

# The Effects of Var Implementation in The Turkish Football Super League

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## Abstract

Technological advances have significantly impacted the field of sport, revolutionizing various aspects of training, performance analysis and supporter participation. The development of data analysis systems, especially in football, has been particularly influential in recent times. One of the latest technologies to enter our lives in football is the Video Assistant Referee (VAR) system. The implementation of technologies such as the VAR system has aimed to reduce errors and increase the accuracy of referees' decisions, emphasizing the importance of their role in the application of the rules of the game. For this reason, according to the variable of being the home team; when the first decisions made by the referee before the VAR system was activated and the decisions made after the VAR system was activated in the positions where the VAR system was activated; Would there be an advantage to the home team in the decisions made by the referee if there was no VAR system? As a result of the analysis related to this question; in 243 positions (49.7%), the home team had an advantage while in 246 positions (50.3%) the away team had an advantage. There was no statistically significant difference ( $p>0.05$ ) when it was analyzed whether the advantage given to the home team or the advantage given to the away team was dependent on the season variable. In 489 positions where the VAR system was activated, it was observed that without VAR, full stands, pitch advantage or noise did not provide an advantage to the home team in wrong refereeing decisions.

**Keywords:** Video assistant referee. Home ownership in football, Turkish football super league.

## Türkiye Futbol Süper Ligi'nde Var Uygulamasının Etkileri

### Özet

Teknolojik gelişmeler spor alanını önemli ölçüde etkilemiş, antrenman, performans analizi ve taraftar katılımının çeşitli yönlerinde devrim yaratmıştır. Özellikle futboldaki veri analiz sistemlerinin gelişimi son zamanlarda etkisini göstermektedir. Futbolda hayatımıza girmiş son teknolojilerden bir tanesi de Video Yardımcı Hakem (VAR) sistemidir. VAR sistemi gibi teknolojilerin uygulanması, hataları azaltmayı ve hakemlerin kararlarının doğruluğunu artırmayı amaçlamış ve oyun kurallarının uygulanmasındaki rollerinin önemini vurgulamıştır. Bu sebeple ev sahibi olma değişkenine göre; VAR sistemini devreye girdiği pozisyonlarda, hakemin VAR sistemi devreye girmeden önce ilk verdiği kararlar ve VAR sistemi devreye girdikten sonra verdiği kararlar incelendiğinde; VAR sistemi olmasaydı hakem tarafından verilen kararlarda ev sahibi takıma bir avantaj oluşacak mıydı? sorusuna cevap aranmaktadır. Bu soru ile ilişkili yapılan analiz sonucunda; 243 pozisyonda (%49,7) ev sahibi takıma avantaj sağlarken 246 pozisyonda (%50,3) deplasman takımına avantaj sağlamıştır. Ev sahibi takıma sağlanan avantaj ya da deplasman takımına sağlanan avantajın sezon değişkenine bağlı olup olmadığına bakıldığında istatistiksel olarak anlamlı bir farklılık bulunamamıştır ( $p>0,05$ ). VAR sistemi devreye girdiği 489 pozisyonda VAR olmasaydı tribünlerin dolu olması, saha avantajı ya da gürültünün yanlış hakem kararlarında ev sahibi takıma karşı bir avantaj sağlamadığı görülmüştür.

**Anahtar Kelimeler:** Video yardımcı hakem. Futbolda ev sahibi olma, Türkiye futbol süper ligi.

## INTRODUCTION

Technological advances have significantly impacted the field of sport, revolutionizing various aspects of training, performance analysis and supporter participation. Video systems have been integrated into sports such as football, water polo and tennis, increasing the ability to study and analyze player performance (39).

The development of data analysis systems, especially in football, has been particularly impressive in recent times. The need for more dynamic and complex systems to effectively improve match performance has increased (32). The importance of data analysis in understanding patterns and performance in football matches, especially in achieving victories, has also been demonstrated in the literature (30, 7). Advanced and dynamic approaches in data analysis have gained a lot of importance in order to increase match performance, attract supporters' attention and improve training methodologies and tactics in football.

In addition, the fact that football matches are presented to the public with images recorded in higher resolution and from different angles through audiovisual technologies has led to more discussion of the decisions made during the game (1). The fact that football is structurally characterized by fast-moving actions has required decisions to be made quickly and the flow of the game to be maintained uninterrupted. However, this short period of time has also brought the risk of making wrong decisions (26). In parallel with the development of football, the referee's responsibilities are also increasing and in this context, incorrect decisions can significantly affect the performance of the players and the outcome of the match (5).

It is only possible to prevent controversies about goal positions and fouls in football matches by combining developing technology opportunities with football rules and ensuring that referees make more accurate and fair decisions. With the introduction of digital media technologies into football, the decision-making situation regarding critical and challenging positions during the match has become clearer and more comfortable (38).

The decisions of referees also affect the outcome and fairness of a match, which is of great importance for the points that teams will earn. Research has emphasized the importance of referees making impartial and correct decisions and has revealed the existence of refereeing bias, especially towards home teams (3). The correct positioning and judgment of referees is crucial for maintaining the rules of the game and ensuring fair competition (27). The implementation of technologies such as the VAR system has aimed to reduce errors and improve the accuracy of referees' decisions, emphasizing the importance of their role in enforcing the rules of the game (40).

Different video replay technologies have been previously used in sports such as golf, rugby and baseball to evaluate controversial decisions (11). The positive contributions provided by the technology applied in these sports have led to the idea that similar technologies should be applied in football. In today's world, where football is undergoing a major transformation, the use of digital technologies to minimise referee errors and reduce the influence of referee decisions on the outcome of the game stands out as a rational solution (34).

The VAR system, which was developed to prevent the positions that football referees missed during the match, allows replaying the positions that occurred during the match (18). It also allows the replay of unfavourable situations that develop on the field (16).

The Video Assistant Referee (VAR) system is used in football to assist match referees in making critical decisions during a match. The VAR system is typically used in situations where important positions need to be reviewed, such as goals, penalty decisions, red card violations and cards given to the wrong player. The VAR system is a crucial component that improves the accuracy and fairness of decision-making in modern football matches. The technology gives referees access to video replays and additional angles, ensuring that key decisions are made correctly. This reduces errors and improves the overall accuracy of refereeing. The implementation of the VAR system has significantly impacted the game by increasing the impartiality of decision-making processes. The VAR system has enhanced transparency in refereeing by allowing both supporters and players to witness the review process and understand the logic behind key decisions. Referees now have the support of advanced video technology to review controversial situations and ensure the accuracy of decisions. This reduces the likelihood of errors by the referee and increases the fair administration of football matches (29, 33). VAR is only used after the referee has made an (initial) decision or if a serious

incident is missed and not seen by the match officials. The referee's original decision is not changed unless there is a 'clear and obvious error' (28).

Studies have shown that there is a bias in referees' decision-making in favor of the home team (4, 8). Whether conscious or unconscious, this bias has been linked to factors such as crowd influence, home crowd noise and social pressure (6, 15, 19). Referees can be influenced by the home stadium environment, supporter and crowd noise, potentially leading to a perceived bias in favor of the home team (15).

Research shows that this bias towards home teams can affect match outcomes and disciplinary decisions, with away teams generally facing more challenges and sanctions than home teams (8). The presence of referee bias contributes to the home advantage phenomenon observed in football and other team sports (10). Furthermore, studies suggest that the implementation of technologies such as the Video Assistant Referee (VAR) system can help reduce home advantage and referee bias to some extent (21).

It is clearly mentioned in the literature that the referee has a bias in favor of the home teams. For this reason, the decisions made by the referee in the positions where the VAR system is activated will be analyzed according to the variable of being the home team. While every point is so important for the ranking of the teams in the league; It is very important to evaluate the effect of the VAR system in the Turkish men's football super league.

## METHOD

In this study, retrospective study model, which is one of the subheadings of observational study, was used. The results of the matches played in the last 3 seasons (2020-2023) in the Turkish men's football super league were analysed. In these matches, the decisions made by football referees in positions where the video assistant referee (VAR) system was activated were analysed.

The data of the study were collected by watching the game summaries of the Turkish men's football super league, which is open access via the internet. The positions where the VAR system was activated in all published super league competitions were analysed. In these positions, the first decisions of the referees before the VAR system was activated and the decisions made after the VAR system was activated were recorded using the paper-and-pencil method.

According to the seasons, the number of decisions before and after the VAR system was activated, the number of decisions in favour of or against the home team, whether there is an effect of being the home or away team on the referee's decisions without the VAR system, and in which of the positions specified in the VAR system the VAR referee intervened more, were calculated by frequency, percentage values and chi-square test in the SPSS program.

### Ethical approval and institutional permission

Before starting the study, ethical approval was obtained from Muğla Sıtkı Koçman University Medical and Health Sciences Ethics Committee (Sports, Health) with the decision dated 30.01.2024 and numbered 20.

## FINDINGS

Season	Number of matches (n)	Number of matches with VAR acted (n)	Number of positions where VAR intervened (n)
2020/2021	420	172	206
2021/2022	380	129	166
2022/2023	342	119	152
<b>Total</b>	<b>1142</b>	<b>420</b>	<b>524</b>

In the 3 seasons evaluated, 1142 matches were played and the VAR system was activated in 420 matches (36.7%). In 420 matches where the VAR system was activated, 524 positions were reviewed.

Table 2. Positions where the Var system was activated according to seasons

Seasons	Positions assessed by VAR					X <sup>2</sup>	sd	p
		Goal	Penalty	Offside	Card	Total		
2020/2021	n	35	92	55	24	206	4.019	6
	%	17	44,7	26,7	11,7	100		
2021/2022	n	23	80	46	17	166		
	%	13,9	48,2	27,7	10,2	100		
2022/2023	n	18	66	45	23	152		
	%	11,8	43,4	29,6	15,1	100		
Total	n	76	238	146	64	524		
	%	145	45,4	279	12,2	100		

**p<0.05**

As a result of the chi-square test conducted to determine whether the positions evaluated within the scope of VAR are dependent on the seasons played variable, the dependency between the variables was not found statistically significant (X<sup>2</sup> =4,019; p>0,05).

Table 3. Advantage of the Var system according to seasons

Seasons	VAR system and the referee's decision are the same	If there was no VAR, who would have benefited from the decision?			X <sup>2</sup>	sd	p
		Advantage to the home team	Advantage for the away team	Total			
2020/2021	15	n	92	99	0.495	2	0.781
		%	48,2	51,8			
2021/2022	8	n	82	76			
		%	51,9	48,1			
2022/2023	8	n	69	71			
		%	49,3	50,7			
Total	35	n	243	246			
		%	49,7	50,3			

**p<0.05**

In the evaluation made by excluding the positions in which the decisions of the VAR system and the referees were the same, that is, the positions in which the referee did not change his decision despite the use of the VAR system (n:35); as a result of the chi -square test was conducted to determine whether the question "Who would have an advantage if there was no VAR system?" was dependent on the seasons played. The dependence between the variables was not found to be statistically significant (X<sup>2</sup>=0,495; p>0,05).

## DISCUSSION AND CONCLUSION

Technological referee assistants are increasingly being used in football. The VAR system has emerged as the latest innovation and is thought to be helpful in ensuring justice in football. In a study involving football players, coaches, fans and referees, it was reported that the VAR system was an important factor in ensuring justice as a common opinion of all participant groups (9). In another study, it was determined that the VAR system is an important factor in ensuring in-game justice by reducing the pressure and stress on referees (13). In this study, the decisions made by football referees in the positions where the VAR system was activated were analysed by considering the competitions played in the last 3 seasons (2020-2023) in Turkey men's football super league. An answer to the question 'Would there be an advantage to the home team in the decisions made by the referee without the VAR system?

In the last 3 seasons (2020-2023), 1142 matches were played and VAR was activated in 420 matches (36.7%). In his study looking at the effects of the VAR system in the champions league, Işın (2023) mentioned that the VAR system was activated in approximately 25% of the matches. In another study conducted in La Liga, the top league in Spain, it was mentioned that the VAR system was activated in 27% of the matches (14). We think that the difference here is related to referee performance. Champions League matches are officiated by the

world's most elite referees and error rates are low. According to the International Federation of Football History and Statistics (23), the referee performance in La Liga, the 3rd largest league in the world, is also at a high level. The high level of referee performance reduces the number of errors made by the referee, thus reducing the chances of the VAR system being activated.

In 420 matches where the VAR system was activated, 524 positions were analyzed. Out of 524 positions, 76 (14,5%) were goal positions, 238 (45,4%) were penalty positions, 146 (27,9%) were offside positions and 64 (12,2%) were card positions. In the 524 positions where the VAR system was activated, the referees changed 489 (93,3%) of their decisions, while they did not change their decisions in 35 (6,7%) of them. When it was analyzed whether the positions evaluated within the scope of VAR were dependent on the season variable, no statistically significant difference was found ( $p>0.05$ ). There is no significant change in the positions that the referees went to VAR according to the seasons. Although VAR is a new system, the types of positions that the referees went to VAR remained almost the same in terms of percentage according to the seasons.

Considering that the referees did not make a mistake in the positions where the decisions they made before the VAR system was activated remained the same after the VAR system was activated, i.e. in the positions where they did not change their decisions, in the remaining 489 positions, when analyzed as 'Whom would the wrong decision of the referee give advantage to if there was no VAR?', 243 positions (49.7%) gave advantage to the home team and 246 positions (50.3%) gave advantage to the away team. When it was analyzed whether the advantage given to the home team or the advantage given to the away team was dependent on the season variable, no statistically significant difference was found ( $p>0.05$ ). There are many studies reporting that the VAR system ensures fairness (9, 12, 13, 20, 25, 31, 41). In the literature and in our study, it is also shown that the VAR system significantly enables referees to make correct decisions by correcting wrong decisions (2, 41). However, according to the results of our study; if the VAR system had not been used in the 3 seasons played between 2020-2023 in the Turkish Super League, referees would have made errors in 489 positions. These errors would have been equally distributed to the home and away teams and the referees would have acted fairly in the distribution of the wrong decisions. In other words, even though the referees would have made wrong decisions in 489 positions where the VAR system was activated, they would not have made a blatantly biased decision against the home team or the away team in these decisions. This situation shows that there is also fairness in the distribution of wrong decisions.

Home teams play their matches in their own stadiums, which shows that they have the support of their own fans behind them. However, in the 2020/2021 season, due to the coronavirus outbreak, fans were not allowed to the matches and the home teams were deprived of fan support. At the beginning of the 2021/2022 season, it was decided by the Turkish Football Federation that the matches would be played with a 50% stadium occupancy rate, and then the restriction was lifted as of 09.11.2021.(35, 36). In the 2022/2023 season, no restrictions were imposed and fans were taken to the stadiums. In the 2020/2021 season, the stadiums remained empty, matches were played with an average of 8,307 spectators in the 2021/2022 season and matches were played with an average of 12,463 spectators in the 2022/2023 season (37). When evaluated in terms of the home team receiving the support of the audience, it was seen that even if the referee had the support of the audience in the wrong decisions of the referee in 489 positions without VAR, it would not create an advantage against the home team.

In the study on the effect of the VAR system in the Chinese super league, it was mentioned that the use of VAR in the Chinese super league prevented the home team advantage to some extent, although the link between the home team advantage and the activation of the VAR system was not strong (21). In our study, the evaluation was made based on the decision made, and Han et al. (21) compared the 2017 season without the use of the VAR system with the 2018 season with the use of the VAR system. It is thought that the difference between these two studies is due to the evaluation criteria.

In addition, in the study evaluating the Brazilian 1st league, the last three seasons without the use of the VAR system were compared with the last three seasons with the use of the VAR system. According to the results, it was mentioned that the VAR system led to a decrease in the number of yellow cards given against the away team, but it did not cause any change in red cards and penalty shoot-outs for the home and away teams. It shows that the introduction of the VAR system does not provide an advantage to the home team or the away team in red cards and penalty shootouts that affect the course of the game in the Brazilian 1st league

(17). Holder et al. (2021) analysed the matches played in the Italian Serie A and German Bundesliga and found that VAR intervention in penalty shoot-outs was equal to the home team and the away team. This situation shows that it does not provide an advantage to the home team in terms of penalty position. While the VAR system does not bring an advantage to the home or away team in the first leagues of Brazil, Italy and Germany, a parallel result emerges by not bringing an advantage in the 1st league of Turkey, which is the subject of our study.

Although the VAR system seems to improve accuracy as it makes the game fairer, the long-term impact of the VAR system on football matches should be further examined in all its aspects. Future research should include referees' views on the VAR system. Furthermore, the effects of the VAR system should be evaluated by taking into account variables such as the playing style, performance and game vision of the teams

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