ORIGINAL ARTICLE

TRENDS in
Sport Sciences
2024; 31(**4**): 245-254
ISSN 2299-9590
DOI: 10.23829/TSS.2024.31.4-6

Temporal trends in goals scored per match across European soccer leagues: a three-decade analysis

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Abstract:
Introduction. Research in soccer has shown that regulatory changes, alongside other factors, shape how the game is played and affect one of its key outcomes–goals scored per match. However, limited data exists on how this trend has evolved in Europe's major domestic leagues. Aim of Study. This study examined temporal trends in goals scored per match in seven major European leagues (Premier League, La Liga, Serie A, Bundesliga, Ligue 1, Eredivisie, and Liga Portugal) over 30 seasons (from 1994/1995 to 2023/2024). Material and Methods. A total of 193,442 goals scored in 71,499 matches were sourced from https://zerozero.pt and further analyzed based on variables "season" and "league". The Spearman correlation was used to assess temporal trends in each league and a pooled average. A one-way ANOVA compared average goals per match among leagues, followed by Tukey's honestly significant difference (HSD) post hoc tests. One-sample t-tests evaluated deviations of each league's mean from the overall average. Results. Significant positive correlations with time were found in the Premier League, Ligue 1, Bundesliga, and the pooled average ($p < 0.001$). Eredivisie (3.07) and Bundesliga (2.93) exceeded the pooled average (2.71) and differed from the other leagues ($p < 0.05$). Ligue 1 (2.46) and Liga Portugal (2.52) had the lowest averages, falling below the European average ($p < 0.001$). Conclusions. Goal-scoring trends are rising across major European leagues, with significant differences among them. Governing bodies and coaches should consider these findings and regional idiosyncrasies when implementing rule changes or developing strategies to maintain competitive balance and soccer's evolving dynamics across the Europe's top leagues.

KEYWORDS: soccer, longitudinal analysis, goal scoring, soccer regulations, league comparisons.

Received: 16 September 2024
Accepted: 15 October 2024

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Introduction

Association football, commonly known as soccer, has undergone significant evolution, driven by strategic, regulatory, and technological shifts. Pioneering research by Wallace and Norton underscores a decades-long transformation in game dynamics and strategic adaptations [30]. Key regulatory changes, like the offside rule in 1990, the back-pass rule in 1992, and the goal kick rule in 2019, have influenced gameplay [12, 18, 27]. Moreover, enhanced professionalism and technological advancements have revolutionized player and match analysis, enriching training and tactical decision-making [21, 24]. These developments have escalated physical and technical demands and amplified strategic complexity of soccer, reflecting broader trends in sports science that have reshaped how the game is played, coached, and perceived globally [3, 6, 12, 30].
The low-scoring nature of modern soccer highlights goals as the sport's most pivotal quantifiable metric [2, 11, 20]. Since the beginning of the 21st century, an average number of goals scored per match in the six Fédération Internationale de Football Association

(FIFA) Men's World Cups (2002-2022) has been 2.51. Although this average has remained below three since the 1958 tournament in Sweden, historical data reveals a different story. From 1930 to 1954, there was a noticeable upward trend in scoring, peaking at 5.38 goals per match in 1954 – the highest ever recorded at a FIFA World Cup [18]. From the late 1950s to the early 1990s, a downward scoring trend in elite soccer was largely attributed to enhanced coordination and proximity among defenders, which outpaced developments in attacking strategies and tactical behaviors [15, 18, 30].

In recent years, there has been stabilization in scoring at the highest levels of soccer, as displayed in studies and match data from major tournaments [11, 15, 18]. This trend has also been observed in European domestic leagues, with the English Premier League averaging 2.73 goals per match over seven seasons (2012/2013-2018/2019) [31], and Spanish La Liga averaging 2.80 goals per match over eight seasons (2011/2012-2018/2019) [6]. Even though scoring from open play remains prevalent [2, 15, 31], it has become increasingly challenging due to reduced available space and a greater demand for fast-paced technical-tactical actions [10, 13, 17, 30]. Concurrently, there has been a significant increase in goals scored from set plays, rising by 0.27% in each World Cup tournament from 1966 to 2018 [15]. Dynamics of goal scoring are deeply intertwined with heightened professionalism, innovations in coaching strategies, and global shifts in sports science, which have collectively reshaped gameplay. Growing emphasis on technical and strategic sophistication has influenced how teams prepare and execute their game plans. For instance, a proportion of goals resulting from team collaboration rose by 0.28% from 1966 to 2018 [15]. Likewise, physical demands of competitive play, especially in high-intensity efforts, have markedly increased [3, 12, 19, 32]. More intriguingly, modifications to the Laws of the Game, prompted by FIFA's concerns over frequency of goals scored, followed the historically low scoring at the 1990 FIFA World Cup (2.21). To encourage more attacking play, FIFA adjusted the offside rule to benefit attackers, and introduced the professional foul rule, making denial of a clear scoring opportunity a sending-off offense [18]. At present, the International Football Association Board (IFAB) has endorsed further trials to modify the offside rule. Proposed by Arsène Wenger, FIFA's Chief of Global Football Development, this rule change would deem a player to be onside if any part of their body capable of scoring aligns with a penultimate defender [14]. The adjustment not only aims to simplify offside calls for on-field assistant referees and video assistant referees (VAR), but also seeks to enhance global appeal of the game by potentially increasing goal-scoring opportunities [4]. This leads to a pertinent initial question: Is the average number of goals scored in soccer consistent over the recent decades? Regardless of extensive research on various determinants of goal scoring in professional soccer [9, 23, 26], a surprising gap remains in understanding how the frequency of goals per match evolves [15], particularly in the major European leagues.

In addition to considering a relatively unexplored facet of goal-scoring evolution in European leagues, it is of paramount importance to acknowledge performance disparities among constituent countries. Existing literature has uncovered differences in playing styles and performance characteristics, influenced by factors such as national culture, historical contexts, and coaching philosophies [8, 16, 20, 22, 25]. Such diversity prompts additional probing questions: Does the average number of goals per match significantly differ across major European leagues in recent decades? And which leagues deviate from the overall average?

As noted, the metric "goals scored per match" transcends mere statistics; it impacts everything from fan engagement to strategic decisions by coaches and players, and even influences regulatory changes at the highest levels of soccer organizations. Thus, examining this metric's evolution over the past three decades is both timely and necessary, with a focus on the major European domestic leagues: the English Premier League, Spanish La Liga, Italian Serie A, German Bundesliga, French Ligue 1, Dutch Eredivisie, and Liga Portugal. In addition to the Big Five leagues, Eredivisie and Liga Portugal were included due to the consistent prominence and high-level performance of their clubs in European competitions. Both leagues regularly feature teams in knockout stages and maintain over 50,000 points in the UEFA association club coefficients [29], underscoring their competitive strength at a continental level. Data collection begins with the 1994/1995 season, a pivotal period marked by substantial regulatory changes in the early 1990s [18], which affected gameplay, players' behavior, and team strategies. This era also coincides with stabilization in certain competitions [6, 15, 31], making it essential for analyzing long-term trends in modern soccer. Understanding these trends across leagues can provide valuable insights into broader shifts in the sport, thereby better informing policy and coaching practices tailored to specific competitive contexts.

Aim of Study

This study aims to elucidate the temporal trends in goals scored per match across the seven major European

domestic leagues – the English Premier League, Spanish La Liga, Italian Serie A, German Bundesliga, French Ligue 1, Dutch Eredivisie, and Liga Portugal – from the 1994/1995 season to the 2023/2024 season. By analyzing longitudinal data over three decades, the research seeks to identify patterns and variations in goal scoring that could inform regulatory and strategic decisions and contribute to scholarly discussions on soccer's evolving dynamics.

Material and Methods

Sample and Data Collection

The sample consisted of 193,442 goals scored in 71,499 matches played in seven European domestic leagues: the Premier League, La Liga, Serie A, Bundesliga, Ligue 1, Eredivisie, and Liga Portugal. The data spans 30 consecutive seasons, from 1994/1995 to 2023/2024, and was sourced from a publicly available website ZeroZero (https://zerozero.pt). Table 1 displays the number of matches and goals scored per league and in total over the last three decades.

Table 1. Matches and goals scored in the seven European leagues and in total, from 1994/1995 to 2023/2024

Leagues	Matches	Goals
Premier League	11,482	30,901
La Liga	11,564	30,802
Serie A	10,660	28,470
Bundesliga	9,180	26,891
Ligue 1	10,855	26,635
Eredivisie	9,106	27,947
Liga Portugal	8,652	21,796
All Leagues	71,499	193,442

Note: excluded from the analysis were goals scored in final play-offs to determine teams' relegation or qualification to European competitions

The ZeroZero website was selected due to its availability, accessibility, and reliability. Its database, based on match results homologated by official governing bodies, ensures accuracy in reflecting official records. Additionally, it offers easy access to historical data, making it ideal for the 30-year period under investigation. Although Soccerway (https://soccerway.com) was also considered, ZeroZero was chosen for better accessibility. To guarantee data reliability, match and goal counts were cross-checked with Soccerway, and no inconsistencies were found.

Written permissions were obtained from both websites' administrators, and their privacy policies were fully respected during data collection. Methodological procedures adhered to the ethics guidelines of the local university and were conducted in compliance with the principles of the Declaration of Helsinki.

Variables and Data Preparation

The dependent variable in this study was the number of goals scored per match, while independent variables were the seasons (coded from 1 to 30) and the leagues (coded as follows: 1 – Premier League, 2 – La Liga, 3 – Serie A, 4 – Bundesliga, 5 – Ligue 1, 6 – Eredivisie, 7 – Liga Portugal, and 8 – all leagues).

The data was organized and the mean goals per match for each league and overall were calculated using Microsoft 365 Excel (Microsoft Corporation, USA). The final dataset was then exported to SPSS 27.0 (IBM SPSS Statistics, IBM Corp., Armonk) for statistical analysis.

Statistical Analysis

The data for each European league was collected, and the pooled average for all leagues was calculated. The Shapiro–Wilk test was performed to assess normality of each league's data. Only the Premier League and Serie A showed significant deviations from the normality ($p = 0.003$ and $p = 0.001$, respectively). Given that $n = 30$, subsequent statistical procedures are robust to normality violations due to the moderate sample size [7]. Firstly, the Spearman correlation (r_s) was used to analyze temporal trends for each league separately. This method assesses the relationship between seasons (as a categorical variable) and the number of goals scored per match within each league and across all leagues. Before applying the one-way ANOVA, the assumption of homogeneity of variances was tested using the Levene's test. The results indicated that the variances were homogeneous across the seven leagues [$F(6, 203) = 1.19$, $p = 0.313$ for a mean-based test]. This suggests that the assumption of homogeneity of variances was met, justifying the use of ANOVA for comparing means.

Secondly, a one-way ANOVA was applied to compare the mean goals per match among the seven European leagues, with time fluctuations excluded. Tukey's honestly significant difference (HSD) post hoc tests were conducted to identify which leagues significantly

differ from each other. Finally, one-sample t-tests were performed to examine whether each European league's mean of goals per match significantly differed from the pooled average of all seven leagues.

Cohen's d was calculated for each one-way ANOVA post hoc pairwise comparison among leagues to measure the effect size of differences. The formula used is as follows:

$$\text{Cohen's d} = \frac{\text{MD}}{\text{SD}_{\text{pooled}}} \quad (1)$$

where MD is a mean difference between two leagues being compared and SD_{pooled} is a pooled standard deviation of two groups, calculated as:

$$\text{SD}_{\text{pooled}} = \sqrt{\frac{(n_1-1)\ SD_1^2 + (n_2-1)\ SD_2^2}{n_1+n_2-2}} \quad (2)$$

where n_1 and n_2 are sample sizes, and SD_1 and SD_2 are standard deviations of two leagues being compared.

For the one-sample t-test, the effect size was calculated using the following formula:

$$\text{Cohen's d} = \frac{(M-\mu)}{SD} \quad (3)$$

where M is league mean, μ is the pooled average for all leagues (2.71), and SD is a league standard deviation.

According to Cohen [5], strength of Spearman correlations is classified as very weak: $0.0 \leq |r_s| < 0.2$, weak: $0.2 \leq |r_s| < 0.4$, moderate: $0.4 \leq |r_s| < 0.6$, strong: $0.6 \leq |r_s| < 0.8$, and very strong: $0.8 \leq |r_s| \leq 1.0$. Additionally, Cohen's d is interpreted as follows: $0.2 \leq |d| < 0.5$, small effect size; $0.5 \leq |d| < 0.8$, medium effect size; $|d| \geq 0.8$, large effect size [5]. The level of significance was set at $p \leq 0.05$.

Results

Table 2 shows the mean goals scored per match in the seven major European leagues, as well as the pooled averages across all leagues over the 30 sampled seasons. The data reveals several important trends and variations in goals scored per match across leagues. Of note, the highest averages of goals per match for each league –

Table 2. Mean goals scored per match in the seven major European soccer leagues over the 30 sampled seasons

Season	Leagues							
	Premier League	La Liga	Serie A	Bundesliga	Ligue 1	Eredivisie	Liga Portugal	All Leagues
1994/1995	2.59	2.54	2.53	3.00	2.50	3.21	2.39	2.68
1995/1996	2.60	2.70	2.63	2.72	2.28	3.01	2.60	2.65
1996/1997	2.55	2.75	2.64	2.98	2.33	2.82 (-)	2.48	2.65
1997/1998	2.68	2.66	2.77	2.89	2.36	3.27	2.52	2.74
1998/1999	2.52	2.64	2.76	2.83	2.36	3.15	2.65	2.70
1999/2000	2.79	2.63	2.50 (-)	2.89	2.57	3.25	2.42	2.72
2000/2001	2.61	2.88	2.76	2.93	2.51	3.01	2.64	2.76
2001/2002	2.63	2.53	2.63	2.92	2.34	2.84	2.67	2.65
2002/2003	2.63	2.67	2.58	2.68 (-)	2.20	2.95	2.63	2.62
2003/2004	2.66	2.67	2.67	2.97	2.33	2.98	2.38	2.67
2004/2005	2.57	2.58	2.53	2.91	2.17	3.10	2.32	2.60
2005/2006	2.48	2.46 (-)	2.61	2.81	2.13 (-)	2.98	2.23 (-)	2.53 (-)
2006/2007	2.45 (-)	2.48	2.55	2.74	2.25	2.99	2.31	2.54
2007/2008	2.64	2.69	2.55	2.81	2.28	3.12	2.30	2.63
2008/2009	2.48	2.90	2.60	2.92	2.26	2.84	2.30	2.61
2009/2010	2.77	2.71	2.61	2.83	2.41	2.92	2.50	2.68

2010/2011	2.80	2.74	2.51	2.92	2.34	3.23	2.43	2.71
2011/2012	2.81	2.76	2.56	2.86	2.52	3.26	2.64	2.77
2012/2013	2.80	2.87	2.64	2.93	2.54	3.15	2.78	2.82
2013/2014	2.77	2.75	2.72	3.16	2.45	3.20	2.37	2.77
2014/2015	2.57	2.66	2.69	2.75	2.49	3.08	2.49	2.68
2015/2016	2.70	2.74	2.58	2.83	2.53	2.98	2.72	2.73
2016/2017	2.80	2.94 (+)	2.96	2.87	2.62	2.89	2.38	2.78
2017/2018	2.68	2.69	2.68	2.79	2.72	3.14	2.70	2.77
2018/2019	2.82	2.59	2.68	3.18	2.56	3.47 (+)	2.70	2.86
2019/2020	2.72	2.48	3.04	3.21	2.52	3.08	2.49	2.79
2020/2021	2.69	2.51	3.06 (+)	3.03	2.76	3.01	2.42	2.78
2021/2022	2.82	2.50	2.87	3.12	2.81 (+)	2.86	2.64	2.80
2022/2023	2.85	2.51	2.57	3.17	2.81 (+)	3.06	2.49	2.78
2023/2024	3.27 (+)	2.64	2.61	3.22 (+)	2.70	3.24	2.87 (+)	2.94 (+)

Note: (+) the highest mean value for the league or all leagues, (-) the lowest mean value for the league or all leagues

and consequently for the pooled average of all leagues – were found over the last eight seasons (2016/2017-2023/2024). Specifically, the Premier League (3.27), Bundesliga (3.22), and Liga Portugal (2.87) registered the highest mean goals scored per match of the last three decades in the 2023/2024 season. The pooled average for all leagues also peaked at 2.94 goals per match in the last sampled season. The other European leagues recorded their highest mean values in different seasons: La Liga in 2016/2017 (2.94), Eredivisie in 2018/2019 (3.47), Serie A in 2020/2021 (3.06), and Ligue 1 in both 2021/2022 and 2022/2023 (2.81).

Conversely, the lowest mean values for goals per match occurred over an eight-season period, spanning from 1999/2000-2006/2007. Eredivisie recorded its lowest average of goals per match (2.82) in the 1996/1997 season, followed by Serie A (2.50) in 1999/2000, and Bundesliga (2.68) in 2002/2003. La Liga, Ligue 1, Liga Portugal, and all leagues dropped to 2.46, 2.13, 2.23, and 2.53, respectively, in the 2005/2006 season. The following season, the Premier League reached its lowest scoring mean per match (2.45).

Figure 1 provides a visual representation of the evolution of goals per match in the analyzed leagues.

The Spearman correlations highlight varying trends in goals scored over the sampled seasons. The Premier League showed a strong positive correlation ($r_s = 0.653$, $p < 0.001$), indicating a significant upward trend in goals scored per match across time. Similarly, Ligue 1 exhibited a strong positive correlation ($r_s = 0.655$, $p < 0.001$), while Bundesliga had a moderate positive correlation ($r_s = 0.387$, $p = 0.034$). The pooled average for all leagues also demonstrated a strong positive correlation ($r_s = 0.668$, $p < 0.001$).

The other leagues did not show statistically significant correlations between goals per match and time. La Liga had a weak negative correlation ($r_s = -0.117$, $p = 0.537$) and Eredivisie displayed a very weak positive correlation ($r_s = 0.061$, $p = 0.748$). Both Serie A and Liga Portugal presented weak positive correlations ($r_s = 0.273$, $p = 0.144$ and $r_s = 0.224$, $p = 0.233$, respectively).

The one-way ANOVA revealed significant mean differences in goals per match among European leagues (Figure 2).

The Premier League, La Liga, and Serie A showed trivial to small, non-significant differences: Premier League vs La Liga ($p = 0.991$, $d = 0.202$), Premier League vs Serie A ($p = 0.998$, $d = 0.144$), and La Liga vs Serie A ($p = 1.000$, $d = -0.052$). These leagues had significantly different mean goals per match compared to the others, with large effect sizes: Premier League vs Bundesliga ($p < 0.001$, $d = -1.536$), Premier League vs Ligue 1 ($p < 0.001$, $d = 1.360$), Premier League vs Eredivisie ($p < 0.001$, $d = -2.400$), Premier League vs Liga Portugal ($p < 0.001$, $d = 1.096$), La Liga vs Bundesliga ($p < 0.001$, $d = -1.810$), La Liga vs Ligue 1 ($p < 0.001$, $d = 1.340$), La Liga vs Eredivisie ($p < 0.001$, $d = -2.600$), La Liga vs Liga Portugal ($p = 0.007$, $d = 1.050$), Serie A

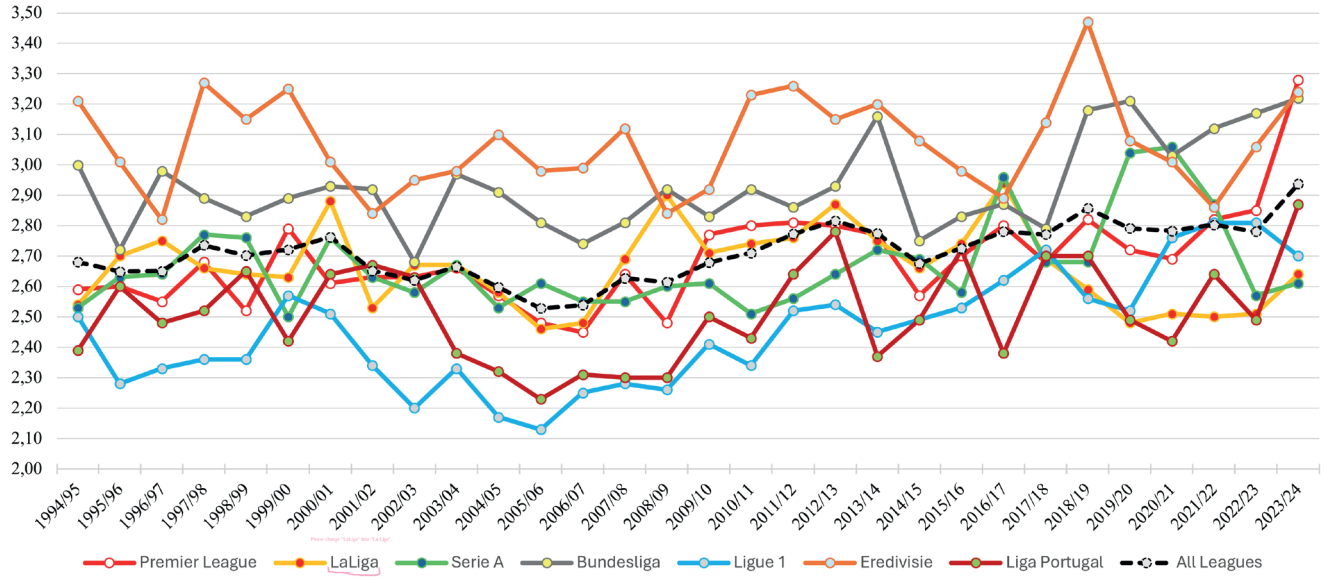

Figure 1. Evolution of goals scored per match across seven major European football leagues (1994/1995-2023/2024)

The chart presents yearly averages of goals per match for the Premier League, La Liga, Serie A, Bundesliga, Ligue 1, Eredivisie, and Liga Portugal, along with a combined average (all leagues). Each color identifies a specific league, and the data highlight variations in scoring patterns and differences in goal averages across competitions.

vs Bundesliga ($p < 0.001$, d = -1.680), Serie A vs Ligue 1 ($p < 0.001$, d = 1.390), Serie A vs Eredivisie ($p < 0.001$, d = -2.520), and Serie A vs Liga Portugal ($p = 0.003$, d = 1.080).

Bundesliga and Eredivisie had significantly higher averages of goals per match than the other European leagues, with large effect sizes: Bundesliga vs Ligue 1 ($p < 0.001$, d = 2.680), Bundesliga vs Liga Portugal ($p < 0.001$, d = 2.670), Eredivisie vs Ligue 1 ($p < 0.001$, d = 3.340), and Eredivisie vs Liga Portugal ($p < 0.001$, d = 3.440). However, there was a large difference between Eredivisie and Bundesliga, with the former displaying a higher average of goals per match ($p = 0.011$, d = 0.910). No significant difference was detected among the European leagues with the lowest goals per match, i.e., Ligue 1 and Liga Portugal ($p = 0.751$, d = -0.346, small effect size).

Finally, one-sample t-tests revealed that the average of goals per match for Bundesliga (t = 7.973, $p < 0.001$, d = 1.456) and Eredivisie (t = 12.643, $p < 0.001$, d = 2.308) over the last 30 years significantly exceeded the pooled average across all leagues (2.71), with large effect sizes. Contrariwise, Ligue 1 (t = -7.428, $p < 0.001$, d = -1.356) and Liga Portugal (t = -6.536, $p < 0.001$, d = -1.194) displayed significantly lower averages, also denoting large effect sizes. Meanwhile, the Premier League (t = -0.634, p = 0.531, d = -0.115), La Liga (t = -2.663, p = 0.055, d = -0.366), and Serie A (t = -1.506, p = 0.143, d = -0.275) did not differ significantly from the pooled average, reflecting trivial to small effect sizes.

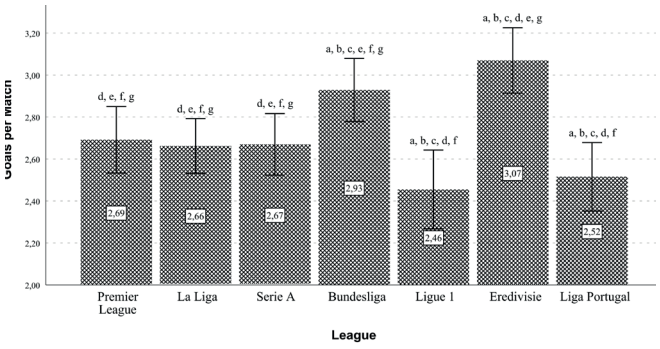

Figure 2. Mean goals scored per match across seven major European leagues over 30 seasons (1994/1995-2023/2024)

Note: a) significantly different ($p < 0.05$) from Premier League, b) significantly different from LaLiga, c) significantly different from Serie A, d) significantly different from Bundesliga, e) significantly different from Ligue 1, f) significantly different from Eredivisie, g) significantly different from Liga Portugal

Discussion

Soccer-specific research has demonstrated that regulatory alterations, among other factors, shape the way the game is played and impact its most fundamental outcome – goals scored per match [12, 15, 18]. Despite

the availability of longitudinal data on the evolution of goal-scoring frequency in the FIFA Men's World Cup, evidence regarding this trend in the major European soccer leagues remains strikingly limited. Therefore, this study aimed to examine how goals per match have evolved across the seven major European domestic leagues – Premier League, La Liga, Serie A, Bundesliga, Ligue 1, Eredivisie, and Liga Portugal – over the last three decades (1994/1995 to 2023/2024).

At first glance, the descriptive statistics revealed a couple of compelling insights. Firstly, three of the seven European leagues recorded their highest average of goals per match in the most recent season (2023/2024), with all leagues posting their peak averages within the last eight seasons. Conversely, the lowest averages occurred over the eight-season span from 1999/2000 to 2006/2007, approximately two decades ago. In contrast to studies that have exposed a plateau in goals scored per match in FIFA Men's World Cups (~2.50) during this century [11, 15, 18], the current findings suggest otherwise.

In response to the first research question – Is the average number of goals scored in soccer consistent over recent decades? – the answer is negative. Significant positive correlations with time (seasons) were observed in the Premier League, Ligue 1, and the pooled average for all leagues, all displaying strong relationships. Bundesliga also showed a significant, moderate positive correlation. Non-significant results were found for Serie A and Liga Portugal, both exhibiting weak positive correlations, whilst Eredivisie presented a very weak positive correlation. The only negative correlation between goals per match and time was noted in La Liga, though this correlation was non-significant and weak. This finding corroborates a recent eight-season longitudinal analysis of La Liga, which proved that the average of goals per match remained stable from the 2011/2012 season to the 2018/2019 season, with the lowest average value recorded in the final sampled season [6].

Altogether, the evidence supports the notion that temporal factors distinctly affect sport-specific performance and outcomes across different contexts and cultures [1, 20]. Hence, attributing these temporal fluctuations solely to modifications in the Laws of the Game, such as the introduction of VAR, might be overly simplistic. For instance, a recent narrative review unveiled that the number of goals per match increased in one study on La Liga, decreased in another on the Turkish Super League, and remained unchanged in five studies covering several professional competitions [28]. However, a key takeaway from this study is that, in general, the average of goals per match has been rising in the major European domestic leagues. It appears that attacking performance is no longer being surpassed by defensive strategies, as previously reported in the literature [13, 15, 30]. Increased professionalism, globalization, and improved coaching not only enhanced the game's tempo and intensity, but also augmented team attacking efficiency in both open play and set plays [15, 17, 30], resulting in more scoring events. Given these findings, it poses a question of whether ongoing efforts to alter the offside rule will truly enhance soccer's global appeal as intended [4].

As per the second research question – Does the average number of goals per match significantly differ across major European leagues in recent decades? – the results of the one-way ANOVA were conclusive: yes. The Tukey's HSD post hoc tests revealed multiple differences across leagues, which are unsurprising to some degree, given the distinct performance characteristics and playing styles documented in European soccer [8, 16, 20, 22, 25]. Eredivisie recorded the highest average of goals per match (3.07), followed by Bundesliga (2.93), both of which showed significant and large differences compared to all other leagues. These averages exceed the ~2.5 goals per match generally considered the norm in modern soccer [15, 18], signaling that attacking strategies may dominate in top-tier divisions of the Netherlands and Germany. Distinctiveness in goal scoring could be attributed to Bundesliga's greater reliance on counterattacking play [16] and attacking efficiency in both open play and set pieces [2, 10], as well as its geographic proximity to the Netherlands [22]. However, further research is required to clarify these differences and to explore strategic, tactical, and technical mechanisms driving the higher goal averages observed.

The Premier League (2.69), La Liga (2.66), and Serie A (2.67) did not differ significantly from each other, unlike the significant discrepancies detected with the other leagues. However, similar averages of goals per match do not necessarily imply uniform playing styles, as performance variations have been witnessed among these leagues [16, 22, 25]. Interestingly, recent studies suggest a trend towards greater homogeneity in technical-tactical behaviors within major European leagues [8, 9], despite their distinct historical approaches to the game. Such growing convergence in play may also be influencing match outcomes. The non-significant difference was further seen between the lower averages in Ligue 1 (2.46) and Liga Portugal (2.52). This result

may reflect lower attacking proficiency among French and Portuguese teams, arguably due to defensive strategies prevailing over attacking efforts or a relative lack of offensive individual quality compared to the other leagues.

Over the past three decades, a total of 71,499 matches have been played across the seven major European leagues, yielding the average of 2.71 goals per match. While this figure reflects contemporary trends in European leagues [6, 31], it surpasses the average of 2.59 goals per match recorded in FIFA Men's World Cups between 1966 and 2018 [15]. However, national tournaments are structurally and competitively distinct from domestic leagues, and preparation at both team and individual levels deeply varies between these competitions, making further comparisons speculative. Notably, the top three rated European leagues did not deviate from the pooled average of all seven leagues – in contrast to Bundesliga (4th), Ligue 1 (5th), Eredivisie (6th), and Liga Portugal (7th) [29]. Regarding the third research question – Which leagues deviate from the overall average? – significant and large-sized effects were found in Bundesliga and Eredivisie, both exceeding the pooled average, whereas Ligue 1 and Liga Portugal fell below the European average of goals per match. Future research could build on these findings by exploring mechanisms driving such deviations from the norm at both league- (e.g., competitive balance, home advantage) and match-level (e.g., key performance indicators).

This study has several limitations that should be acknowledged. First, the use of correlation, ANOVA, and t-test analyses identifies associations between time (seasons) and averages of goals per match across the leagues or differences among them; nevertheless, it does not infer causality. Although significant relationships and differences were observed, the factors driving temporal fluctuations in goal scoring remain speculative. Second, this research relied merely on aggregate data from domestic leagues, possibly overlooking match- and player-level variables that could influence the results (e.g., individual performances, injuries, strategic-tactical variations in specific matches). Third, the analysis did not take into account potential external factors, such as economic disparities among leagues, changes in a league structure, or evolving team investment strategies. Moreover, the impact of emerging technologies like VAR or mid-season rule adjustments was not examined in depth, limiting insights into how these factors directly shape offensive or defensive dynamics over time. Future research could address these limitations by incorporating more granular data and employing more advanced statistical models to uncover causal mechanisms.

Conclusions

This study provides a comprehensive analysis of goal-scoring trends across the seven major European domestic leagues over the past three decades, unveiling the general increase in the averages of goals per match, particularly in the Premier League, Ligue 1, and Bundesliga. Significant differences were found among leagues, with Eredivisie and Bundesliga recording the higher averages, whilst Ligue 1 and Liga Portugal showed the lower ones. The Premier League, La Liga, and Serie A registered similar averages, close to the overall league average. Prevailing attacking strategies, supported by professionalism, tactical evolution, and improved coaching, appear to be driving the rise in goal-scoring rates, challenging the plateau observed in FIFA Men's World Cups.

As the governing bodies consider further modifications to the offside rule, the current upward trend in goals must be taken into consideration to ensure that offensive stimulation does not upset balance between attack and defense. The goal-scoring inequalities across leagues highlight regional influences, requiring a continued analysis to promote competitive fairness. Policymakers and coaches should also consider how temporal changes, such as evolving team structures and economic shifts, affect league dynamics. These insights can guide decisions on player development, strategic-tactical planning, and potential rule changes to maintain competitive integrity across the Europe's top leagues.

Conflict of Interest

The author declares no conflict of interest.

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