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VIDEO ASSISTANT REFEREE'S EFFECT ON FOOTBALL: TURKISH SUPER LEAGUE CASE

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ABSTRACT

Technology is now widely used in sports. One of those technology is video assistant referee (VAR) system. After being officially used in 2018 World Cup for the first time, major leagues started using VAR from the 2018/2019 season. In this study, 94 match weeks played in the Turkey Super League since the 2017/2018 season were analyzed. The present study has two purposes. The first one is to examine the effect of VARs on football statistics. The second purpose is to determine the differences of VAR statistics between two seasons. This study has shown that while goals per game ($p<0,05$), yellow cards per game, red cards per game was decreased, average match time (second) per game ($p<0,05$), ball in play time (second) per game was increased after the use of VAR. The second major finding was that the frequency of decisions did not changed per game, and the total count of positions reviewed per game decreased significantly in the second season of VAR system.

Key words: Video assistant referee system. Referees Decision. Football.

RESUMO

Efeito do árbitro assistente de vídeo no futebol: caso da super liga turca

A tecnologia agora é amplamente utilizada no esporte. Uma dessas tecnologias é o sistema de árbitro assistente de vídeo (VAR). Depois de ser oficialmente usado na Copa do Mundo de 2018 pela primeira vez, as principais ligas começaram a usar o VAR a partir da temporada 2018/2019. Neste estudo, foram analisadas 94 semanas de jogos disputados na Super League da Turquia desde a temporada 2017/2018. O presente estudo tem dois objetivos. O primeiro é examinar o efeito dos VARs nas estatísticas do futebol. O segundo objetivo é determinar as diferenças das estatísticas VAR entre duas temporadas. Este estudo mostrou que enquanto gols por jogo ($p<0,05$), cartões amarelos por jogo, cartões vermelhos por jogo diminuíram, tempo médio de jogo (segundo) por jogo ($p<0,05$), tempo de bola em jogo (segundo) por jogo foi aumentado após o uso de VAR. A segunda descoberta importante foi que a frequência das decisões não mudou por jogo, e a contagem total de posições revisadas por jogo diminuiu significativamente na segunda temporada do sistema VAR.

Palavras-chave: Sistema de árbitro assistente de vídeo. Decisão dos árbitros. Futebol.

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INTRODUCTION

There are 3 human factors that will affect the outcome in sports: coach, athlete and referee.

Coaches' role is to train athletes and devise tactics and strategy. Athletes' role in general involves training and performance. Finally, although it varies from sport to sport, referees have similar roles, but are more complex. The referees' role is to manage the match properly.

The referees must have a strong physical fitness and decide in complex situations at the time (Macmahon et al., 2007).

The International Fair Play Committee states that the referees have about 1 second in evaluating the position and deciding (Leveaux, 2010).

As mentioned above referee's decisions affect the results of the match. In some cases, even a single decision changes the course of the match (Leveaux, 2010).

Imagine the home team's player dropping the opponent footballer inside the penalty area in a crowded stadium. Consider the opposite of the same position. How would the referee decide? Studies show that the referees have decided mostly in favor of the home teams (Lane et al., 2006).

Downward and Jones (2007) found that the frequency of seeing the first yellow card of the away team was higher. Unkelbach and Memmert (2010) reported that high-noise environments increase referees' chances of showing a yellow card by 10%.

According to Plessner and Betsch (2001), the first decisions made by the referees affect their following decisions. In the study, they found a negative correlation between penalty decisions that could be made to the same team.

Also, a positive correlation was found between the penalty decision that can be given to a team and the penalty decisions that can be given to the opposing team. Erikstad and Johansen (2020) stated that in favor of successful teams, the referees made an easier penalty decision.

Mascarenhas et al., (2009) examined 144 positions in 7 matches from the New Zealand Football League with a panel of independent referees. While the panel stated 64% of the referees' decisions were correct, they determined that there was no correlation between the right decisions and the variables such as movement speed, heart rate and distance covered on these correct decisions. In addition, it was determined that the referees made 51% correct decisions in the first 15 minutes of each half and 70% in the remaining time. In parallel with this result, Helsen et al., (2006) found that the referees made significantly more mistakes in the offside decisions in the first 15 minutes of the match compared to the remaining 15 minutes periods.

Carlos, Ezequiel and Anton (2019) studied the effect of using VAR in the German Bundesliga and Italy Serie A leagues. They found differences when comparing seasons without and with VAR in the variables of offside, playing time 1st half, total playing time and yellow cards in Bundesliga, fouls, goals and yellow cards in Serie A. In addition, when all matches were examined without making a league distinction, they found significant difference in the goals, red cards, total playing time and yellow cards.

Considering all these, the VAR system will have social and economic consequences in many aspects before and after the matches, both for the teams, leagues, and for the fans and the football industry. With this study, the VAR system, which has just started to be implemented in the world, is examined.

The study sample as Turkey Premier League were selected. By comparing the results of the VAR system with the previous season when this system was not used, it is aimed to fill the gap in the literature. It is believed that the results of the study will shed light on both academics and practitioners.

In the following sections of the study, the data and method used in the analysis will be explained first.

Afterwards, the data will be analyzed, and the results will be interpreted. Finally, there will be a discussion section.

Video Assistant Referee (VAR) System

Considering the effect of the referees' decisions on the matches and teams, technology in sports is used to minimize the misjudgment.

In this sense, The International Football Association Board (The IFAB) in 2018 approved the use of Video Assistant Referees (VAR) to help the referees to make their decisions only for goals, penalty, direct red card and mistaken identity (IFAB, 2018).

In the VAR system, the final decision is made by the referee.

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The referee communicates with the VOR room via the headset. The team in the VOR room will examine all positions that fall into the four situations mentioned above and report to the referee.

If there is no mistake in the decision, they forward it to the referee and there is usually no pause in the match. In the event of a potential misjudgment, the VAR team will forward the fault to the referee. In this case, the referee can act in three ways. He corrects his decision according to the advice from the VAR room.

Or, when he sees it necessary, he also decides by watching the image on the VAR monitor. Or he does not consider the advice from the VAR room and continues the match in line with his decision.

The referee stopping the match and watching the footage again is called an On-field review (OFR). In this case, the referee watches the relevant position again from different angles and speeds and makes his decision accordingly.

Despite entering the Laws of the Game in 2018, VAR was first conceived in 2012-2013 season in the Eredevisie during the Netherland's Referee 2.0 project. Due to the success of the results, the Royal Netherlands Football Association made an application to allow video play during the game, but FIFA rejected it at that time (Farrell et al., 2019).

The VAR system is used in many major domestic leagues in different geographies of the world such as Brasileirão, Premier League, Ligue 1, Bundesliga, Chinese Super League, La Liga, Serie A, Russian Premier League, and Turkish Super League.

In addition, it is used in continental and international tournaments and leagues such as Copa Libertadores, Copa Sudamericana, UEFA Champions League, UEFA Europa League, UEFA Super Cup, UEFA Women's Champions League, CAF Champions League, and FIFA World Cup.

Some criticisms have also been raised with the use of the VAR system. Discussions were made about the accuracy of the decisions made through the VAR system.

Or criticisms were made that some decisions were continued by the referees without being re-evaluated with the VAR system.

Although these are related to the technical aspect of the issue, there are also socio-economic aspects of the issue. Football is one of the biggest entertainments and sports organizations in the world.

Billions of people are directly or indirectly involved in the football industry. With the arrival of the VAR system, there has been a debate among people about whether there will be a change in the context of excitement and enjoyment due to the nature of football.

These discussions include allegations that intentional or unintentional actions made by the football player or the referee affect the result or slow the pace of the game or stop the game. This has created question marks on issues such as following football, subscription status of broadcast organizations, and advertising revenues.

For example, there has been controversy in the English Premier League about the VAR system killed football and the fans were turning away from following the league (Moore, 2019).

In the face of these discussions, there are also opinions that the VAR system is still in a very new and developing stage and will be better understood and accepted by the fans and teams in the future.

With the implementation of the VAR system, technical deficiencies will be eliminated. In addition to these, it is claimed that the system will become more acceptable for all parties by regulating the necessary rules and practices.

In the context of all these debates and criticisms, this study is expected to contribute to the existing discussions by comparing the actual results.

MATERIALS AND METHODS

Turkey Football Federation approved the use of VAR starting from the beginning of 2018/2019 season. The initial sample consist of 94 match weeks (34 match weeks with VAR, 60 match weeks without VAR) played in Turkish Super League.

The data was retrieved from the website of OPTAsports.com. Variables used in the research are as follows: goals per game, yellow cards per game, red cards per game, average match time (second) per game, ball in play time (second) per game, VAR overturns per game, the frequency of decisions not changed per game, and the total count of positions reviewed per game.

To analyze the effect and evolution of VAR, two research models were developed. First model included match statistics (goals per

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game, yellow cards per game, red cards per game, average match time per game and ball play in time per game) and we try to find how VAR effects match statistics. In the other model, using VAR statistics (overturns, decisions not changed and counts of positions reviewed) we try to investigate VAR's evolution.

Statistical analysis was performed using jamovi software based on R (The Jamovi Project, 2019; R Core Team, 2018).

Significance levels were set at the 5% level using the independent t-test. T-test is a parametric method used to compare the means of two groups. Normality, equal variance and independence assumptions should be provided in order to apply the t-test, which is a parametric method (Kim, 2015).

Since the data to be used in the analysis did not normally distributed, Mann Whitney U test, one of the non-parametric methods, was used in the current study. Mann Whitney U test is a non-parametric method that does not require normal distribution and can be used in small samples (Orhunbilge, 2000).

RESULTS

Model 1

In model 1, goals per game, yellow cards per game, red cards per game, average match time per game and ball play in time per game variables were used.

The purpose of Model 1 is to analyze the effects of using VAR. As shown in Table I, there is a significant difference between the two groups in goals and average match time. There was no significant difference in other variables. There is a clear decrease in the number of goals.

The average goal per game at the 2018/2019 season decreased by 2.5 goals compared to the previous season.

There is extraordinarily little decrease in the number of yellow cards and red cards. Average match time increased by 112.7 seconds (approximately 2 minutes) in the 2018/2019 season compared to the previous season.

However, the ball in play time decreased by 9 seconds. From this point of view, it can be said that the increase in average match time is caused by VAR.

Table 1 - Model 1 analysis results.

	Group	Mean	Median	SD	p
Goals (n=34)	No VAR	26.65	26	4.14	0.038
	VAR	24.15	24	4.80	
Yellow cards (n=34)	No VAR	40.44	41.50	5.85	0.535
	VAR	39.85	40	5.91	
Red cards (n=34)	No VAR	2.59	2	2.22	0.871
	VAR	2.32	2	1.53	
Average Match Time (second) (n=34)	No VAR	5795.18	5793	43.62	0.000
	VAR	5907.88	5899.50	54.84	
Ball in play time (second) (n=34)	No VAR	3287.59	3279.50	75.41	0.686
	VAR	3278.00	3283.50	78.58	

Model 2

There are three variables in Model 2: VAR overturns, the frequency of decisions not changed, and the total count of positions reviewed.

The weekly frequencies of these variables for the 2018/2019 and 2019/2020 seasons are shown in Figure 1.

VAR decisions affect almost every game and improve refereeing accuracy (Roelands and De Pauw, 2019).

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In 2018/2019 season 4.35 decision, in 2019/2020 season 4.077 decision was overturned.

This indicated that VAR influence referees' decisions. Looking at the graphs, it can be said that there is a dramatic decrease in the frequency of decisions not changed in VAR.

The reason for this can be evaluated as the referees being called to the VAR in less and more accurate positions.

Similarly, it is evident that there is a marked decrease in the collection of positions examined in the VAR.

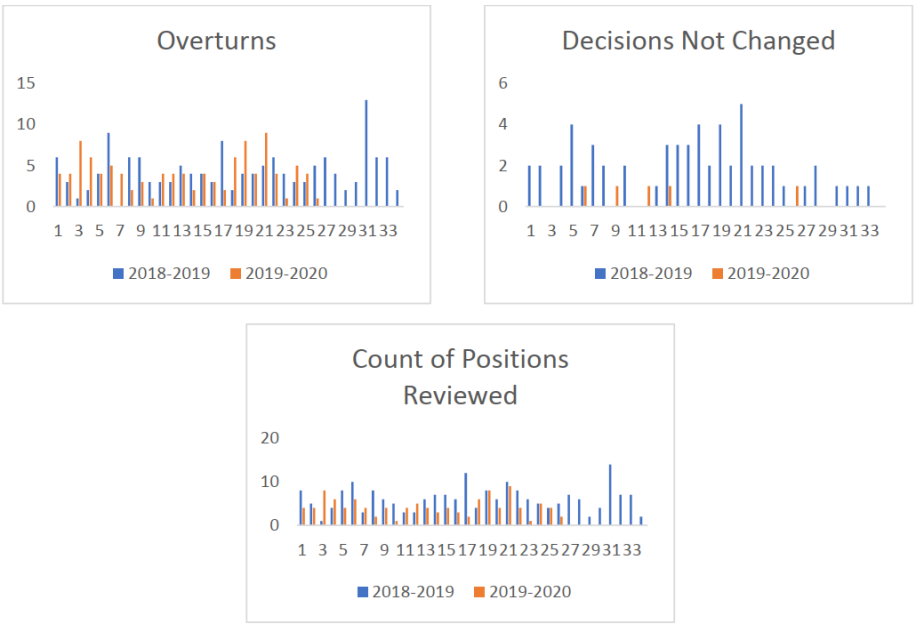

Figure 1 - Frequencies of VAR statistics.

The purpose of Model 2 is to examine whether there are differences between 2 seasons according to VAR decisions and counts of positions reviewed. Analysis results are shown in Table 2.

There is a significant decrease between 2 seasons in the frequency of decisions not changed and the total count of positions reviewed variables. This result supports Figure 1.

Table 2 - Model 2 analysis results.

	Season	Mean	Median	SD	p
Overturns	2018-2019 n=34	4.35	4	2.45	0.796
	2019-2020 n=26	4.077	4	2.077	
Not changed	2018-2019 n=34	1.74	2	1.33	0.000
	2019-2020 n=26	0.192	0	0.402	
Total	2018-2019 n=34	6.09	6	2.81	0.007
	2019-2020 n=26	4.27	4	2.01	

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DISCUSSION

The referees are influenced by the atmosphere, teams and players when making the decision. This influence causes the result of the match to sometimes result in a team's favor. VAR was introduced to football to increase the refereeing accuracy.

With the introduction of VAR, radical changes have occurred in football. In the past, football players were celebrating the goal when the referee made a goal decision. Now they wait for the VAR decision whether there was an offside or foul before the goal. Similarly, the referees could miss out some serious foul play or offensive gesture before the VAR.

At the 2014 World Cup, football viewers still remember that Luis Suarez bite Giorgio Chiellini. If VAR technology was used, Suarez would see a red card and Italy National Team would take advantage.

Some football followers believe that VAR brings justice for such positions. On the other hand, some thinks VAR is against the spirit of football and kills football.

Based on these two views, in the current study the effect of using VAR on football was investigated. For this purpose, 2 different models have been developed.

In Model 1, the effects of using VAR on the variables of goals, yellow cards, red cards, average match play and ball in play time were investigated. In Model 2, VAR decisions were examined. In the study, played in Turkish Super League since the 2017-2018 season, 94 matches (34 matches without VAR, 60 matches with VAR) were used.

As a result of the analysis of Model 1, a significant difference was found between the two seasons in goals and average match times.

Carlos, Ezequiel and Anton (2019) also found similar results at Bundesliga and Serie A. It is concluded that the yellow cards differ in all 3 leagues. In all 3 leagues, yellow cards decreased after the use of VAR started.

The reason for this decrease can be shown that players play more carefully after the introduction of VAR.

In addition, there was a significant decrease in the number of goals in Serie A and Super League. The goals canceled by the VAR decision had a serious impact in this decrease. There was also an increase in the total playing time variable in both Bundesliga and Super League. It can be shown as evidence that factors such as reviewing the positions and the decision process prolong the match time.

Model 2 was developed to investigate the decisions made in VAR and the frequency of reviewed positions. There was a decrease in VAR Overturns, but this decrease is not statistically significant.

It can be said that it is effective in the reduction of overturns that the referees make more correct decisions, or the referees are called less to review positions.

Also, there was a serious decrease in the frequency of decisions not changed. The most important factor in this decline is that the referees were advised less to the VAR screen.

CONCLUSION

Until recently, referees could not review their decisions on the court. But today, thanks to VAR, referees re-evaluate some positions and could change their own decisions. In this context, the referees can review the positions for goals, penalties, direct red cards and mistaken identity positions.

Thus, the goals scored can be re-examined and canceled if it’s necessary.

Red cards and penalties given / not given similarly are reviewed again and the right decision is made. While these reviews are being made, the match duration is extended.

This is one of the most important problems of VAR.

From this point of view, it can be said that with the start of VAR, changes have occurred in football statistics. In the current study, these changes have been revealed.

In addition, it was determined that the VAR system get better and develops as it is used.

The most important limitation of this study is that the data only consist Turkish Super League. In further research, the number of leagues can be increased and differences between leagues can be examined.

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REFERENCES

1-Downward, P.; Jones, M. Effects of crowd size on referee decisions: Analysis of the FA Cup. Journal of sports sciences. Vol. 25. Num. 14. 2007. p. 1541-1545.

Revista Brasileira de Futsal e Futebol
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2-Erikstad, M. K.; Johansen, B. T. Referee Bias in Professional Football: Favoritism Toward Successful Teams in Potential Penalty Situations. Frontiers in Sports and Active Living. Vol. 2. 2020. p. 1-5.

3-Farrell, M. A Brief History (And Defense) of VAR. 2019. Available in https://sites.duke.edu/wcwp/2019/04/01/a-brief-history-and-defense-of-var/ Access in: 25/03/2020.

4-Helsen, W.; Gilis, B.; Weston, M. Errors in judging "offside" in association football: Test of the optical error versus the perceptual flash-lag hypothesis. Journal of sports sciences. Vol. 24 Num. 05. 2006. p. 521-528.

5-International Football Association Board-IFAB, 2018. Historic Step for Greater Fairness in Football. Available in http://www.theifab.com/news/historic-step-for-greater-fairness-in-football/# Access in: 25/03/2020.

6-Kim, T. K. T test as a parametric statistic. Korean Journal of Anesthesiology. Vol. 68. Num. 6. 2015. p. 540-546.

7-Lane, A. M.; Nevill, A. M.; Ahmad, N. S.; Balmer, N. Soccer referee decisionmaking: 'Shall I blow the whistle?'. Journal of Sports Science & Medicine. Vol. 5. Num. 2. 2006. p. 243-253.

8-Leveaux, R. R. Facilitating Referee's Decision Making in Sport via the Application of Technology. Communications of the IBIMA. Vol. 2010. 2010. p. 1-8

9-MacMahon, C.; Helsen, W. F.; Starkes, J. L.; Weston, M. Decision-making skills and deliberate practice in elite association football referees. Journal of Sports Sciences. Vol. 25. Num. 1. 2007. p. 65- 78.

10-Mascarenhas, D. R. D.; Button, C.; O'Hare, D.; Dicks, M. Physical performance and decision making in association football referees: A naturalistic study. The Open Sports Sciences Journal, Vol. 2. Num. 1. 2009. p. 1-9.

11-Moore, J. Var is Killing football and turning people away from the Premier League. Available in: https://talksport.com/football/649030/var-killing-football-premier-league-offside/# Access in: 20/09/2020.

12-Orhunbilge, N. Örnekleme yöntemleri ve hipotez testleri. Avcıol Publishing. İstanbul. Turkey. 2010. p. 360.

13-Plessner, H.; Betsch, T. Sequential effects in important referee decisions: The case of penalties in soccer. Journal of Sport and Exercise Psychology. Vol. 23. Num. 3. 2001. p. 254-259.

14-R Core Team. R: A Language and envionment for statistical computing. 2018. [Computer software]. Available in: https://cran.r-project.org/.

15-Roelands, B.; De Pauw, K. Technological Impact on Human Performance. International Journal of Sports Physiology and Performance. Vol. 14. Num. 1. 2019. p. 1-1.

16-The jamovi project. jamovi. 2019. (Version 1.1) [Computer Software]. Available in: https://www.jamovi.org.

17-Unkelbach, C.; Memmert, D. Crowd noise as a cue in referee decisions contributes to the home advantage. Journal of Sport and Exercise Psychology. Vol. 32. Num. 4. 2010. p. 483-498.

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