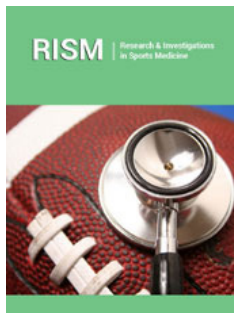


Home Advantage and Audience Effect Analysis of Turkish Super League in Covid-19 Season

Erdem Subak* and Kaan Kaya

Department of Physical Education and Sports, Istanbul Esenyurt University, Istanbul, Turkey

ISSN: 2577-1914



***Corresponding author:** Erdem Subak, Department of Physical Education and Sports, Istanbul Esenyurt University, Istanbul, Turkey

Submission:  July 20, 2021

Published:  August 20, 2021

Volume 7 - Issue 5

How to cite this article: Erdem Subak, Kaan Kaya. Home Advantage and Audience Effect Analysis of Turkish Super League in Covid-19 Season. *Res Inves Sports Med*, 7(5), RISM.000674. 2021. DOI: [10.31031/RISM.2021.07.000674](https://doi.org/10.31031/RISM.2021.07.000674)

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Abstract

Covid-19 pandemic dramatically affected soccer. Many competitions played without an audience in the 2019/2020 season. The aim of this study was to analyze Points (P), Goals Forward (GF), and Goals Away (GA) per game in Turkish Super League (TSL), Premier League, Bundesliga, La Liga, and Serie A before (BP) and After Pandemic restrictions (AP) during the 2019/2020 season separately and together. The tables of five leagues were separated into two terms as BP and AP, and P, GF, and GA were calculated for each period. Average P, GF, and GA per game were statistically compared. Paired samples t-test and paired samples correlations were used for statistical analysis. The obtained results showed that home P and GA increased AP in TSL without statistical significance. In parallel, home P and GF increased AP in Premier League and La Liga and showed significant correlations ($p < 0.05$). In contrast, in Bundesliga and La Liga, home P and GF decreased AP with significant correlation ($p < 0.05$). In La Liga, away GA significantly decreased AP ($p = 0.010148^*$). When all results of all teams ($n = 98$) were compared together, home P ($r = 0.4371$; $p = 0.000007^{***}$) and GA decreased AP and showed significant correlations. Furthermore, away P ($r = 0.386661$; $p = 0.000084^{***}$) and GF ($r = 0.505488$; $p = 0.000001^{***}$) increased with significant correlation. These results showed that the Covid-19 pandemic dissimilarly affected different leagues. However, overall results showed that home performances decreased and away results increased AP.

Keywords: Home advantage; Pandemic; Soccer teams; Sport fans

Introduction

The Covid-19 pandemic affected the entire world as well as football. When the virus reached Europe, it caused the postponement of football matches during the 2019-2020 season. After the postponement, the remaining matches played under Covid-19 restrictions. Some of them affected leagues were the Turkish Super League (TSL), Premier League, La Liga, Bundesliga, and Serie A. In these five leagues before pandemic restrictions, 1269 competitions were played with an audience; under pandemic restrictions, 483 matches were played without an audience.

Among Covid-19 restrictions, the most substantial constraint for soccer matches was playing matches without an audience. There are several types of research on audience effects on footballers and referees [1-4]. Previous studies have asserted that home teams have an advantage with the audience majority [1,5-8]. Marek et al. [9] indicated that Super League Greece was the most affected league by home advantage, the least affected was the Football League Fourth Division of England [9]. In 2007, some soccer teams played without an audience owing to safety restrictions. Analysis of that period showed the referee decisions were affected by the audience [10]. The derbies played in the same stadium were analyzed, and the results showed that there was a significant audience effect on players' performance [11].

The results for leagues served as a significant resource for researchers during the 2019/2020 Covid-19 season. Research showed the factors (e.g., particular tactics, referee bias, travel effects, and local conditions) that affected the matches during the Covid-19 season [12]. In Bundesliga, the number of fouls and aerial duels was higher during restriction term matches [13]. Another study on Bundesliga showed that the number of cards that players

were given was significantly different during the Covid-19 term [14]. Sors et al. [15] suggested that the home advantage and referee decision differences between home and away were neutralized during the Covid-19 term [15].

During the seasons before the Covid-19 term, the main problem of the research was audience effects on the matches; there were few matches without an audience during the same season. In previous seasons, only when the clubs were fined for audience actions, the matches were played without an audience. Because there were different squads of the teams in different seasons, the effect of this factor on the results was considerable. During the Covid-19 term, the number of matches with and without an audience was higher than that in previous seasons. Furthermore, the matches were played with the same squads. This situation makes the 2019/2020 season a worthy season to study audience effects on soccer matches.

Although there are many studies on the 2019/2020 Covid-19 season results in many leagues, there are no studies on the TSL results. In addition, the number of studies on goals forward and away per game before and during Covid-19 restrictions is insufficient. In this study, the 2019/2020 league tables of TSL, Bundesliga, Premier League, La Liga, and Serie A were analyzed. We compared the Points (P), Goals Forward (GF), and Goals Away (GA) of all teams before the Covid-19 pandemic restrictions (BP) and After (AP).

Materials and Methods

Study design

The 2019-2020 season of TSL, Bundesliga, Premier League,

Serie A, and La Liga was analyzed. The season was analyzed for each league under two conditions, BP and AP. Home and away league tables of each league BP and AP were analyzed. The BP and AP weeks of each league are shown in Table 1. We calculated P, GF, and GA per match for BP-home, BP-away, AP-home, and AP-away matches.

Table 1: BP and AP weeks of each league.

League	BP Weeks (with audience)	AP Weeks (without audience)
Turkish Super League	26	8
Premier League	29	9
Serie A	25	13
Bundesliga	25	9
La Liga	27	11
Total	132	50

BP: Before Covid-19 Pandemic; AP: After Covid-19 Pandemic

Statistical analysis

For each league, the mean values of P, GF, and GA per match were calculated for home results and away results. BP and AP means were compared. IBM SPSS Statistics version 25 was used for statistical analysis. Paired samples t-test was used to compare mean BP and AP values. To analyze the correlation between BP and AP values, paired samples correlation was used. The confidence level was set at 95% ($p < 0.05$). Statistical results, $p < 0.05$, $p < 0.01$, and $p < 0.001$ are indicated with (*), (**), and (***) symbols in Table 2.

Table 2: Points (P), goals forward (GF), goals away (GA) per game before (BP) and after Covid-19 Pandemic restrictions (AP), and statistical results for all leagues.

Turkish Super League					
Home Results	BP (per match)	AP (per match)	Mean	Correlation	
			p	r	p
P	1,5436±0,110629	1,5885±0,144860	0.77973	0.254907	0.278091
GF	1,5766±0,126670	1,622650±0,140390	0.774808	0.297299	0.203028
GA	1,22795±0,077630	1,38515±0,136777	0.348477	-0.094511	0.691855
Away Results					
p	1,1563±0,084951	1,1277±0,155521	0.856731	0.264188	0.260356
GF	1,2086±0,066108	1,3252±0,138598	0.408975	0.246109	0.295579
GA	1,55805±0,124548	1,59355±0,112863	0.844333	-0.126454	0.595248
Premier League					
Home Results					
P	1,5902±0,106150	1,64335±0,192797	0.740798	0.570891	0,008565**
GF	1,5085±0,111732	1,55085±0,209728	0.778726	0.733772	0,000231***
GA	1,22005±0,088959	1,15585±0,148551	0.682101	0.233049	0.322751
Away Results					
p	1,1684±0,120339	1,15665±0,120339	0.947151	0.238072	0.312129
GF	1,5085±0,114405	1,25665±0,150504	0.709188	0.381905	0.096586
GA	1,42485±0,088296	1,80665±0,302782	0.272088	-0.270528	0.24866
Bundesliga					
Home Results					

P	1,4984±0,121867	1,2202±0,166964	0.104925	0.393996	0.085637
GF	1,7054±0,155477	1,4452±0,166195	0.160685	0.387445	0.091449
GA	1,49035±0,113426	1,6652±0,162887	0.340547	0.20051	0.396646
Away Results					
p	1,2759±0,099321	1,55935±0,204181	0.111803	0.558727	0,010445*
GF	1,48985±0,107827	1,64435±0,162431	0.240789	0.620358	0,00352**
GA	1,70045±0,106503	1,45185±0,206019	0.243903	0.251909	0.283976
La Liga					
Home Results					
P	1,71485±0,109131	1,49±0,139228	0.068466	0.583891	0,006871**
GF	1,50595±0,123770	1,25505±0,109631	0.094764	0.257211	0.273619
GA	1,02555±0,076101	1,09165±0,104262	0.552329	0.297783	0.202259
Away Results					
p	1,00195±0,088923	1,2667±0,180864	0.105139	0.510203	0,021541*
GF	1,0242±0,062467	1,0833±0,145851	0.648322	0.489047	0,02865*
GA	1,5123±0,091045	1,25±0,116843	0,010148*	0.634331	0,002665**
Serie A					
Home Results					
P	1,442±0,130284	1,5345±0,146602	0.533319	0.450615	0,046161*
GF	1,517762±0,135969	1,754±0,120637	0.109711	0.400055	0,072347
GA	1,345762±0,078152	1,506762±0,129516	0.241024	0.253314	0.267886
Away Results					
p	1,2759±0,099321	1,55935±0,204181	0.111803	0.558727	0,010445*
GF	1,48985±0,107827	1,64435±0,162431	0.240789	0.620358	0,00352**
GA	1,70045±0,106503	1,45185±0,206019	0.243903	0.251909	0.283976

BP: Before Covid-19 Pandemic; AP: After Covid-19 Pandemic; P: Points; GF: Goals Forward; GA: Goals Away

* $p < 0,05$; ** $p < 0,01$; *** $p < 0,001$; r: Paired Samples Correlation.

Result

In TSL, home P, GF, and GA means were greater during AP matches than during BP matches but were statistically insignificant. Away P was greater during BP matches; GF and GA were greater during AP matches but were statistically insignificant. There were no significant correlations between BP and AP values (Table 2).

In Premier League, home P and GF were greater during AP matches. The mean difference was meaningless but had significant correlation ($p < 0.01$ for P and $p < 0.001$ for GF). Home GA decreased during AP matches but was statistically insignificant. Away P decreased, and GA increased but without statistical significance. GF was greater during AP matches but without statistical significance. There was no significant correlation between away BP and AP values.

In Bundesliga, home P and GF decreased during AP matches, and GA increased but was meaningless and had no significant correlation. For away matches, P and GF increased during AP. The differences were meaningless but showed significant correlation for P ($p < 0.05$) and GF ($p < 0.01$). GA decreased during AP but was statistically meaningless (Table 2). In La Liga, home P and GF decreased, and GA increased but was statistically meaningless (Table 2). However, home P values showed significant correlation ($p < 0.01$). For away results, P and GF were greater during AP but

without statistical significance; however, P and GF were significantly correlated ($p < 0.05$). Away GA results were significantly greater during BP ($p < 0.05$) and showed significant correlation ($p < 0.01$).

In Serie A, home P was greater during AP but without statistical significance; however, home P had significant correlation ($p < 0.05$). Home GF and GA increased during AP without statistical significance and had no significant correlation. Away P and GF increased during AP without statistical significance but had significant correlation ($p < 0.05$ for P; $p < 0.01$ for GF). GA was greater during BP but without statistical significance and did not show significant correlation. All data are shown in Table 2. We statistically compared P, GF, and GA per game of all teams ($n = 98$) in these five leagues during BP and AP. There were no significant differences between the results. However, there were statistically significant correlations. Home points per game of teams decreased after pandemic restrictions with significant correlation ($r = 0.4371$; $p = 0.000007$ ***). Similarly, GF per game during home games decreased after pandemic restrictions ($r = 0.401008$; $p = 0.000043$ ***). Otherwise, GA per game increased during AP home games ($r = 0.27191$; $p = 0.006759$ **). In away games, P ($r = 0.386661$; $p = 0.000084$ ***) and GF ($r = 0.505488$; $p = 0.000001$ ***) of teams increased after pandemic restrictions. There was no significant difference for GA per game during away games. All data are shown in Table 3.

Table 3. P, GF, and GA per game of all teams (n = 98) in these five leagues during BP and AP, and statistical results

		BP	AP	Mean	Correlation	
				p	r	p
H	P	1,562122±0,052590	1,497898±0,072774	0,351999	0,4371	0,000007***
	GF	1,571755±0,059652	1,531347±0,071215	0,577361	0,401008	0,000043***
	GA	1,262949±0,042591	1,360837±0,065937	0,153681	0,27191	0,006759**
A	P	1,183398±0,047741	1,27498±0,077995	0,219143	0,386661	0,000084***
	GF	1,256143±0,045121	1,365643±0,070720	0,079252	0,505488	0,000001***
	GA	1,550908±0,045865	1,577449±0,087895	0,785242	0,04897	0,632051

BP: Before Covid-19 Pandemic; AP: After Covid-19 Pandemic; P: Points; GF: Goals forward; GA: Goals Away; H: Home; A: Away.

*p<0,05; **p<0,01; ***p<0,001; r: Paired Samples Correlation.

Discussion

Although differences were meaningless in TSL analysis, home P, GF, and GA per game of the teams increased after pandemic restrictions. Otherwise, P during away matches decreased. GF per game was greater during away matches played without an audience. Parallel to TSL, P and GF per game during home matches increased during AP in English Premier League. An increase in P ($r=0.570891$; $p=0.008565^{**}$) and GF per game ($r=0.733772$; $p=0.000231^{***}$) showed significant correlation. GA per game decreased during home competitions but without statistical significance. In contrast, GA during away games increased but without statistical significance (Table 2).

Similar to TSL and Premier League, P and GF per game increased during AP in Serie A. This increase showed significant correlation ($r=0.450615$; $p=0.046161^{*}$). After pandemic restrictions, an increase in away P per game ($r=0.558727$; $p=0.010445^{*}$) and GF ($r=0.620358$; $p=0.00352^{**}$) per game showed significant correlations (Table 2). Contrary to expectations, home P in TSL, Premier League, and Serie A increased during AP. By considering the disadvantage of playing competitions without an audience, this result is surprising. Sors et al. [15] analyzed 841 competitions of the four countries in UEFA ranking and showed that audience significantly affected team success Sors et al. [15]. The results for these three leagues contradict those observed by Sors et al. [15] Fischer & Haucap [16] showed that the adverse effects of competitions without an audience decreased over time, and the players adapted to games without an audience [16]. In a more detailed analysis, Souza et al. [17] showed that the players' performance decreased during first matches without an audience; however, after 8-10 competitions, players' performance reached a steady state [17]. The audience may adversely affect both the home team and the away team. The players' performance increase may depend on the players' adaptation to quiet stadiums and absence of audience pressure. In addition, the players can more clearly hear the coach when there is no audience. This factor may affect the teams' performance. Moreover, it was possible that the referee bias decreased, and the teams paid more attention to rules during home competitions. Scoppa [18] showed that the number of fouls,

yellow cards, and red cards decreased during home games without an audience Scoppa [18].

In Turkey Regional Amateur League, home advantage was observed in more than 50% of the matches in the last five years [19]. In the abovementioned study, home GF per game was 1.61, and away GF was 1.20. Our study showed that home GF before pandemic restrictions was 1.58 and 1.63 after pandemic restrictions. For away games in TSL, before pandemic restrictions, home GF was 1.221 and 1.33 after pandemic restrictions (Table 2). This result is similar to that in amateur leagues. In Turkish First League, home advantage was observed in 61.10% of all matches [20]. The abovementioned results showed that home advantage was a significant advantage for all amateur and professional leagues regardless of the audience. Moreover, most amateur matches play without an audience or with very few audiences in Turkey. These results suggest that home advantage may depend on other factors (e.g., psychological and travel effects) more than on the audience. In addition, the leagues in the same country may be similarly affected by home advantage. Pollard and Gomes showed that in the USA, home advantage was significantly higher in different amateur and professional team sports [6]. Similarly, in England, home advantage was observed both in lower and upper leagues [5].

We observed that in Bundesliga, home P and GF per game decreased, and GA per game increased during AP, which differs from the results for TSL, Premier League, and Serie A. Although the difference between home results was not significant, away P ($r=0.558727$; $p=0.010445^{*}$) and GF per game ($r=0.620358$; $p=0.00352^{**}$) showed significant correlation. After pandemic restrictions, away P and GF increased, and GA per game decreased. GA per game decreased without statistical significance in away competitions (Table 2). Like Bundesliga, the home performance of the teams decreased after pandemic restrictions in La Liga. The home points average decreased after pandemic restrictions and showed a significant correlation ($r=0.583891$; $p=0.006871^{**}$). Similarly, GF per game in home games decreased; however, the difference was not significant. After pandemic restrictions, away P ($r=0.510203$; $p=0.021541^{*}$), GF ($r=0.489047$; $p=0.02865^{*}$), and GA showed significant correlation. After pandemic restrictions, the

teams won more points and scored more goals in away competitions (Table 2). Furthermore, GA in away competitions significantly decreased after pandemic restrictions ($p = 0.010148^*$).

When determining the worst and most affected leagues by home advantage, Marek et al. concluded that home and away games were affected differently in different countries [9]. In our study, the different home and away results in various leagues support Marek's conclusions. Sors et al. [15] showed that referee bias decreased in competitions without an audience [15]. This result may be a reason for success variation in home and away matches in different leagues.

The analysis of the results of all teams ($n=98$) in five leagues revealed a clear correlation. After pandemic restrictions, P and GF decreased in home competitions without an audience. In contrast, GA per game increased in home competitions after pandemic restrictions. In parallel, P and GF per game of teams increased in away stadiums (Table 3). Although the results were different in various leagues, when we analyzed all teams together, we identified the teams that lost home advantage. Otherwise, the teams' performance increased in away competitions. Away P and GF per game increased. In a detailed analysis, Wunderlich et al. showed that after pandemic restrictions, the referees showed fewer yellow cards, red cards, and fouls to away teams [21]. In the same study, researchers showed that the dominant game of home teams significantly decreased, and home teams had fewer shots and shots on target. These may be some of the reasons for the home performance decrease.

Conclusion

The Covid-19 pandemic affected the football players. In this study, the analysis of different results for five leagues before and after the Covid-19 pandemic showed that conditions differently affected various leagues. However, when we investigated all results together, we observed a decrease in home performance and an increase in away performance. Playing matches without an audience appears to be a significant factor. Regardless, combined with other studies, it is determined that other factors also have positive and negative effects. Apart from referee decisions and travel conditions, the particular circumstances of the Covid-19 pandemic are likely a significant reason for different results. The spread of the virus and cases in players, teammates, and their immediate surroundings may have affected the players' psychology. Nevertheless, the 2019/2020 football season was an outstanding season to analyze the audience effect on players' performance and results. For coaches, these results provide additional information to improve tactical performance of the players; for researchers, these results provide scientific data when studying other competitions under similar conditions.

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