P., Bezuglov, E., & Di Michele, R. (2022). Technical and physical performance across five consecutive seasons in elite European Soccer. International Journal of Sports Science & Coaching, 17479541221089247.
41. Radziminski, L., Jastrzebski, Z., (2021) Evolution of physical performance in professional soccer across four consecutive seasons Balt J Health Phys Act. 13(3). 76-85.
42. Sekulic, D., Versic, S., Decelis, A., Castro-Piñero, J., Javorac, D., Dimitric, G., . . . Modric, T. (2021). The effect of the covid-19 lockdown on the position-specific match running performance of professional football players; preliminary observational study. International Journal of Environmental Research and Public Health, 18(22).
43. Platt, B. N., Uhl, T. L., Sciascia, A. D., Zacharias, A. J., Lemaster, N. G., & Stone, A. V. (2021). Injury rates in major league baseball during the 2020 COVID-19 season. Orthopaedic Journal of Sports Medicine, 9(3).