

## EXAMINING THE SUPERIORITY OF PROFESSIONAL FOOTBALL TEAMS WITH THE CONTRIBUTION OF EXPECTED GOAL (xG) VALUE

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### ABSTRACT

The abbreviation for Expected goal is xG in statistics of football. The xG measures the quality of a chance by calculating the likelihood that it will be scored from a particular position on the pitch during a particular phase of play. The purpose of this study was to evaluate the xG metric in terms of contextual variables such as teams' final table status, match status, and venue. The xG scores of teams (n=760) from the 380 matches of the 2021-2022 Turkish Super League season were collected for this study. Contextual variables indicated the following; the success level, success status and advantage of the teams. Accordingly, the groups were organized as follows; final table rank was five groups (i.e. 1st four teams, 2nd four,...), match status was three groups (win, draw and lose) and venue was two groups (home, away). The results showed that top ranked teams scored higher xG than lower ranked teams. 1st four and 2nd four teams were significantly higher than 5th four teams. xG scores of the winning teams were significantly higher than the draw and losers. Home teams also achieved a significantly higher xG score than away teams. The results suggest that the expected goal (xG) metric can evaluate the success of the teams.

**Key words:** Analysis. Final-ranking. Match status. Venue. Success.

### RESUMEN

Examinando la superioridad de los equipos de fútbol profesional con la contribución del valor de gol esperado (xg)

La abreviatura de Gol esperado es xG en estadísticas de fútbol. El xG mide la calidad de una oportunidad calculando la probabilidad de que se marque desde una posición particular en el campo durante una fase particular del juego. El propósito de este estudio fue evaluar la métrica xG en términos de variables contextuales como el estado de la mesa final de los equipos, el estado del partido y el lugar. Para este estudio se recopilaban las puntuaciones xG de los equipos (n=760) de los 380 partidos de la temporada 2021-2022 de la Superliga turca. Las variables contextuales indicaron lo siguiente; el nivel de éxito, el estado de éxito y la ventaja de los equipos. En consecuencia, los grupos se organizaron de la siguiente manera; la clasificación de la liga al final fue de cinco grupos (es decir, los primeros cuatro equipos, los segundos cuatro,...), el estado del partido fue de tres grupos (ganar, empatar y perder) y el lugar fue de dos grupos (local, visitante). Los resultados mostraron que los equipos mejor clasificados obtuvieron una mayor xG que los equipos de menor clasificación. Los primeros cuatro y los segundos cuatro equipos fueron significativamente más altos que los quintos cuatro equipos. Las puntuaciones xG de los equipos ganadores fueron significativamente más altas que las del sorteo y los perdedores. Los equipos locales también lograron una puntuación xG significativamente más alta que los equipos visitantes. Los resultados sugieren que la métrica de gol esperado (xG) puede evaluar el éxito de los equipos.

**Palabras clave:** Análisis. Clasificación final. Estado del partido. Lugar. Éxito.

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## INTRODUCTION

The primary aim of soccer teams is to win the match in league matches or tournament matches and finally become the champion. It is necessary to win a match for success and score a goal to win the match.

Therefore, previous studies have examined the teams' efforts and methods to score goals. These were the type of play (open play and set play), the style of play (positional play, direct play and counter attack), The offensive starting area (defense, center and attack zone) and the direction of attack (center, left or right).

These were evaluated in terms of tactical elements and duration (first and second half of matches or 15-minute periods). In addition, how the goal was scored in previous studies; body parts (head, right-left foot), number of ball contacts, goal zone and opponent pressure were evaluated according to criteria (Kubayi, 2020; Michailidis et al., 2013; Mitrotasios, Armatas, 2014; Mülazımoğlu et al., 2020).

Previous studies analyzing major football championships and national leagues sought answers to the following question; How was the goal scored? In these studies, variables such as league ranking (upper, middle, lower teams), match result (win, draw-loss), venue (home, away) and game system were examined.

The results of the effects of the criteria that directly affect the score (total number of shots and goals, etc.) and the criteria that show the team's superiority (number of passes, possession of the ball, etc.) on these variables were determined (Armatas, Yiannakos, 2010; Evangelos et al., 2013; Janković et al., 2011; Lago-Penas et al., 2010, 2011; Liu et al., 2015, 2017; Yiannakos, Armatas, 2017).

For example, the results of the research examining the distribution of goals scored by playing style showed that the average of 60-75% of goals scored was from open play and 25-40% from set play, which encouraged soccer coaches to give more importance to set games (Armatas, Yiannakos, 2010). Mülazımoğlu, et al., summarized the characteristics of goals in the study that examined the process between the start of the attack and the goal kick in the Champions League 2017/2018 season; 71% open play,

56% organized attack, 45% attacks from the second zone, 45% with 1-3 passes, 88% from inside the penalty area 54% B2-zone (inside Zone 17), 54% strikers, 64% no pressure, 53% right foot, 64% one touch (Mülazımoğlu et al., 2020).

Besides the formation processes of goals, some previous studies have examined the technical and tactical criteria of the game in terms of the success of the teams. Studies in which winning teams have more ball possession (Grant et al., 1999; Jones et al., 2004) have produced contrasting results with studies that losing teams have more ball possession (Lago-Penas, 2009).

Is football changing or the evaluation methods of the matches? We can say both. Major organization World Cups or continental championships and major country leagues have always been admired and tried to imitate the playing styles of successful teams. Developing technology gives the opportunity to examine every moment of the game by adding more and different criteria.

A phenomenon that all these changes and developments have affected in recent years is the expected goal metric. The expected goal (xG) metric has been one of the main drivers of this analytical revolution in soccer (Biermann, 2019; Decroos, Davis, 2019).

Models developed for "Expected Goal" allow analysts to retrospectively assess whether a team is underperforming or overperforming in a match by comparing its goals to scoring opportunities (Tureen, Olthof, 2022; Whitmore, 2021).

Even football broadcasters today use the xG metric as a statistic in match analysis. Experts have also used these metrics to add a layer of statistical analysis to their discussion when comparing teams and players over the course of a season (Whitmore, 2021).

Expected goals measures the quality of a chance by calculating the likelihood that it will be scored from a particular position on the pitch during a particular phase of play. This value is based on several factors from before the shot was taken. An xG model is a probabilistic model that assigns a score between "0" and "1" for any shot observed in a football match (Decroos, Davis, 2019; Whitmore, 2021).

The philosophy of the model is that given the occurrence characteristic or predictor

of a shot, the model predicts a probability score for the observed shot.

This score therefore represents the estimated probability of converting a shot into a goal based on a range of shot-related characteristics (Anzer, Bauer, 2021; Decroos, Davis, 2019; Tureen, Olthof, 2022).

So much so that this xG is calculated by different statistical firms using different methods. Commonly used predictors are shot position, distance to target, shot angle, type of play, body part used to shoot, shot type, and shot technique (Whitmore, 2021).

Newer models have also begun to include predictors beyond shooting characteristics such as goalkeeper position, defender position, type of pass taken and whether the shooter is under pressure (Vatavani, 2022; Whitmore, 2021). xG models are still regularly tweaked and new approaches to soccer analytics continue to be proposed (Vatavani, 2022). For example, a striker's goal-scoring ability is not the same as that of a defender. The scorers' xG calculations have to be different from the others. The companies that created the xG metric are still trying to find solutions to these controversies (Tureen, Olthof, 2022).

In this study, leaving all these controversial issues aside, the xG scores calculated by a widely used company according to the existing methods were used in the data set.

Therefore, in this study, the xG scores of the teams in a professional football league were examined according to the success criteria.

## MATERIALS AND METHODS

In this study, all matches (380) played in the 2021-2022 season in the Turkish Super League were analyzed. In these matches, 760 data of all teams were examined.

The xG score calculated for each team in all matches was recorded separately in the first half (1st-half), second half (2nd-half) and full time. The data of OPTA (Opta Sports, London, UK), which records the detailed statistics of the league matches of the countries, were obtained from the Whoscored website (<https://www.whoscored.com>), which is open to access.

Most football partners, such as coaches, analysts, managers and football players, examine the statistics about the matches from these sites. This data from sports statistics sites has been used in many previous studies examining football performances (Dendir, 2016; Hao et al., 2022). The reliability of the data provider's data has been confirmed by previous studies (Liu et al., 2017; Ruan et al., 2022).

The groups of variables in the dataset are arranged as follows; (i) in five groups according to the ranking of the final league-table; the top four teams qualified for European Cups (1st-four), the second four teams (2nd-four), the third four teams (3rd-four), the fourth four teams (4th-four) and the bottom four relegated teams (5th-four). (ii) in three groups (win, draw and loss) according to the match status, (iii) in two groups (home and away) according to the venue. The analyses were in agreement with all ethics guidelines of the local university.

## Statistical analysis

The mean xG metric and standard deviations of the teams in all matches were calculated separately for both first-second halves and full time of the match. It was determined by homogeneity test (Kolmogorov-Smirnov) that xG scores were not normally distributed. It was decided to use nonparametric tests to compare the intergroup xG score mean distributions of the independent variables. For the final league-table and match status, which the independent variables with three or more groups, the xG averages were tested by the Kruskal Wallis H test and then the Bonferroni adjusted Mann-Whitney U test. For the Venue with two groups, the xG averages were tested by the Mann-Whitney U test. In specific, the mean xG for each variable was compared between the five table positions using a series of Kruskal Wallis H tests with p values of under 0.05 indicating significant table-position effects.

Where a significant table-position effect was found, individual pairs of variables were compared between the two table-position groups using a series of Bonferroni adjusted Mann-Whitney U tests with p values of under 0.005 indicating significant differences. p values was 0.017 for match status. A two-independent sample test (Mann-Whitney U) was used for the

venue variable. Two-sided significance for all results was set at a 5% level. All statistical analyses were conducted using SPSS version 22.0 for Windows (SPSS Inc., Chicago, IL).

## RESULTS

According to the Kruskal Wallis H test results in Table 1, a significant difference was found between the xG score averages of the teams according to the league ranking.

Respectively ( $X^2(df=4;p)$ ); 1st half (17.48; .002), 2nd half (23.55; .000), and full time (29.65; .000). Bonferroni adjusted Mann-Whitney U test was used to determine the difference between which groups' xG mean according to league rank. In 1st half, 1st four teams were found higher than 5th four ( $p<.005$ ). In the 2nd half, the 1st four and 3rd four teams were higher than the 5th four ( $p<.005$ ). In full time, 1st four and 2nd four teams were higher than 5th four ( $p<.005$ ).

**Table 1 -** A comparative analysis of xG mean values of teams by final league-table positions.

Part of Match	League Rank	n	xG				Mean Rank	$X^2$	df	p*	Diff. Groups <sup>§</sup>
			Mean	SD	Min.	Max.					
1st half	1st four	152	0.78	0.53	0.01	2.75	436.41	17.48	4	0.002	1>5
	2nd four	152	0.70	0.51	0.01	2.17	392.79				
	3rd four	152	0.61	0.46	0.01	2.88	362.30				
	4th four	152	0.64	0.46	0.01	2.47	373.96				
	5th four	152	0.56	0.42	0.01	2.12	337.04				
2nd half	1st four	152	0.96	0.63	0.01	3.13	420.16	23.55	4	0.000	1>5 3>5
	2nd four	152	0.84	0.58	0.01	2.78	381.81				
	3rd four	152	0.91	0.56	0.04	3.05	415.30				
	4th four	152	0.84	0.64	0.01	3.59	372.70				
	5th four	152	0.67	0.51	0.02	2.85	312.53				
Full time	1st four	152	1.74	0.85	0.48	4.32	440.35	29.65	4	0.000	1>5 2>5
	2nd four	152	1.54	0.78	0.30	4.39	393.20				
	3rd four	152	1.52	0.80	0.05	4.49	385.16				
	4th four	152	1.48	0.76	0.18	4.18	378.34				
	5th four	152	1.23	0.66	0.19	3.22	305.45				

**Legend:** \* Kruskal Wallis H tests showing significant difference to between league ranks ( $p<0.01$ );

<sup>§</sup> Bonferroni adjusted Mann-Whitney U tests showing significant difference to groups ( $p<0.005$ )

Kruskal Wallis H test results are shown in Table 2; a significant difference was found between the xG score averages of the teams according to the match status. Respectively ( $X^2(df=2;p)$ ); 1st half (64.05; .000), 2nd half (59.83; .000), and full time (115.38; .000).

Bonferroni adjusted Mann-Whitney U test was used to determine the difference between which groups' xG mean according to match status. In all part of match, win teams were found higher than loss and draw ( $p<.017$ ).

**Table 2** - A comparative analysis of xG mean values of teams by match status.

Part of Match	Match status	n	xG				Mean Rank	X <sup>2</sup>	df	p*	Diff. Groups <sup>§</sup>
			Mean	SD	Min.	Max.					
1st half	1 Win	289	0.83	0.54	0.01	2.88	458.04	64.05	2	0.000	1>2
	2 Draw	182	0.61	0.43	0.01	1.81	363.81				1>3
	3 Loss	289	0.52	0.39	0.01	2.12	313.47				
2nd half	1 Win	289	1.07	0.67	0.01	3.59	458.50	59.83	2	0.000	1>2
	2 Draw	182	0.73	0.50	0.01	2.38	345.15				1>3
	3 Loss	289	0.69	0.48	0.01	2.24	324.76				
Full time	1 Win	289	1.90	0.84	0.30	4.49	487.94	115.38	2	0.000	1>2
	2 Draw	182	1.34	0.68	0.18	3.61	339.09				1>3
	3 Loss	289	1.20	0.61	0.05	3.22	299.14				

\* Kruskal Wallis H tests showing significant difference to between match status ( $p < 0.01$ );

§ Bonferroni adjusted Mann-Whitney U tests showing significant difference to groups ( $p < 0.017$ )

Table 3 shows that according to the venue variable, the xG score averages of the home teams were found to be significantly

higher than the away teams in all parts of the match ( $p < 0.01$ ).

**Table 3** - A comparative analysis of xG mean values of teams by venue variable.

Part of Match	Venue	n	xG				Mean Rank	U	Z	p*
			Mean	SD	Min.	Max.				
1st half	Home	380	0.71	0.46	0.01	2.88	415.64	58846.50	-4.413	0.000
	Away	380	0.60	0.49	0.01	2.75	345.36			
2nd half	Home	380	0.94	0.61	0.01	3.59	417.16	58270.00	-4.603	0.000
	Away	380	0.75	0.56	0.01	3.05	343.84			
Full time	Home	380	1.65	0.78	0.18	4.49	426.29	54801.50	-5.750	0.000
	Away	380	1.35	0.77	0.05	4.39	334.71			

**Legend:** \* Mann-Whitney U tests showing significant difference to between league ranks ( $p < 0.01$ )

## DISCUSSION

The current study, which examines the expected goal (xG) scores of the teams in the Turkish Super League in the 2021-2022 season, focused on three main issues; i) ranking in the final table, ii) match success status, and iii) venue status. The first two items covered the success of the teams, and the third item covered the advantage of the teams.

The first important result was that the xG scores of the top four teams in the final table were higher than the other groups and it was significantly higher than the bottom four teams.

Being at the top of the final table is an indicator of success for the teams, so we can comment that the xG statistics of successful moves are also high. The second important result was observed in xG scores in terms of the

success of the teams at the end of the match. Winning teams had higher xG scores than draw and losing teams. The final table ranking representing long-term success and match-status representing instant success show us that the xG metric is a very important data in evaluating the success of a team. It is generally accepted that a football team has an advantage in a home match. Our third important result questioning this phenomenon is that the xG scores of the home teams were higher than the away teams.

Some studies in the literature on how to calculate xG have not clarified which football statistics companies' method is effective (Fernandez-Navarro et al., 2019).

Therefore, some previous researchers have conducted studies revealing the use of



different methods in the calculation of the xG metric (Rathke, 2017; Ruan et al., 2022).

Fernandez-Navarro et al., (2019) argued that only the xG metric is not sufficient. They proposed the Possession Effectiveness Index, which is calculated using the xG metric and the ball movement points metric produced from some play style criteria. In this study, in which the English Premier League (EPL) matches were evaluated, the match status (losing, drawing and winning) and venue (home or away) were examined according to the league ranking. Styles of play analyzed in this study (i.e. Direct Play. Counterattack. Maintenance. Build Up. Sustained Threat. Fast Tempo. Crossing and High Pressure) showed different effectiveness depending on match status, venue and quality of opposition (Fernandez-Navarro et al., 2019).

Rathke (2017) reported that the xG metric in the final table is distinctive in determining the level of success.

Fernandez-Navarro et al. (2019) reported that higher ranked teams achieved higher effectiveness scores (Fernandez-Navarro et al., 2019). In our study, the fact that the 1st-four and 2nd-four teams achieved higher full time xG scores than the last four teams in the league ranking is similar to these studies.

It is known that football teams create higher game efficiency and superiority in home games (Jamieson, 2010). In general terms, this is an accepted result, but it has been reported that this situation changed in the following minutes in the first half of the matches, and the home teams lost this superiority for some game criteria (Lago-Penas et al., 2017).

The results of our study showed that the home teams achieved higher xG scores in both halves of the matches. In addition, it is seen that the xG averages of the home teams in the first half of the matches increased compared to the visiting teams in the second half.

Previous studies have shown that more goals were scored in the second half of the matches, in favor of the winning teams. It was stated that the teams scoring the first goal won more matches (Armatas et al., 2009; Armatas, Yiannakos, 2010; Leite, 2013; Tokul, Mülazimoglu, 2018; Yiannakos, Armatas, 2017). In a previous study emphasizing that the winning teams stand out in technical and tactical criteria in the game, contrary to the

losers, the winning teams performed more interception, clearance and aerial challenge and fewer crosses, passes and dribbles (Taylor et al., 2008).

On the other hand, it has been reported that at the top of the league and successful teams in the championships have higher total shoot and shoot on target (Castellano et al., 2012; Lago-Penas et al., 2010).

In a previous study, the three seasons of the Turkish Super League were examined in terms of physical demands and technical performances according to the final ranking of the teams.

According to the study results, there was no evolutionary trend in physical demands over successive seasons, and teams in different positions showed similar physical responses.

On the other hand, evolutionary trends were observed concerning technical variables. Specifically, the number of lost balls, ball touches in the central corridor, and goals from set pieces increased from season one to the others, while the number of successful dribbles reduced over time.

Finally, rank-based differences were observed in technical parameters. Top teams presented a higher percentage of successful passes, longer ball possession, more passes per minute, more key passes, and more passes to the pitch's final third.

Shooting technical performance was not evaluated in this study, which is the main criterion that determines the xG metric in our study (Akyildiz et al., 2022).

A previous study examined the relationship between play styles and xG. If teams strengthen their own-goal defense, they will make fewer mistakes and take on less dangerous situations with the goalkeeper's high-intensity effort and defense. This greatly reduces the opponent's xG (Ruan et al., 2022).

It is emphasized in the studies that contextual variables affect playing styles in football matches and that teams exhibit different behaviors at any moment of the game.

Therefore, depending on all these variables, the teams entering the goal position and scoring the goals vary (Fernandez-Navarro et al., 2018; Ruan et al., 2022).

The secondary aim of this study, which it tries to put forward in a conceptual sense, is; As Herberger and Litke stated in their studies, "big data and sports analytics have become

important tools in professional soccer and can increase the competitiveness of professional football clubs" (Herberger, Litke, 2021).

## CONCLUSIONS

In conclusion, this study emphasized that the expected goal (xG) metric can evaluate the success of the teams.

At the end of the league, the top rank teams and the winners had higher xG scores. The phenomenon that the home teams have an advantage with the higher xG score is also confirmed.

This study, "Is xG important for evaluating success?" It has produced remarkable results because it clarifies the doubts, that in recent years' football stakeholders and especially technical staff really care about the xG metric. In this study, the data of the teams were examined, but future studies in which the data of the individual players will also be examined can use the xG metric more effectively.

Therefore, all evaluators (manager, scout, analyst, etc.), especially coaches, can use the xG metric to evaluate the performance of a team or player.

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