

**DID FOOTBALL PLAYERS AVOID PHYSICAL INTERACTION IN THE GAMES AFTER COVID-19?**

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**ABSTRACT**

COVID-19 has been affecting all components of our daily routines since December 2019. One of the affected industries from COVID-19 based prevention measurements is football. Most of the leagues stopped temporarily and then re-started without spectators which caused important economic loss in this industry. The aim of this paper was to investigate if the players avoided physical interactions from their opponents after the leagues re-started. The data covers 6 European football leagues with 5689 matches from the seasons in the years of 2018-2021. The examined parameters in the study were foul, challenge, air challenge, tackle, number of possessions, ball possession time and average time of possession. The results showed that the players might have been avoided physical interactions to protect themselves from a possible contagion. Providing more hygiene conditions and also awareness studies are needed to prevent possible negative effects of COVID-19 on the football industry.

**Key words:** COVID-19. Player Performance football. Football. Physical interaction. European leagues.

**RESUMO**

Os jogadores de futebol evitaram a interação física nos jogos após a covid-19?

A COVID-19 tem afetado todos os componentes das nossas rotinas diárias desde dezembro de 2019. Uma das indústrias afetadas pelas medidas de prevenção à COVID-19 foi o futebol. A maioria das ligas pararam temporariamente e depois recomeçaram sem espectadores, o que causou perdas económicas importantes nesta indústria. O objetivo deste estudo foi investigar se os jogadores evitavam interações físicas com os seus adversários após o reinício das ligas. Os dados abrangeram 6 ligas de futebol europeias com 5689 partidas das temporadas de 2018-2021. Os parâmetros examinados no estudo foram faltas, desafio, desafio aéreo, carga de ombro, número de recepções de posse de bola, tempo de posse de bola e tempo médio de posse de bola. Os resultados mostraram que os jogadores poderão ter evitado interações físicas para se protegerem de um possível contágio. É necessário proporcionar maiores condições de higiene e estudos de consciencialização para evitar possíveis efeitos negativos da COVID-19 na indústria do futebol.

**Palavras-chave:** COVID-19. Desempenho do jogador. Futebol. Interação física. Ligas europeias.

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## INTRODUCTION

Severe acute respiratory syndrome-coronavirus 2 (SARS-CoV-2), is responsible for COVID-19, was first observed in the seafood bazaar of Wuhan-China in December 2019. The virus has spread to almost all around the world in a very short time.

In March 2020, the World Health Organization (WHO) declared a pandemic (Matheson, Lehner, 2020).

Main mechanism of SARS-CoV-2 infection is based on the interaction of spike protein virus with the human angiotensin converting enzyme-2 (ACE-2) of the respiratory cells (Matheson, Lehner, 2020).

Since vaccination has not been completed yet, many restrictions have been applied by most of the governments.

The restrictions have affected many daily routines. Among them, sports that are based on close interactions have also been affected remarkably by the measurements of COVID-19.

In March 2020, all components of societies were affected by this novel infection. There have been many restrictions including limited entering indoor buildings, use of masks, regular controls of body temperature, prevention of older people from going to streets etc. All these kinds of measurements have created new life conditions for all.

Based on the statements of the WHO in the first week of March 2020, the COVID-19 pandemic stopped global sports activities all around the world.

In particular, governments that make emergency and aggressive action plans have made joint decisions with relevant organizations to play sports competitions without spectators in order to reduce pathogen spread by targeting social distance. It was seen as a necessary step to reduce the rate of spread among the audience and to prevent possible COVID-19 transmission, reducing the risk of spreading to individuals.

However, the coronavirus test of a football player was positive in Italy Serie A on 11 March 2020.

After that it was declared that five football players and team doctors from the same team were also affected (Corsini et al., 2020). UEFA, the governing body of European football, announced that all club competitions

were postponed as of March 15, and then made a second statement on March 17, 2020 that EURO 2020 will be held between 11 June - 11 July 2021 in the summer of 2021 in uefa.com.

Various governments around the world introduced home isolation practice for infected people, predicting that they could be carriers in their healthy individuals.

After the postponed matches, football clubs and football players had to adapt to the home isolation. On the other hand, there have been various discussions about how football players' home isolation can cause psychological and physiological effects and changes with lack of training.

Because of the organizational and economical concerns, most of the leagues were restarted. However, the psychology of football players was not evaluated if they were willing to restart or not.

Since football federations did not give a clear date regarding when the postponed competitions will start some of the football players left their teams and they started to be in home isolation. These reasons caused the football players to work away from their coaches and training.

This situation is not evaluated by the coaches during the training of football players with intensive match and training programs, lack of communication with their coaches, lack of competition with another football player playing in their own position, deprivation of team-specific tactical work and staying away from teammates. It may have caused organizational problems.

Fitness, physical preparation and recovery based training protocols have been proposed to the football players during quarantine periods by several authors (Azevedo et al., 2020; Mohr et al., 2020).

However, most of the personal training has been carried out in the homes of the football players.

But it is reported in some reports that this kind of personal training may cause to reach the physical targets of the football players due to different densities and also methods are applied by player to player (Mohr et al., 2020).

Grazioli et al. (2020) confirmed that the differences have been observed in physical features of the players and match data related to the before and after break for COVID-19.

When the studies on the performance analysis of athletes in football are examined, it is seen that most of them focus on the changes in the performance variables that the teams and football players face during the match (Garganta, 2009; Hughes, Bartlett, 2002; Lago-Peñas, 2012).

It should not be forgotten that the nature of football is based on the frequent physical interactions with the opponent team members.

Exposing very regular announcements in all platforms related to social distancing for preventing COVID-19 and then exposing to physical exercise where nearly zero social distancing must have affected the football players.

There are many physical interactions during a football session which can provide spreading of SARS-CoV-2 even if players are tested for COVID-19 since incubation of virus in the body may vary greatly person to person.

Egger et al., (2021) reported 18 positive cases from 3 matches in Germany and they recommended further comprehensive studies on the transmission of COVID-19 during football matches.

In our investigation, we wanted to show whether the players avoided physical

interactions during football matches because of their concerns on COVID-19 as the people are very regularly informed to be very careful to their social distancing.

Many reports have so far revealed that SARS-CoV-2 is very contagious when people are not careful to the social distances.

## MATERIALS AND METHODS

The matches of the same teams before and after the 2019-2020 COVID-19 pandemic break were chosen.

The data were retrieved from the website <https://football.instat.com/> with written permission (Instat, n.d.). Instat is a platform that provides sports performance data on football, futsal, basketball and ice hockey for all components of the sport such as athletes, leagues, clubs, researchers and media.

The six major leagues in this study are Bundesliga (Germany), La Liga (Spain), Liga Nos (Portugal), Premier League (UK), Serie A (Italy) and Süper Lig (Turkey). The postponed and re-started dates of these leagues were given in Table 1.

**Table 1** - The postponed and re-started dates of the studied leagues.

Name of the league	Postponed Date	Re-started date
Bundesliga (Germany)	13 March 2020	16 May 2020
La Liga (Spain)	12 March 2020	12 June 2020
Liga Nos (Portugal)	12 March 2020	3 June 2020
Premier League (UK)	13 March 2020	17 June 2020
Serie A (Italy)	9 March 2020	20 June 2020
Süper Lig (Turkey)	19 March 2020	12 June 2020

5689 matches with 7 different variables from six major football leagues in Europe were analyzed in this study.

The study covers 3541 matches from the 2018-19 season until COVID-19 break and 2148 matches after COVID-19 break until the end of March 20, 2021.

These parameters were selected due to they are very related to the close interactions among players.

These are foul, challenge, air challenge, tackle, number of possessions, ball possession time and average time of possession.

The definitions of the parameters are revealed in Table 2.

These definitions can be found in [instat.com](http://instat.com).

**Table 2** - The abbreviations and definitions of the variables (Instat.com).

Foul	FOUL	Foul is unfair action deemed by the referee. In the majority of cases foul is committed after a challenge against an opponent and the one who commits the foul loses the challenge. Sometimes however fouls are committed not in a challenge. It happens when a player is on the ball without performing active actions and another player commits an intentional foul.
Challenge	CHALL	These are situations where rivals engage in a challenge for the neutral ball. That is, at the time of engaging, the ball should not be possessed by any one of the rivals. If several players are involved in a challenge, the two players who were closest to the ball are noted as the ones engaged. A challenge can be in the form of mutual pushing or mutual attempts to reach the ball.
Air Challenge	AIRCHALL	Two rivals fighting for the ball above shoulder height, the rivals play or try to play with their heads.
Tackle	TCKL	is an active action of a player, who tries to get the ball from the opponent who possesses it.
Number of Possessions	NOFPOSSE	In general, ball possession by a team is registered only if actions are made by one team during a period of the game and at the same time the ball is controlled for a required time during this period. As a result of challenges, pickups and interceptions the defending team gets the ball (i.e. the action and two following actions are made by players from one team, or a player from this team is on the ball for more than 3 seconds. Number of Possessions (calculated as the amount of Single Ball Possessions)
Ball Possession Time	BPOSSTIME	total duration of all Single Ball Possessions
Average Time of Possession	AVRTMPOSS	the average value for all Single Ball Possessions is calculated

The normality test and variance homogeneity of the data were checked by Kolmogorov-Smirnov and Levene tests, respectively.

The results were given to be mean and standard deviations. Independent t test was used to compare the results related to before and after COVID-19 break.

All hypothesis and statistical analyses were carried out by using IBM SPSS Statistics for Windows, version 24.0 (IBM Corp., Armonk,

NY, ABD). 0.01 was set as statistical significance in the statistical tests.

## RESULTS

The effects of COVID-19 break on the football match parameters were investigated in the present study. The results clearly showed that COVID-19 affected significantly the examined variables from the analyzed national football leagues of the 6 countries in this study. The results of the study were shown in Table 3.

**Table 3** - The descriptive statistics of the study.

	PREPOSTCOVID	N	Mean	Std. Dev	t	df	p
FOUL	Pre-COVID-19	3541	13.05	4.28	-2.57	9299.67	0.010
	Post-COVID-19	2148	13.26	4.14			
CHALL	Pre-COVID-19	3541	157.35	26.49	16.55	9424.02	0.000
	Post-COVID-19	2148	149.13	25.17			
AIRCHALL	Pre-COVID-19	3541	44.62	15.53	9.59	9187.11	0.000
	Post-COVID-19	2148	41.76	15.26			
TCKL	Pre-COVID-19	3541	32.65	8.67	14.17	11377	0.000
	Post-COVID-19	2148	30.28	8.61			
BPOSSTIME	Pre-COVID-19	3541	1580.11	354.23	-0.22	11377	0.824
	Post-COVID-19	2148	1581.64	357.17			
BPOSSNUM	Pre-COVID-19	3541	106.87	11.99	23.03	9644.34	0.000
	Post-COVID-19	2148	101.79	11.04			
BPOSSAVTIME	Pre-COVID-19	3541	14.92	3.65	-10.34	8640.64	0.000
	Post-COVID-19	2148	15.68	3.88			

The statistical difference ( $p < 0.001$ ) was observed for foul (Pre-COVID-19:  $13.05 \pm 4.28$ , Post-COVID-19:  $13.26 \pm 4.14$ ,  $p < 0.001$ ) and ball possession average time (Pre-COVID-19:  $14.92 \pm 3.65$ , Post-COVID-19:  $15.68 \pm 3.88$ ,  $p < 0.001$ ).

The increases between pre- and post-COVID-19 were found only for these two parameters. Apart from these two parameters, significant decreases were observed for other studied parameters between pre- and post-COVID-19 ( $p < 0.001$ ).

The decreases in the parameters such as challenge (Pre-COVID-19:  $157.35 \pm 26.49$ , Post-COVID-19:  $149.13 \pm 25.17$ ,  $p < 0.001$ ), air challenge (Pre-COVID-19:  $44.62 \pm 15.53$ , Post-COVID-19:  $41.77 \pm 15.26$ ,  $p < 0.001$ ) and ball

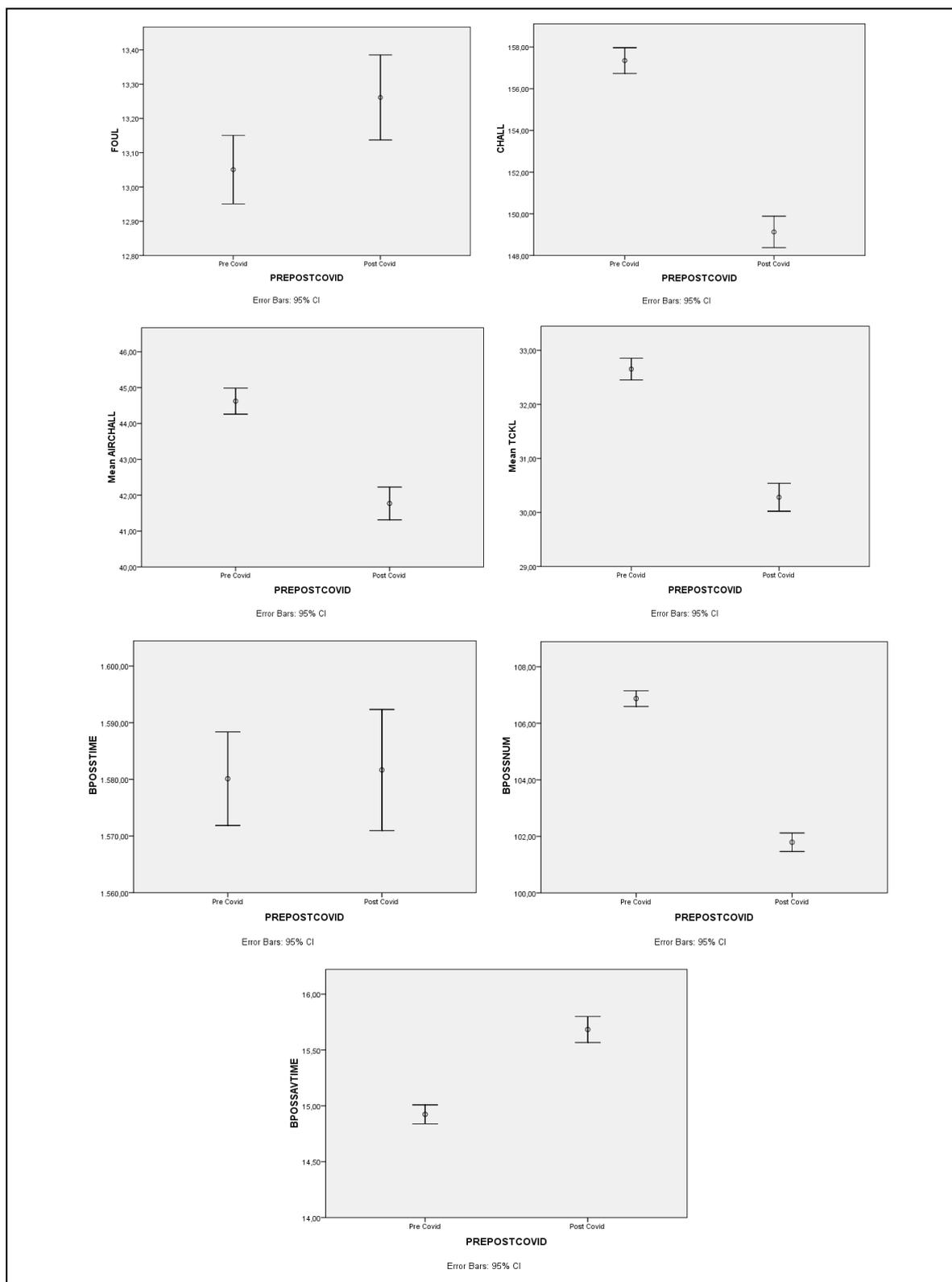
possession number (Pre-COVID-19:  $106.87 \pm 11.99$ , Post-COVID-19:  $101.79 \pm 11.04$ ,  $p < 0.001$ ) were noteworthy. Even if we observed increases after COVID-19 break, no statistical difference ( $p > 0.05$ ) was observed for the ball possession time (Pre-COVID-19:  $1580.12 \pm 354.23$ , Post-COVID-19:  $1581.65 \pm 357.17$ ,  $p > 0.005$ ).

Also, we observed significant decrease (Pre-COVID-19:  $32.65 \pm 8.67$ , Post-COVID-19:  $30.28 \pm 8.61$ ,  $p < 0.001$ ) in the most important parameters of the study, the tackle, in which players needed to be close contact. From the results, it could be said that the players did avoid the physical interaction from the opponent teams' players.

The results were also given in Figure 1.

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## DISCUSSION

SARS-CoV-2 has spread very fast, transformed into a pandemic and it has affected the people all around the world.

Current health system could not find an immediate solution for the pandemic. T

herefore, the governments have started to apply immediate measures such as cancelling sport activities, distance learning methods in education, mandatory mask use etc.

Frequent COVID-19 based announcements in all means of communication platforms such as social media and TV news created serious concerns against COVID-19.

Main argument in these announcements is to obey social distancing strictly. Football is a sport where frequent and close interaction are needed among the players in the game.

Although some of the national football federations stopped and declared the champion based on the current results.

Mohr et al., (2020) published a review paper in which many valuable comments such as aerobic and anaerobic training, preparation methods and injury prevention are discussed for the elite football players after they return to games due to the COVID-19 lockdown.

The authors also reported that similar methodologies should be prepared for similar future circumstances. Bisciotti et al., (2020) proposed practical medical recommendations for returning football training and competition after COVID-19 lockdown.

Corsini et al., (2020) published a letter to call for football governance to create maximum sensitivity to re-start the games due to many reasons such as possible long-term effects of COVID-19 and extreme mutability of SARS-CoV-2 etc.

Some authors reported how football players should arrange their training based on COVID-19 situations (Meyer et al., 2021; Mon-López et al., 2020; Primorac et al., 2020).

Ruiz-Lozano et al., (2020) gives some recommendations for re-starting the football matches in their letter.

Souza et al., (2021) reported the effects of COVID-19 on the running performance of the football players in LaLiga.

They found out that the players need at least 8-10 matchdays to obtain a satisfied fitness level compared to the previous seasons.

The authors also present that the running performances of the players in LaLiga increased progressively after COVID-19 outbreak (Souza et al., 2021).

Sors et al., (2020) examined the effects of COVID-19 from a different perspective.

Actually, the home advantage and referee bias are important research topics in football and COVID-19 provided an important experiment for the researchers who are interested in these topics.

From the outputs of the paper of Sors et al., (2020), it could be said that the home advantage and referees bias may decrease in the matches without spectators.

However, it should not be forgotten that COVID-19 is an extraordinary case and its effects may also have affected the results. Facer-Childs et al., (2021) investigated the effects of COVID-19 on the sleep and mental health of 565 athletes from different sports disciplines.

They reported that COVID-19 disturbs sleep patterns and also physical activities of the athletes. Since the sleep and mental health of the athletes are strictly related to the success of the athletes, specific strategies should be developed to get rid of the effects of COVID-19 on the psychological parameters of the athletes (Facer-Childs et al., 2021).

Mota et al., (2021) discussed player substitutions rule during COVID-19 period. They reported that this rule could be considered as suitable for decreasing concerns such as injury risk etc.

There has been an increasing trend on the studies related to football and its performance parameters parallel to technological developments. The trainers in the football teams are highly interested in the performance parameters of the players within the matches (Goes et al., 2020; Kubayi, Toriola, 2020; Liu et al., 2020; Pantzalis, Tjortjis, 2020; Sors et al., 2020).

Moreover, the teams create special working groups in their structure to monitor these parameters regularly. There have also been reports related to the prediction of match results by using the performance parameters of the players in the scientific literature (Arntzen, Hvattum, 2020; Li et al., 2020; Saritha, 2020; Stübinger et al., 2020; Stutzig et al., 2015).

A few papers on the sports and player performance and their interactions with COVID-

19 have been published on this fact and they are reviewed here.

Only a few scientific reports have been available in the scientific literature related to the effects of COVID-19 on the football-based parameters. The effects of COVID-19 on football players match performance-based reports and also athletes are also very new but the related papers are also in increasing trend (Jukic et al., 2020; Santana et al., 2021; Wunderlich et al., 2021).

There is a proportional relationship between challenge and foul. Challenges generally occur during a neutral ball. Two or more players attack the neutral ball.

The players should be in close contact with their opponents to get the ball. In our investigation, we observed that although the number of fouls increased, the number of challenges decreased significantly.

These results clearly show that the players are not very keen on challenges and they do not prefer to be in close contact with other players.

Similar case is valid for the air ball. Likewise, two or more players want to get the ball coming from their shoulder levels. For these kinds of situations, even if a very short time-contacts can occur, the players might have avoided contacting their opponents due to COVID-19's transmission via aerosols including SARS-CoV-2.

The football teams need attack efficiency to create their score chances or to complete their attacks with a score. Tackles are defined as getting the ball from the opponent player who gets the ball. In order to carry out this movement, close physical interaction is also needed. This result was well in line with our expectations since we observed a decreased number of tackles in the game after COVID-19.

As it is well known by all, team press is needed as a collective action of a football team where the players synergistically should move in a game.

This needs accumulation of more than 2 players in a restricted region of the game area. The tackle is an important defense method in the football game to create successful attacks.

Liu et al., (2015) reported that there is a direct correlation between win and tackles during the group qualifications.

Tackle is one of the parameters in football which needs close contact to get the

ball from the opponents. This parameter is of great importance for the football team to win the game.

On the other hand, since we observed that the number of tackles decreased after COVID-19 and this decrease is significant, it could be reported from the results that the players are not keen on contacting their opponents to get the ball via tackles.

Mutual pushing is observed during challenges and air challenges. The risks related to the uncontrolled contacts and injuries are very high during challenges, air challenges and tackles.

Many scientific reports can be found related to these contacts which result in injuries in the scientific literature before COVID-19 (Beaudouin et al., 2019; Fuller et al., 2004; Rahnama et al., 2002).

In our research, we conclude that players avoid challenge, air challenge and tackles to decrease the risk of not only virus transmission but also injuries after COVID-19 period.

When we compare the results with the before COVID-19 period, no statistical difference can be reported for some parameters that are mentioned in this study.

As an example, Lago-Penas et al., (2010) reported that no statistical difference related to game statistics reported for win, lose and draw teams in Spanish league.

In another study in which 380 games are examined, no difference was found for foul numbers (Lago-Ballesteros, Lago-Peñas, 2010).

Liu et al., (2015) evaluated FIFA World Championship games and reported no statistical relationship between foul number and win rates.

Santana et al., (2021) studied the effects of COVID-19 on the Bundesliga. They reported that while goal attempt and distance covered increased, passes accuracy and fouls committed also increased after COVID-19.

The present paper also reports the increased foul numbers from the matches examined from the 6 European Football Leagues.

Moreover, Jones et al., (2004) reported that the winner teams have more ball possessions compared to loser teams. 170 games from Spanish league show similar findings (Lago, Martín, 2007).

Castellano et al., (2012) researched 177 games with respect to the three world championships and reported that ball possession is one of the distinguishable features of the teams.

On the other hand, Liu et al., (2015) investigated 2014 World Championship matches and they reported that no positive correlation between ball possession and win.

Contrary to these results, significant decreased ball possession numbers ( $p < 0.01$ ) and increased ball possession average time ( $p < 0.01$ ) were observed between pre and post COVID-19 values. But we did not observe a remarkable difference for ball possession in our research.

In Europe, in Italy, where COVID-19 spread the fastest and the death rate was high, it was decided to play football competitions in the 26th week of leagues without spectators. Towards the end of this first week, with a few exceptions, a series of statements about professional leagues, international events and Tokyo 2020 Olympic games began to come around the world. In the face of a rapidly developing health crisis, the decisions to stop, cancel or postpone sports events were announced by the regulatory bodies as a necessary step. With the decisions taken in March 2020 and subsequent months, very rare events were witnessed in terms of sports history.

Considering the history of sports, there have been no sports events that have been postponed or canceled on a global scale.

This unusual global crisis has caused organizational, financial and social disruptions in sports lovers, athletes, coaches, clubs, sports organizations and sports management organizations.

However, the fact that the measures taken against COVID-19 were perhaps insufficient and the rapid spread of the virus caused more casualties than expected, brought various discussions about how to ensure the continuation of the postponed sports events.

During the period between the postponement of the football leagues, the players may have developed psychological, physiological, performance and financial losses.

These effects may have affected their performance after restart. Training structures for football teams should be revised.

Workouts can be divided into two if necessary. It is not possible for us to determine whether the players avoided physical contact as per their position while doing their training collectively.

However, it may be possible to record various attack and defense variables during the match and to understand how these variables are affected after COVID-19.

## CONCLUSION

In conclusion, it could be said that the pandemic remarkably affects the parameters of football games. Football players might have avoided physical interaction because of the contagious nature of the SARS-CoV-2.

Further research is strongly suggested to understand all dimensions of the effects of COVID-19 on the football industry.

## DECLARATION OF CONFLICTING INTERESTS

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

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