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Analysis and Comparison of Team Success Based on Match Technical and Running Performance in The Bundesliga Leagues: 2022-2023 Season

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Abstract
The aim of this study is to compare the performance of the matches played in the Bundesliga and Bundesliga 2 in the 2022-2023 season and to reveal the factors affecting the league ranking. Data were collected from the Bundesliga official website; 5 technical-tactical and 4 physical performance, 9 parameters in total were evaluated. Independent Samples T-Test was used to determine the differences between the groups, Pearson Correlation Test was used to determine the relationships between the parameters. As a result of the analyses, it was determined that the number of high intensity runs and sprints in the matches was significantly higher in BL. In addition, there were no significant relationships between the physical performance parameters in Bundesliga (BL) and the points collected by the teams at the end of the league and the league ranking; these relationships were determined to be with different levels of technical parameters. In Bundesliga 2 (BL2), along with technical parameters, significant relationships were found at different levels between running distance per match and league ranking and number of goals scored. As a result, it can be said that the teams in the top leagues play faster football than the teams in the lower leagues. In addition, since the teams in the higher leagues perform almost equally in terms of tactical and physical performance, it can be said that the teams in the lower leagues should utilise their opportunities positively in order to be successful, while the teams in the lower leagues should also have a higher running distance per match.

Key words: *Analysis, Bundesliga, Goal, Running distance, Soccer*

Bundesliga Liglerinde Maç Teknik ve Koşu Performansına Dayalı Takım Başarısının Analizi ve Karşılaştırılması: 2022-2023 Sezonu

Özet
Bu çalışmanın amacı, 2022-2023 sezonunda Bundesliga ve Bundesliga 2'de oynanan maçların performansını karşılaştırmak ve lig sıralamasını etkileyen faktörleri ortaya koymaktır. Veriler Bundesliga resmi internet sitesinden toplanmış; 5 teknik-taktik ve 4 fiziksel performans olmak üzere toplam 9 parametre değerlendirilmiştir. Gruplar arasındaki farklılıkları belirlemek için Bağımsız Örneklem T-Testi, parametreler arasındaki ilişkileri belirlemek için Pearson Korelasyon Testi kullanılmıştır. Analizler sonucunda, maçlardaki yüksek yoğunluklu koşu ve sprint sayısının BL'de anlamlı olarak daha yüksek olduğu belirlenmiştir. Ayrıca, Bundesliga (BL)'daki fiziksel performans parametreleri ile takımların lig sonunda topladıkları puanlar ve lig sıralaması arasında anlamlı bir ilişki bulunmamış; bu ilişkilerin teknik parametrelerin farklı düzeyleri ile olduğu belirlenmiştir. Bundesliga 2 (BL2)'de ise teknik parametrelerin yanı sıra maç başına koşu mesafesi ile lig

sıralaması ve atılan gol sayısı arasında farklı düzeylerde anlamlı ilişkiler bulunmuştur. Sonuç olarak, üst liglerdeki takımların alt liglerdeki takımlara göre daha hızlı futbol oynadıkları söylenebilir. Buna ek olarak, üst liglerdeki takımlar taktiksel ve fiziksel performans açısından neredeyse eşit performans gösterdiğinden, alt liglerdeki takımların başarılı olmak için fırsatlarını olumlu kullanmaları gerektiği ve alt liglerdeki takımların maç başına koşu mesafesinin de daha yüksek olması gerektiği söylenebilir.

Anahtar kelimeler: *Analiz, Bundesliga, Gol, Koşu mesafesi, Futbol*

Introduction

Soccer is a highly complex sport involving the interaction between physical and technical factors (Bradley et al., 2013; Mota, Thiengo, Gimenes & Bradley, 2016) and match performance is multifactorial. This performance is characterised by the interaction of technical, tactical, physical, physiological and psychological components (Vergonis et al., 2019). In soccer, where the main goal is to defeat the opponent, it is necessary to initially determine and improve the level of physical conditioning in order to achieve this goal and compete successfully (Ertetik & Müniroğlu, 2021). In addition, a high level of technical skill and advanced tactical behaviour parameters should also be together (Carling, 2013). At this point, one of the methods used to collect data is match analysis.

Match analysis forms the basis of the stage of determining the match strategy and tactics, and with the development of technology, computer software allows the technical, tactical and physical performance components determined during the match to be easily analysed (Arı & Deliceoğlu, 2020). Match analysis, which is used to evaluate the characteristics that are of great importance for every coach in order to determine the strengths and weaknesses of both their own and the opposing team (Lago-Penas, Lago-Ballesteros, & Rey., 2011), also enables physiological, biological, technical and tactical development (Safiq, Sulaiman & Rahmat, 2013).

In the last decade, it has been reported that there has been an increase in match physical and technical performance parameters in professional soccer (Bush, Barnes, Archer, Hogg & Bradley, 2015; Bradley et al., 2016; Reynolds, Connor, Jamil & Beato, 2021), soccer players covered 8-13 km during the match (Reilly, 2003) and this distance is covered with an intermittent exercise regime (Di Salvo, Gregson, Atkinson, Tordoff & Drust, 2009). In another study in the literature, it was shown that there are different physical requirements between teams depending on various factors (Rampinini, Coutts, Castagna, Sassi & Impellizzeri, 2007). In addition, it has been reported that physical performance may also play an auxiliary role in successful technical performance (Andrzejewski, Chmura, Konefal, Kowalczuk, & Chmura, 2018; Chmura, Andrzejewski, Konefal, Mroczek, & Rokita, 2017; Hoppe, Slomka, Baumgart, Weber, & Freiwald, 2015; Yang, Leicht, Lago, & Gomez, 2018). On the other hand, some existing studies on the subject have shown that team success at the end of the season is related to technical performance (Andrzejewski et al., 2022; Kite &

Nevill, 2017; Lago-Ballesteros & Lago-Penas, 2010; Lago-Penas & Lago-Ballesteros, 2011; Lepschy, Wasche, & Woll, 2020; Yang et al., 2018).

Considering that soccer has become a game played in faster and smaller areas today, it is thought that researches should be conducted to improve player and team performance. It is thought that it is important that the sample of these studies to be conducted consists of high-level leagues, tournaments or organisations in order to reflect today's understanding of soccer. In addition, it seems necessary to investigate whether physical game parameters as well as technical and tactical components can make a distinction at the point of achieving success. To date, a limited number of studies have identified the relationship between physical performance and a team's final position in the rankings (Brito Souza, Lopez-Del Campo, Blanco-Pita, Resta, & Del Coso, 2020; Clemente et al., 2019; Di Salvo et al., 2009; Hughes & Churchill, 2005; Lago-Penas, Lago-Ballesteros, Dellal, & Gomez, 2010; Lago-Penas et al., 2011; Rampinini, Impellizzeri, Castagna, Coutts, & Wisloff, 2009; Safiq et al., 2013). In this context, there is a need to increase the number of studies on the correlation between team success, match technique and running performance in professional soccer. There are very few data on this subject, especially in the German Bundesliga (Andrzejewski et al., 2018; Andrzejewski et al., 2022; Hoppe et al., 2015; Konefal et al., 2019a; Lepschy et al., 2020). However, for a better understanding of team success, both match technique and running performance variables should be integrated into the same analysis. In Germany, a soccer country, the Bundesliga, one of the best leagues in the world, where the best teams compete, brings together different styles of play and therefore, the key performance indicators may differ from those identified in other national and European leagues.

In addition, it is thought that investigating and comparing the physical, technical and tactical performances of the teams in the top and bottom league is important for the development of today's soccer, and determining whether the parameters that are effective for the success of the teams in different divisions are different will be effective in terms of training planning, strategy and tactical understanding to be developed. Since the relative levels of the leagues are different, it is possible that the physiological demands on the players in each league are also different. Little research has been conducted on performance differences between league levels, and in the studies that do exist, researchers have found that players competing at the highest standard run at a higher intensity during a match than players at a less elite standard (Mohr, Krustrup, & Bangsbo, 2003). In line with all these, the aim of

the study was: 1) To determine the match technique and running performance required by the teams in a professional soccer league, 2) To make a performance comparison of the matches played in Bundesliga (BL) and Bundesliga 2 (BL2) in the 2022-2023 season, 3) To analyse the relationship between the success of the teams at the end of the season and the variables related to match technique and running performance, 4) To reveal the most important factors affecting the league ranking in both leagues.

Materials and Methods

Sample of the Study

A total of 1024 matches played by the teams in the Bundesliga and Bundesliga 2 in the 2022-2023 season constitute the sample of the study. During the current research, the "Higher Education Institutions Scientific Research and Publication Ethics Directive" was followed.

Data Collection

The data of the study were collected through the Bundesliga official website (https://www.bundesliga.com/en/bundesliga). The data were analysed and evaluated by soccer coaches who are also match analysis coaches. In the study, 5 technical-tactical (ball possession, accurate pass percentage, number of goals, number of shots and total points) and 4 physical performance (running distance per match, total running distance, high intensity running and number of sprints), 9 parameters in total were evaluated. In addition, the current performances of the teams in the league were associated with the league ranking separately and it was determined which performance parameter was effective on the league ranking.

Statistical Analysis

The data were analysed in SPSS 25.0 package programme. Mean and standard deviation values from descriptive statistics were used in the analysis. Shapiro-Wilks test was applied to determine the normality of the data distributions. Independent Samples T-Test was applied to reveal the difference between the teams in Bundesliga and Bundesliga 2; Pearson Correlation Test was applied to determine the relationships between the performance parameters of the teams; Regression analysis was applied to determine which parameter is effective on the league ranking and the significance level was accepted as $\alpha=0.05$.Reference intervals based on magnitude will be used to describe the level of association between the data ($r<0.09$ insignificant; $0.1<r<0.29$ small; $0.3<r<0.49$ medium; $0.5<r<0.69$ high; $0.7<r<0.89$ very high; $r>9$ excellent) (Hopkins, Marshall, Batterham, & Hanin, 2009).

Ethics of Research

The ethics committee approval of the study was obtained at the meeting of Bandırma Onyedi Eylül University Health Sciences Non-Interventional Research Ethics Committee dated 21.06.2023 and numbered 2023-46.

Results

At the end of the matches played in Bundesliga and Bundesliga 2 in the 2022-2023 season, the data revealing the differences between the technical-tactical and physical performances of the teams in the leagues in the matches are given in Table 1.

Table 1

Comparison of technical, tactical and physical performances of the leagues at the end of the season

Parameters	Leagues	N	Mean ± ss	t	p
Ball Possession (%)	BL2 BL	612	49.33 ± 5.445 49.33 ± 4.740	.522	1.000
Accurate Pass Percentage (%)	BL2 BL		79.59 ± 3.956 80.37 ± 4.584	.539	.587
Number of goal	BL2 BL		50.06 ± 12.012 53.94 ± 14.219	.887	.382
Number of shots	BL2 BL		461.83 ± 43.480 431.00 ± 71.039	.330	.126
Total Points	BL2 BL		46.94 ± 12.226 46.83 ± 13.883	.510	.980
Running Distance Per Match (km)	BL2 BL		114.02 ± 2.398 115.11 ± 1.901	-1.515	.139
Total Running Distance (km)	BL2 BL		3876.54 ± 81.542 3913.67 ± 64.612	-1.514	.140
Number of High Speed Running	BL2 BL		22235.72 ± 1036.145 24004.94 ± 1197.191	-4.741	**.000***
Number of Sprint	BL2 BL		7076.67 ± 354.459 7761.28 ± 581.958	-4.263	**.000***

*$p<0.05$

According to Table 1, when the differences between the technical-tactical and physical parameters of the teams in Bundesliga and Bundesliga 2 were examined at the end of the season, statistically significant differences were found in favour of Bundesliga between the data of high intensity running and sprint number ($p<0.05$). In other variables, no significant difference was found ($p>0.05$).

The data revealing the relationships between the technical-tactical and physical performances of the teams in Bundesliga 2 in the 2022-2023 season and the league ranking are given in Table 2.

Table 2

The relationship between the technical, tactical and physical performances of the teams in Bundesliga 2 at the end of the season and the league standings

Parameters	Ball Possession	Accurate Pass Percentage	Number of goals	Number of shots	Total Point	League Ranking	Running Distance Per Match	Number of High Speed Running	Number of Sprint
Ball Possession	1								
Accurate Pass Percentage	**.949****	1							
Number of goals	**.647****	**.682****	1						
Number of shots	**.735****	**.768****	**.753****	1					
Total Point	.408	.334	.320	**.486***	1				
League Ranking	**.575***	**.613****	**.813****	**.693****	-.403	1			
Running Distance Per Match	.388	.415	**.607****	**.500***	.154	**.561***	1		
Number of High Speed Running	.319	.344	.385	.387	.082	-.303	**.897****	1	
Number of Sprint	.155	.170	.316	.158	.086	-.095	**.703****	**.732****	1

*p<0.01; **p<0.05

As a result of the analyses, medium and high positive significant relationships were found between league ranking and possession (r=.575; p<0.05), accurate pass percentage (r=.613; p<0.01), number of goals (r=0.813; p<0.01), number of shots (r=.693; p<0.01) and running distance per match (r=.561; p<0.05). No significant relationships were found between league ranking and other running distances and numbers (Table 2).

At the end of the matches played in the Bundesliga in the 2022-2023 season, the data revealing the relationships between the technical-tactical and physical performances of the teams in the leagues in the matches and the league ranking are given in Table 3.

Table 1

The relationship between the technical, tactical and physical performances of the teams in the Bundesliga at the end of the season and the league standings

Parameters	Ball Possession	Accurate Pass Percentage	Number of goals	Number of shots	Total Point	League Ranking	Running Distance Per Match	Number of High Speed Running	Number of Sprint
Ball Possession	1								
Accurate Pass Percentage	**.921****	1							
Number of goals	**.859****	**.773****	1						
Number of shots	**.862****	**.720****	**.864****	1					
Total Point	**.808****	**.802****	**.818****	**.708****	1				
League Ranking	**.669****	**.616****	**.822****	**.618****	**.757****	1			
Running Distance Per Match	-.051	-.040	.136	-.047	-.136	-.311	1		
Number of High Speed Running	.093	.099	.250	.103	-.045	-.215	**.652****	1	
Number of Sprint	.268	.189	.377	.400	.170	-.182	.148	**.772****	1

*p<0.01; **p<0.05

As a result of the analyses, moderate and high positive significant relationships were found between league ranking and possession (r=.669; p<0.01), accurate pass percentage (r=.616; p<0.01), number of goals (r=0.822; p<0.01) and number of shots (r=.618; p<0.01). No significant relationships were found between league ranking and running distances and numbers (Table 2).

The data revealing which parameter is more effective on the league rankings of the teams in the leagues at the end of the matches played in Bundesliga and Bundesliga 2 in the 2022-2023 season are given in Table 4.

Table 2

Factors influencing the league standings in Bundesliga 2 and Bundesliga

Leagues	Parameters		R^2	ΔR^2	β	t	p	F
Bundesliga 2	**Model 1**	**Running Distance Per Match**			.095	-.460	.653	
		Ball Possession			.080	.154	.880	
		Accurate Pass Percentage	.826	.683	.110	-.200	.845	5.171*
		Number of shots			.158	-.540	.599	
		Number of goals			.613	-2.201	**.048***	
Bundesliga	**Model 1**	**Ball Possession**	.843	.710	.106	-.184	.857	7.971*

	Accurate Pass Percentage	.064	.154	.880	
	Number of shots	.402	1.110	.287	
	Number of goals	1.128	-3.383	**.005***	

*p<0.05

In Model 1, it was observed that all parameters had a significant positive interaction on the league ranking of the teams. In addition, it was found that the number of goals explained approximately 83% of the league ranking of the teams. In Model 2, it was observed that there was a significant positive interaction of all parameters on the league ranking of the teams. It was also found that the number of goals explained approximately 84% of the league ranking of the teams (Table 4).

Discussion and Conclusion

The aim of this study is to determine the match technique, tactics and running performance required by teams in different levels of leagues and to analyse the relationship between the teams' success at the end of the season and the variables related to match technique and running performance in order to be successful in the league. The main findings of the study are that there is a significant correlation between the position of the standings in Bundesliga 2 and both match technique and running performance per match; in Bundesliga, there is a significant correlation between the league ranking of the teams and only the match technique parameters. Moreover, when the level of influence of the interacting relationships on the league ranking is analysed, it is found that the most influential factor in both leagues is the number of goals.

Our analysis showed that in BL2, there were significant correlations between ranking position and both running distance per match and technical performance, which is consistent with previous studies (Andrzejewski et al., 2022; Hoppe et al., 2015; Oberstone, 2009). In BL, significant relationships were found between ranking position and technical performance. In the literature, especially previous studies have shown that team success at the end of the season is related to technical performance (Kite & Nevill, 2017; Konefal et al., 2019b; Lago-Ballesteros & Lago-Penas, 2010; Lago-Penas & Lago-Ballesteros, 2010; Lepschy et al., 2020; Yang et al., 2018). Moreover, some research has shown that technical performance may be more important than physical performance for success in soccer (Konefal et al., 2019a; Liu, Hopkins & Gomez, 2016). For example, a recent study in the German Bundesliga reported a trend that variables related to accuracy (e.g. shots on goal or goal efficiency) are critical (Konefal et al., 2019b; Lepschy et al., 2020). A similar conclusion can be made according to

the results of studies conducted to determine which parameters are more effective for leaving matches victorious (Bilgin & Müniroğlu, 2022; Coşkuner, Büyükçelebi & Kurak, 2020; Gürkan, 2023; Gürkan, Yüksel & Ertetik, 2020; Zhou, Zhang, Calvo & Cui, 2018). Researchers have reported that shooting and accurate shooting averages are effective in terms of the teams to be victorious. Gürkan (2023) also stated in his study that teams should have superiority in technical parameters such as ball possession and number of accurate passes in order to be in the top ranks.

On the other hand, according to some studies in the literature, physical performance may play an auxiliary role in successful technical performance (Andrzejewski et al., 2018; Chmura et al., 2017; Hoppe et al., 2015; Yang et al., 2018). For example, in one of these studies, it was concluded that match running performance alone did not have a significant relationship with team success, but there were positive-significant correlations between ball possession and running performance (Hoppe et al., 2015). This can be explained by the result obtained in a study by Vigne et al. (2013). The researchers argued that more successful teams exert less physical effort during the match, possibly due to greater technical skill or tactical awareness, which leads to more possession. Supporting this argument, Yang et al. (2018) reported that lower ranked teams travelled more distance without possession than higher ranked teams.

It is also worth noting that the top teams perform more sprints in possession than the bottom teams, which means that sprints are key for tactical purposes. In particular, these movements allow to create open spaces, 1v1 activities or penetrating passes, which reinforces the importance of strength and conditioning in professional soccer (Gomez, Gomez-Lopez, Lago & Sampaio, 2012; Oliva-Lozano, Fortes, Krustrup & Muyor, 2020; Oliva-Lozano, Fortes & Muyor, 2021a; Yang et al., 2018). According to a study conducted in the Spanish LaLiga, soccer is evolving towards a more intense game in which players increase the total sprint and high-intensity distances travelled in a match (Pons et al., 2021). However, there are variables related to match running performance, such as players' maximum running speed, and according to a recent study, these variables have a weak correlation with team success (Del Coso et al., 2020). As conditioning and training programmes develop in soccer, there may be year-to-year differences in physiological performances between leagues (Krustrup & Bangsbo, 2001). These findings of the researchers are in parallel with our results showing the differences between BL and BL2 leagues in our study.

The researchers recognise that there are many factors that may have influenced the results of the analyses presented in the study. For example, one of the limitations of this study is that physical performance variables such as high-intensity running distance, sprint distance, total acceleration or deceleration could not be reported on the site where the data were obtained. Another limitation is that this type of research should also be written taking into account the influence of different contextual variables such as playing position, fitness level, etc. (Oliva-Lozano, Rago, Fortes & Muyor, 2021b). Furthermore, the current study focussed on Bundesliga and Bundesliga 2 leagues. Therefore, future research could be designed to take these limitations into account for a better understanding of both physical and technical performance in professional soccer. Furthermore, running performance in the whole game sample should be analysed for a better understanding of how running parameters affect the game.

Strength and conditioning coaches can take into account the results of this study to develop appropriate training strategies, as significant interactions were observed between ranking position and both physical and technical performance. In order for teams to be more successful at the end of the season, they need to learn to possess and use the ball positively, make positive use of the opportunities they have, and cover more distance with the ball. In addition, considering that the sprint activities of the teams in the top league are more than the teams in the lower leagues, this means that it is necessary to improve sprint performance in match play. Therefore, these results may have practical implications, especially for the professional soccer teams in the lower leagues, showing in which direction they can improve their game.

Ethics Committee Permission Information

Ethical review board: Bandırma Onyedi Eylül University Health Sciences Non-Interventional Research Ethics Committee

Date of the ethical assessment document: 21.06.2023

Number of the ethical assessment document: 2023-46

Declaration of Contribution Rates of Researchers

The processes related to the introduction, methodology and findings sections of the study were carried out by the first author; the processes related to data collection, discussion and conclusion sections were carried out by the first and second authors.

Conflict Statement

The authors do not declare any conflicts with the research.

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