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Evolving running load demands and fixture congestion in the English Premier League: a decade of insights from 2015/2016 to 2024/2025

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ABSTRACT

Objectives To describe the running load demands and fixture congestion of English Premier League (EPL) teams from seasons 2015/2016 to 2024/2025.

Methods A total of 3750 games across ten seasons were analysed for team total distance (TD), high-intensity distance (HID; >5.5 m/s), high-speed running distance (HSR; 5.5–7 m/s) and sprint distance (SprD; >7 m/s). Matches were tracked using semi-automated systems; TRACAB (2015/2016–2018/2019) and Second Spectrum (2S; 2019/2020–2024/2025). Match minutes (Wyscout) were used to calculate total and congested minutes per season.

Results Significant small to large increases (all p<*0.001*) were observed in team TD (*effect size (ES): 0.56*), HID (*ES: 1.79*), HSR (*ES: 1.67*) and SprD (*ES: 1.61*), along with moderate increases in per-minute metrics for HID/min (*ES: 1.55*), HSR/min (*ES: 1.41*) and SprD/min (*ES: 1.46*) between 2015/2016 and 2024/2025. TD/min (*ES: –0.27*) showed a small decrease. Trivial to moderate differences were found in season-to-season comparisons for TD (p<0.05; ES: –0.65 to *0.81*), HID (p<0.05; ES: 0.16 to *0.47*), HSR (p<0.05; ES: –0.17 to *0.55*) and SprD (p<0.05; ES: 0.19 to *0.26*). Rolling 3-season total (+1600 min) and congested (+1415) match minutes increased for all players between 2015/2016 and 2024/2025. A higher increase was seen for the top six team players' total (+5659) and congested (+2003) minutes.

Conclusion Running load demands (TD, HID, HSR, SprD, HID/min, HSR/min and SprD/min), total match minutes and congested minutes have increased over the last decade. The top six teams are exposed to more total and congested minutes than other teams. Continuous monitoring of player responses to these increased demands is essential to better understand the potential impact on player health, especially those with more exposure.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Running load demands in English Premier League (EPL) football increased between 2006 and 2018.
⇒ The global football calendar is expanding with football governing bodies, UEFA (Union of European Football Associations) and FIFA (Fédération Internationale de Football Association), extending competitions, which will likely increase fixture congestion.

WHAT THIS STUDY ADDS

⇒ This study provides updates on EPL team running load demands from season 2015/2016 to 2024/2025 and offers a better understanding of player utilisation, especially in the context of fixture congestion.
⇒ Total distance, high-intensity distance, high-speed running distance and sprint distance, as well as total match minutes and congested minutes, have all increased over the last decade.
⇒ These findings highlight the need to examine how these increased demands may inform future considerations for player health.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ This study provides valuable insights for player health management, guiding players, coaching staff and support teams.
⇒ We offer evidence to inform football policy makers in shaping guidelines and strategies for managing player running load and fixture congestion.

INTRODUCTION

Running load demands in the English Premier League (EPL) have significantly increased over time,[1 2] with regular updates recommended to monitor these changes.[2] High-intensity distance (HID; speed >5.5 m/s) rose by 30% between 2006 and 2013,[1] followed by a 12% increase from 2014 to 2018.[2] Similarly, sprint distance (SprD; speed >7 m/s) increased by 35% from 2006 to 2013[1] and by 15% between 2014 and 2018.[2] These trends are expected to continue.[3 4]

While the total number of EPL games has remained constant, the global football calendar is expanding, with UEFA and FIFA extending competitions.[5 6] This will likely impact players from successful teams involved in European and international matches, not only in the EPL but around the world,[7–9] increasing fixture congestion.

During this period, players have raised concerns about increased physical and mental fatigue,[10] criticising the intense scheduling.[11] The players' union (Professional Footballers' Association; PFA) is advocating for mandatory breaks to protect player well-being, as highlighted by PFA Chief Executive Officer Maheta Molango's statement:

> **Players are now part of an endless schedule of games and competitions for club and country, with their limits constantly being pushed**
> **Professional Footballers' Association CEO Maheta Molango.[11]**

Check for updates

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Given these developments, it is crucial to examine the current running load and fixture congestion demands on players and their potential implications on health and well-being.

This study aims to assess the current running load demands and fixture congestion trends over the past 10 seasons, providing insights to guide player health considerations. Specifically, the study seeks to (i) update EPL team running load from the 2015/2016–2024/2025 seasons and (ii) explore trends in total and congested match minutes for players.

METHODS

Data collection

Team running load variables (total distance (TD; m), HID (m; >5.5 m/s), high-speed running (HSR; m >5.5–7 m/s) and SprD (m >7 m/s), totals and per-minute values (/min) were analysed across 10 consecutive EPL seasons (2015/2016–2024/2025). Team running load included goalkeepers in the analysis, following previous team running load trends[2] and due to the goalkeepers increased involvement with in-game team dynamics.[12] Data were collected using optical tracking systems: TRACAB Gen-4 semi-automated HD cameras (sampling at 25 Hz; TRACAB, Chyronhego, New York, USA) from 2015/2016 to 2018/2019, followed by Second Spectrum (2S; sampling at 25 Hz; Los Angeles, USA) from 2019/2020 to 2024/2025. The dwell time, or minimum effort duration, was set at 0.5 s for HSR and 1 s for SprD efforts in both systems.

To address differences in HSR and SprD between the two systems, raw data were processed using Python (www.python.org) and *R* software (www.r-project.org) to ensure interchangeability. Ethical approval for the use of anonymised match data was granted by the EPL and host university in accordance with the Helsinki Declaration.

Inclusion criteria

Running load trends

The dataset included 34 teams, 1912 players (all male) and 3750 games across the period analysed. Due to technical issues, 50 games lacked tracking data and were excluded. Additionally, 342 games were removed from analysis where the match finished with fewer than 22 players on the pitch (due to red cards or injuries). This is because a sending-off can have an effect on team running load outputs.[13] After applying the exclusion criteria, 3408 games were included in the final analysis for running load trends.

Equity, diversity and inclusion statement

This study was conducted with a commitment to equity, diversity and inclusion. The research design and analysis did not involve or discriminate on the basis of race, ethnicity, gender, age, disability, sexual orientation or socioeconomic status. While the dataset reflects the performances of male professional EPL teams, all data used were anonymised and publicly sourced through licensed tracking systems, ensuring respect for individual privacy and identity. As this study was done in a male population, a similar study in female professional football would be appropriate, to better understanding the evolution in the female game.

Fixture congestion

Wyscout (www.wyscout.com) data were used to provide player minutes for all participants (five games and 270 min) across the EPL 2015/2016–2024/2025 seasons, calculating all minutes played by players that were representing an EPL club during this time period. Minutes were compiled on a season-by-season basis, with each season concluding after the final major tournament of that period (eg, FIFA World Cup, table 1).

Table 1 Season, date of the final game included in that season's analysis and the competition from which the final game was sourced

Season	Date season ended	Final game of that season
2015/2016	10 July 2016	UEFA European Championship
2016/2017	20 July 2017	CONCACAF Gold Cup
2017/2018	15 July 2018	FIFA World Cup
2018/2019	19 July 2019	CAF Africa Cup of Nations
2019/2020	16 August 2020	UEFA Europa League
2020/2021	11 July 2021	UEFA European Championship
2021/2022	14 June 2022	UEFA Nations League
2022/2023	13 July 2023	CONCACAF Gold Cup
2023/2024	15 July 2024	CONMEBOL Copa America
2024/2025	13 July 2025	FIFA Club World Cup

CAF, Confederation of African Football; CONCACAF, Confederation of North, Central American and Caribbean Association Football; CONMEBOL, Confederación Sudamericana de Fútbol; FIFA, Federation Internationale de Football Association; UEFA, Union of European Football Associations.

Minutes were categorised based on the competition they were derived from: EPL, club (cup competition, not EPL) and international. Minutes were calculated by summing the total minutes of players that met the inclusion criteria (>5 games, >270 mins), for each team (teams 1–20 of that season), with the average total of all teams provided (total team mins/20). These minutes were used to calculate both the total minutes played (sum of all minutes) and the total minutes played under high fixture congestion for all players and the 11 players with the highest total minutes per team (T11). T11 players were analysed to see if a team's most frequently used players were more exposed to match congestion. Congestion was defined when a player participated in three games within an 8-day period, with the third game being the first classified as a congested match. Any subsequent games played within three days after this congested match were also included in the congested minutes (eg, if a player's next game occurred 3 days after, and the previous two games were within an 8-day span, it would also be included as a congested match).

A subset of teams, which tend to play more fixtures due to frequent involvement in UEFA Club competitions and typically feature top-tier players in the EPL,[5] was also analysed for both total and congested minutes. To define this subset, the six teams (T6) with the highest cumulative points from the 2015/2016–2024/2025 seasons were selected: Manchester City, Liverpool, Manchester United, Arsenal, Chelsea and Tottenham Hotspur.

It must be noted that minutes were capped to reduce errors in the data (96 min=full game; 128 min=games including extra time), meaning some minutes may not be fully accounted for in the match congestion analysis.

Statistical analysis

Optical tracking system interchangeability analysis

Across the 2019/2020 season, both TRACAB and 2S systems (25 Hz sampling frequency) concurrently tracked EPL fixtures, allowing for a comparison of positional tracking variables between the two systems. To assess agreement, a Bland–Altman plot[14] and a linear mixed model regression (with venue ID as a random factor) were used for analysis (figure 1). The correlation coefficient (*r*) from repeated measures correlations was interpreted using the following qualitative descriptors: trivial (<0.01), small (0.01–0.09), moderate (0.09–0.25), large (0.25–0.49), very large (0.49–0.81), near perfect

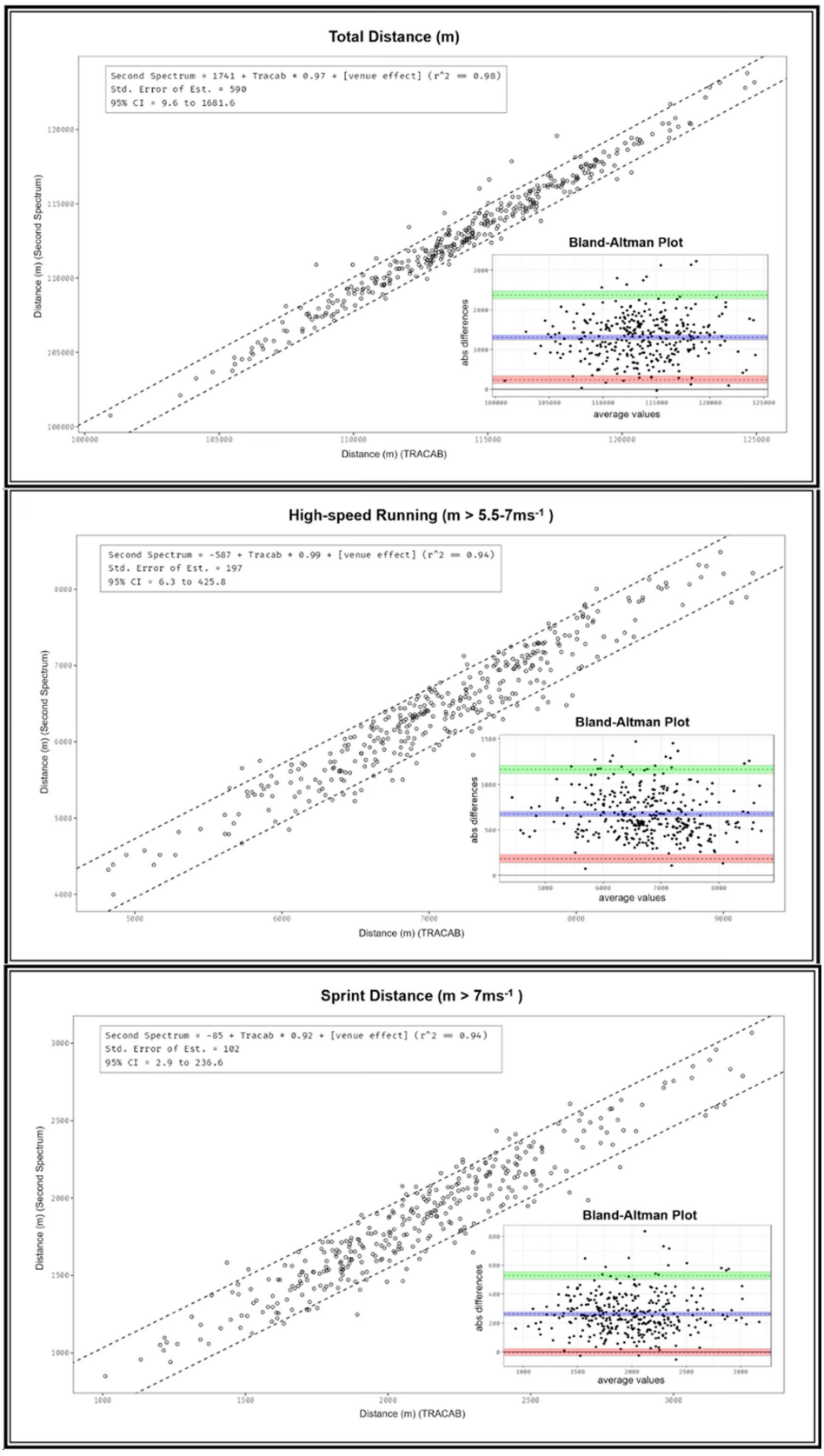


Figure 1 Bland-Altman plot showing correlation and agreement between total distance (m), high-speed running distance (m; 5.5–7 m/s) and sprint distance (m; >7 m/s), produced by TRACAB and Second Spectrum optical tracking systems. Abs, absolute; Est, estimate.

(0.81–0.98) and perfect (>0.98).[15] Confidence in the observed values was assessed using the SE of estimate and 95% CIs (95%) derived from the square root of the error in the regression equation.

To determine proportional bias, the percentage difference between the systems was regressed against their average using linear mixed model regression.[14]

To identify any differences between the two devices, a two-tailed paired sample t-test was conducted, with statistical significance set at $p<0.05$. A normality of differences was also ran (see appendix). The magnitude of differences was interpreted using Cohen's *d* effect size (ES), categorised as trivial (<0.20), small (0.2–0.6), moderate (0.6–1.2), large (1.2–2.0), very large (2.0–4.0) and huge (>4.0).[14]

Given that 2S is the current optical provider for the EPL and has been validated by FIFA under the Quality Programme for Electronic Performance and Tracking Systems (EPTS),[16] running load variables from TRACAB (TD, HID, HSR and SprD) were adjusted to align with 2S using the calibration equations shown (figure 1) to enable longitudinal analysis of running load trends from 2015/2016 to 2024/2025. It is noted that the FIFA EPTS Quality Programme provides independent validation reports certifying system accuracy under controlled conditions, though results are context-specific and not always directly comparable across systems.

Running load trends

Data were collected from the EPL portal to examine season-to-season trends in team running load outputs (2015/2016–2024/2025), expanding on previous studies.[2] The data were processed and analysed using *R* software (https://www.r-project.org/), with Rstatix and tidyverse used for data manipulation.

Statistical significance was set at $p<0.05$, with adjustments made for multiple pairwise comparisons. ESs were calculated using Cohen's *d* to assess the relationship between the seasons evaluated. A 95% CI[14] was used to show the differences in mean outputs between successive seasons (eg, 2015/2016 to 2016/2017, 2016/2017 to 2017/2018, etc) as well as for comparisons between the 2015/2016 and 2024/2025 seasons.

Match minutes and congestion

Data from Wyscout were collected to determine the match minutes played by all players present in the EPL per season (EPL club only, club cup competition and international). Player minutes were aggregated on a club basis, meaning that if a player transferred to a new EPL club during that season, their minutes were reset to zero for the new club, with the accumulation of minutes for their previous club ending on the day of the transfer. The analysis was conducted at a team rather than an individual player level to account for the transient nature of EPL squads over the seasons.[17]

Minutes were also observed in a three-season rolling average to account for increases in smaller blocks, accounting for the international tournaments that occur every other season.

RESULTS

Online supplemental table 1 provides an overview of running load distances between 2015/2016 and 2024/2025 in the EPL.

Online supplemental table 1: comparison of season-to-season 2015/2016 to 2024/2025 team totals and per-minute data for TD (m), HID (m; >5.5 m/s), HSR (m >5.5–7 m/s) and SprD (m >7 m/s). Colour codes are green for significant positive change and red for significant negative change.

Running load

Team total running load metrics, including TD, HID, HSR and SprD, for each season are presented in figure 2.

Team TD/min, HID/min, HSR/min and SprD/min for each season are reported in figure 3.

Season-to-season comparisons showed trivial to moderate changes in total and per-minute running load outputs for teams (online supplemental table 1). Comparison of 2015/2016 to 2024/2025 showed small to large increases in all team total variables, with moderate increases in team HID/min, HSR/min and SprD/min variables and a small decrease in TD/min (online supplemental table 1).

Match minutes and congestion

Figure 4 displays that total minutes played per season remained stable, with the 3-year rolling average increasing by 1600 min. Minutes have remained stable in the EPL, with fluctuations in other competitions. Since 2019/2020, minutes played by all players peaked in the 2023/2024 season (+6969 min), with season-to-season increases until the most recent season (2024/2025). The 11 players with the highest minutes per team (T11; ie, T11 players×20 teams) contribute to ~70% of match minutes over the season, with their match minutes peaking in 2023/2024 by 3659 min since 2019/2020. The percentage of T11 players' total mins remains relatively stable season-to-season.

For top 6 (T6) clubs, an increase in rolling 3-season average can be seen +5659 min (+9% increase, figure 5). EPL minutes remain steady throughout, with fluctuations seen in other competitions.

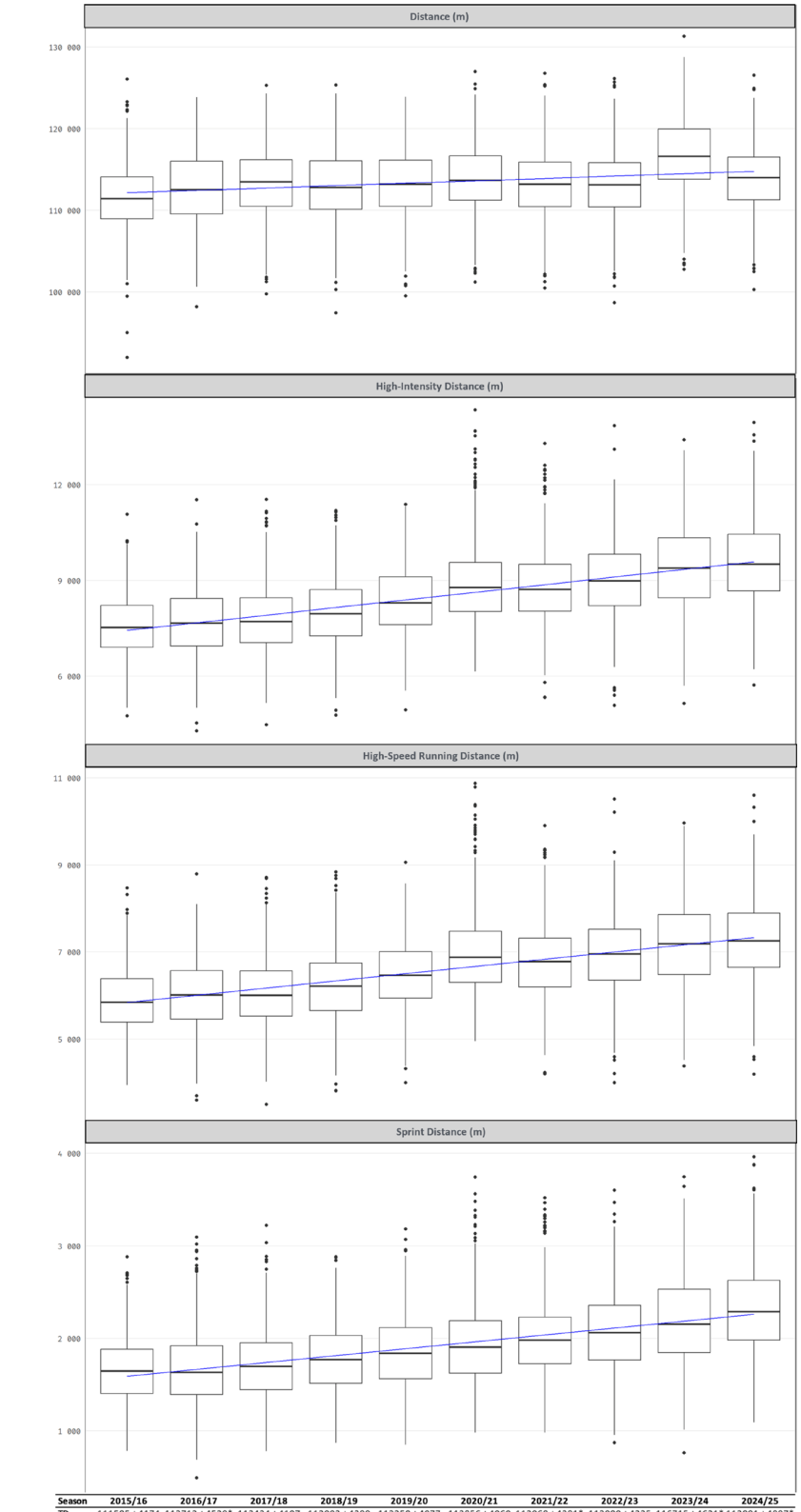
Congested minutes have increased in recent seasons (figure 5), with the highest congested percentage of minutes over the COVID seasons (2019/2020, 2020/2021), with a higher percentage for T6 teams. This was due to a requirement to complete the seasonal fixture list in a shorter span of time.[18] In comparison to the first three seasons' average, congested minutes have increased for all players (13%–26%). T6 teams saw a reduction in percentage of congested minutes in 2023/2024 (−6%) but had higher increases in the two seasons prior (+10% and +24%) and the season afterwards (+29%). Players in T6 teams have a higher percentage of their minutes congested.

DISCUSSION

This paper aimed to examine the current EPL running load trends (2015/2016–2024/2025) to help inform player health considerations. Results show a continual increase in team running load demands (TD, HID, HSR and SprD), with the largest increase in 2023/2024, likely due to an increase in match duration[19] (+5.0 minutes since 2015/2016; table 2). The modification to the added time rule in the 2024/2025 season[20] resulted in a reduction in match minutes. Running intensity (HID/min, HSR/min and SprD/min) also increased, while TD/min reduced. Total and congested match minutes have risen over the past five seasons, with bigger increases for T6 teams, suggesting players for these teams are being exposed the most. Research has shown some elite players are having as few as 22 rest days between seasons, averaging 4.3 days between games.[10]

Running load is still increasing in the EPL

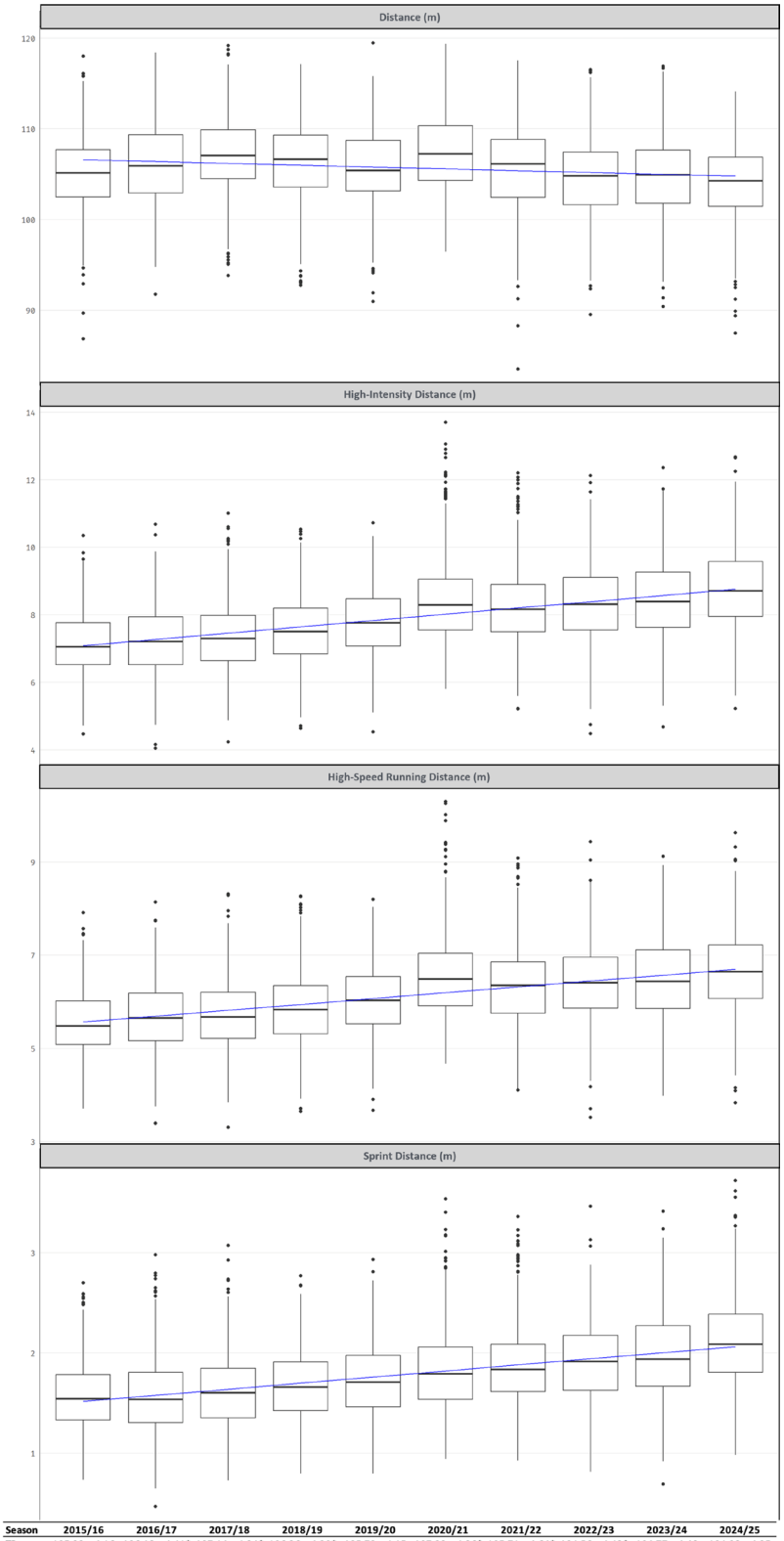
Small to large significant increases were evident in TD, HID, HSR and SprD when comparing 2015/2016 to 2024/2025. The majority of seasons saw an increase in at least one of the team total running load variables measured, while the 2021/2022 season was the only one that saw a significant reduction in more than one variable (figure 2). Trivial to moderate differences are displayed for team totals TD (two increases, two decreases), HID (six increases), HSR (five increases, one decrease) and SprD (five increases), following previous seasonal trends.[2] Both TD and HSR showed trivial to small decreases in 2021/2022, while a moderate decrease in TD happened



	Season	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25
Values	TD	111585 ± 4174	112713 ± 4520*	113424 ± 4197	113003 ± 4299	113258 ± 4077	113856 ± 4060	113068 ± 4281*	113080 ± 4335	116715 ± 4621*	113891 ± 4097*
	HID	7558 ± 963	7701 ± 1090	7787 ± 1061	8024 ± 1100*	8332 ± 1096*	8895 ± 1279*	8803 ± 1158	9026 ± 1214*	9399 ± 1388*	9611 ± 1300*
	HSR	5899 ± 720	6031 ± 782	6067 ± 779	6236 ± 833*	6471 ± 794*	6951 ± 956*	6798 ± 853*	6948 ± 877*	7197 ± 987*	7285 ± 931
	SprD	1659 ± 349	1669 ± 394	1720 ± 374	1788 ± 373	1861 ± 397*	1943 ± 423*	2005 ± 410	2078 ± 430*	2202 ± 506*	2326 ± 471*
% change from 2015/16	TD		1.0%	1.6%	1.3%	1.5%	2.0%	1.3%	1.3%	4.6%	2.1%
	HID		1.9%	3.0%	6.2%	10.2%	17.7%	16.5%	19.4%	24.4%	27.2%
	HSR		2.2%	2.8%	5.7%	9.7%	17.8%	15.2%	17.8%	22.0%	23.5%
	SprD		0.6%	3.7%	7.8%	12.2%	17.1%	20.9%	25.3%	32.7%	40.2%

*Significantly different to the season before ($p<0.05$)

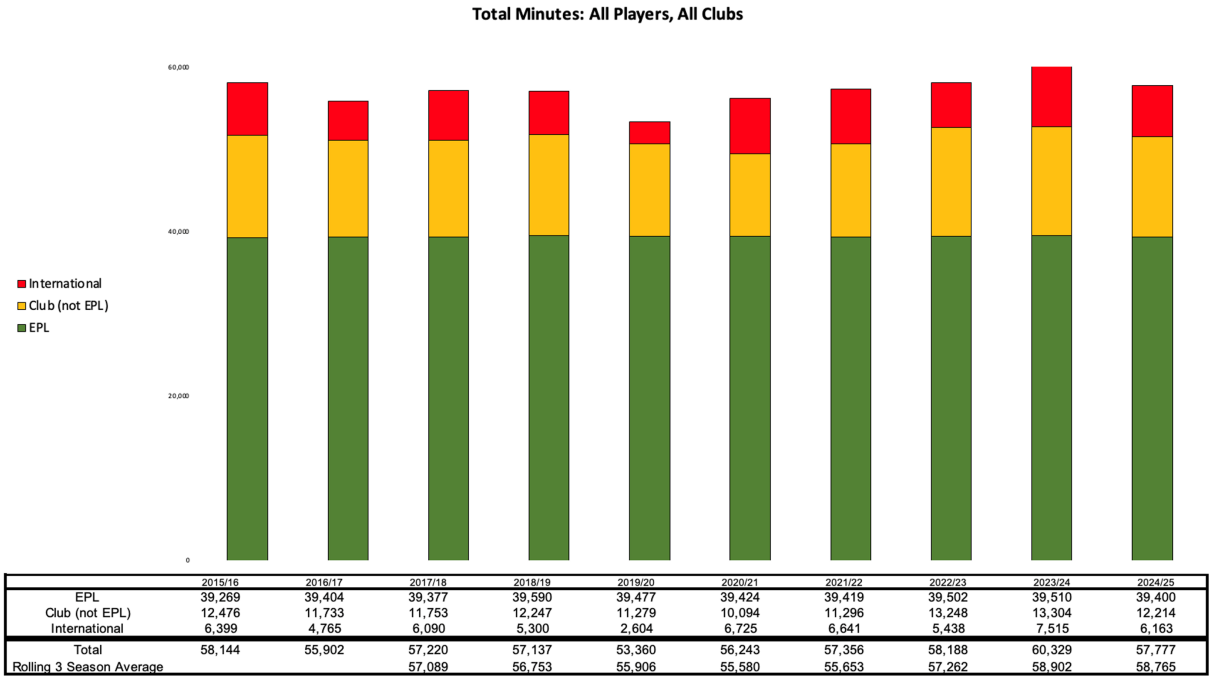
Figure 2 Box and whisker plots for team totals TD, HID, HSR and SprD with median values IQRs and outliers across 10 seasons in the EPL. The table has the mean values and SD for that season. The lower and upper hinges correspond to the first and third quartiles (the 25th and 75th percentiles). EPL, English Premier League; HID, high-intensity distance; HSR, high-speed running; SprD, sprinting distance; TD, total distance.



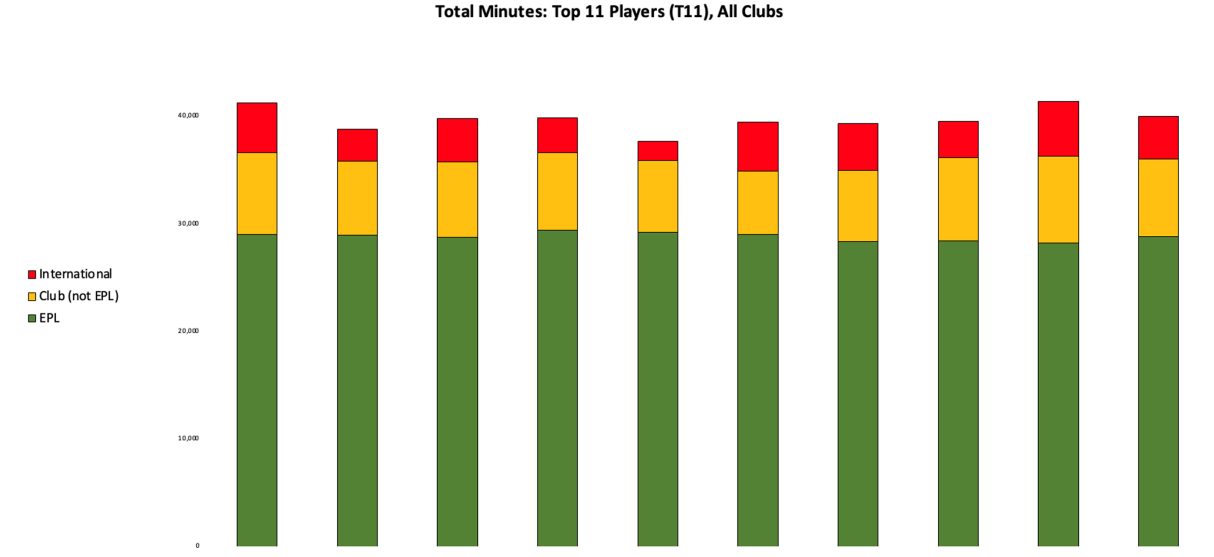
	Season	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25
Values	TD	105.22 ± 4.16	106.18 ± 4.41*	107.14 ± 4.24*	106.36 ± 4.30*	105.72 ± 4.15	107.33 ± 4.26*	105.71 ± 4.64*	104.56 ± 4.43*	104.77 ± 4.48	104.08 ± 4.25
	HID	7.13 ± 0.92	7.25 ± 1.03	7.35 ± 1.00	7.55 ± 1.04*	7.78 ± 1.02*	8.39 ± 1.22*	8.23 ± 1.11	8.35 ± 1.13	8.43 ± 1.23	8.78 ± 1.19*
	HSR	5.56 ± 0.69	5.68 ± 0.74	5.73 ± 0.74	5.87 ± 0.79*	6.04 ± 0.74*	6.55 ± 0.92*	6.36 ± 0.82*	6.42 ± 0.82	6.46 ± 0.88	6.66 ± 0.85*
	SprD	1.56 ± 0.33	1.57 ± 0.37	1.62 ± 0.35	1.68 ± 0.35	1.74 ± 0.37	1.83 ± 0.40*	1.87 ± 0.39	1.92 ± 0.40	1.98 ± 0.45	2.13 ± 0.43*
% change from 2015/16	TD		0.9%	1.8%	1.1%	0.5%	2.0%	0.5%	-0.6%	-0.4%	-1.1%
	HID		1.7%	3.1%	5.9%	9.1%	17.7%	15.4%	17.1%	18.2%	23.1%
	HSR		2.2%	3.1%	5.6%	8.6%	17.8%	14.4%	15.5%	16.2%	19.8%
	SprD		0.6%	3.8%	7.7%	11.5%	17.3%	19.9%	23.1%	26.9%	36.5%

*Significantly different to the season before (p<0.05)

Figure 3 Box and whisker plots for team per minutes of TD, HID, HSR and SprD with median values IQRs and outliers across 10 seasons in the EPL. The table has the mean values and SD for that season. The lower and upper hinges correspond to the first and third quartiles (the 25th and 75th percentiles). EPL, English Premier League; HID, high-intensity distance; HSR, high-speed running; SprD, sprinting distance; TD, total distance.



	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25
EPL	39,269	39,404	39,377	39,590	39,477	39,424	39,419	39,502	39,510	39,400
Club (not EPL)	12,476	11,733	11,753	12,247	11,279	10,094	11,296	13,248	13,304	12,214
International	6,399	4,765	6,090	5,300	2,604	6,725	6,641	5,438	7,515	6,163
Total	58,144	55,902	57,220	57,137	53,360	56,243	57,356	58,188	60,329	57,777
Rolling 3 Season Average			57,089	56,753	55,906	55,580	55,653	57,262	58,902	58,765



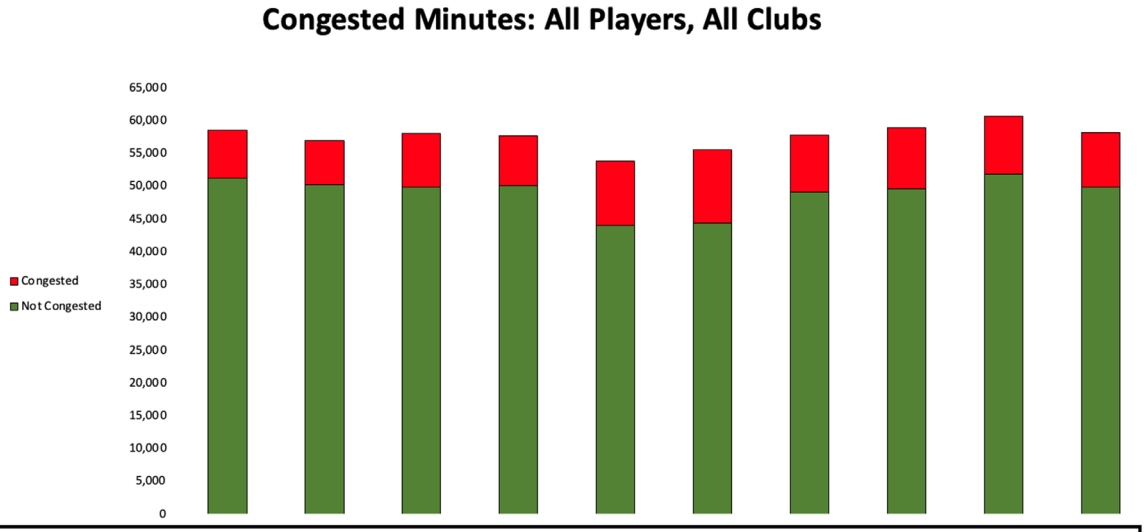
	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25
EPL	28,986	28,918	28,703	29,403	29,183	29,005	28,349	28,375	28,185	28,803
Club (not EPL)	7,605	6,893	7,046	7,177	6,709	5,882	6,618	7,738	8,111	7,223
International	4,630	2,948	4,048	3,276	1,783	4,548	4,354	3,403	5,038	3,919
Total	41,221	38,759	39,797	39,856	37,675	39,435	39,321	39,516	41,334	39,945
Rolling 3 Season Average			39,926	39,471	39,109	38,989	38,810	39,424	40,122	40,265
% of Total Mins Top 11	71%	69%	70%	70%	71%	70%	69%	68%	69%	69%

Figure 4 All players (minimum five appearances and >270 mins in EPL) and top 11 (T11; 11 highest minutes per team) minutes per season (sum of all minutes played per category / 20) in competitions. EPL, Club (non-EPL, cups) and International. EPL, English Premier League.

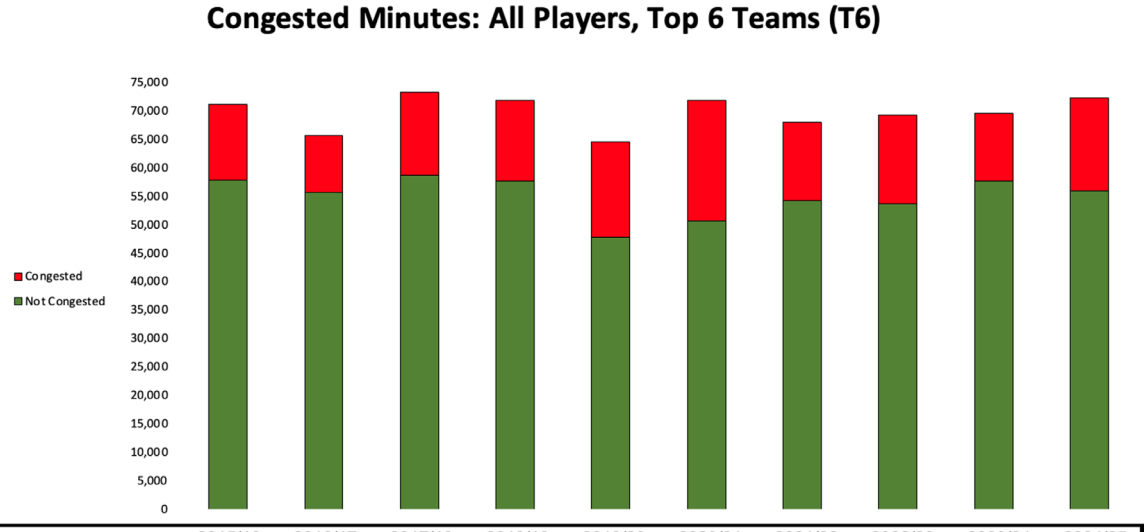
in 2024/2025, highlighting fluctuations season-to-season that occur, supporting previous findings.[2]

The largest increase in running load demands occurred in the 2023/2024 season, the only season in which all variables increased. These increases can be attributed to the more accurate calculation of added time (+2.9 min; table 2), as mandated by the International Football Association Board (IFAB) under Law 7, which governs match duration.[19] The reduction in time in 2024/2025 (−1.8 min; Table 2), due to modification of the added time rule,[20] also saw a reduction in TD (online supplemental table 1), suggesting match duration and TD are linked.

Interestingly, TD/min showed a reduction in the 2024/2025 season compared with 2015/2016, with three of the 10 seasons having a trivial to small decrease. However, during the same period, higher speed intensity rose (HID/min, HSR/min and SprD/min), indicating that the intensity of matches has increased (online supplemental table 1), with a higher percentage of TD running happening at a higher speed (>5.5 m/s). The increase in higher speed demands could be related to the tactical evolution of football, such as the prevalence of increasing transitional moments, counter-pressing in defensive transition and counter-attacking in attacking transition.[21]



	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25
Not Congested	51,232	50,124	49,762	50,032	43,929	44,285	49,058	49,555	51,831	49,814
Congested	7,229	6,803	8,211	7,619	9,852	11,193	8,664	9,341	8,800	8,346
Total	58,461	56,927	57,973	57,651	53,781	55,478	57,722	58,896	60,631	58,160
% Congested mins (total)	12%	12%	14%	13%	18%	20%	15%	16%	15%	14%
Rolling 3 Season Average Total			57,787	57,517	56,468	55,637	55,660	57,365	59,083	59,229
Rolling 3 Season Average Congested			7,414	7,544	8,560	9,554	9,903	9,732	8,935	8,829
% Change of Congested mins (1st 3 season avg)				3%	33%	51%	17%	26%	19%	13%



	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25
Not Congested	57,763	55,668	58,666	57,664	47,770	50,716	54,229	53,632	57,751	55,965
Congested	13,319	9,983	14,588	14,135	16,747	21,112	13,836	15,699	11,853	16,347
Total	71,082	65,651	73,254	71,799	64,517	71,828	68,065	69,332	69,604	72,312
% Congested mins (total)	19%	15%	20%	20%	26%	29%	20%	23%	17%	23%
Rolling 3 Season Average Total			69,996	70,235	69,857	69,381	68,136	69,741	69,000	70,416
Rolling 3 Season Average Congested			12,630	12,902	15,157	17,331	17,231	16,882	13,796	14,633
% Change of Congested mins (1st 3 season avg)				12%	33%	67%	10%	24%	-6%	29%

Figure 5 All players (minimum five appearances and >270 mins in EPL) and top six team players (T6; players from top six clubs) non-congested and congested (three games in 8 days) minutes per season in competitions. All players, all clubs— sum of all minutes/20. All players, top six teams— sum of all minutes/6. EPL, English Premier League

Table 2 Number of games available for analysis, games that finished with 11v11 players, mean game duration, number of players included in each season's analysis and the mean age of players per season

Season	Total games tracked	Games that finished 11v11	Mean game duration	Players included in analysis that season	Mean age of players
2015/16	372	330	96.3±1.7	542	27.4
2016/17	378	352	96.4±1.7	521	27.8
2017/18	380	353	96.2±1.9	514	27.3
2018/19	377	341	96.5±1.8	503	27.2
2019/20	370	332	97.4±1.9	513	27.0
2020/21	375	344	96.5±2.1	518	27.0
2021/22	376	341	97.3±2.7	536	27.2
2022/23	371	351	98.4±2.7	548	27.0
2023/24	372	330	101.3±3.0	559	26.7
2024/25	379	334	99.5±2.9	555	26.7

Consistent with previous findings,[1 2] small change was displayed in season-to-season TD until the added time change was implemented in 2023,[19] while more substantial increases were seen in higher speed running demands. This trend has been apparent since original observations[1] and has continued. Over 10 seasons, increases of 2% (TD), 27% (HID), 23% (HSR) and 40% (SprD) are displayed (figure 2), following previously reported trends.[2] The implementation of the IFAB changes relating to added time may have caused larger increases in team running loads, compared with previously observed smaller longitudinal changes.[2] This may result in changes in individual player pacing strategies, allowing self-regulation of effort for perceived most crucial/intense periods of a game,[22] especially as higher speed running variables increase (figure 3). This may be reflected in the reduction of TD per minute (TD/min), suggesting that players could be lowering their overall running intensity to conserve energy for more high-speed efforts. This may be a trend that is seen in the coming seasons with a high amount of direct attacks apparent in the EPL compared with other leagues.[23]

Match minutes have increased, more so for the top six teams

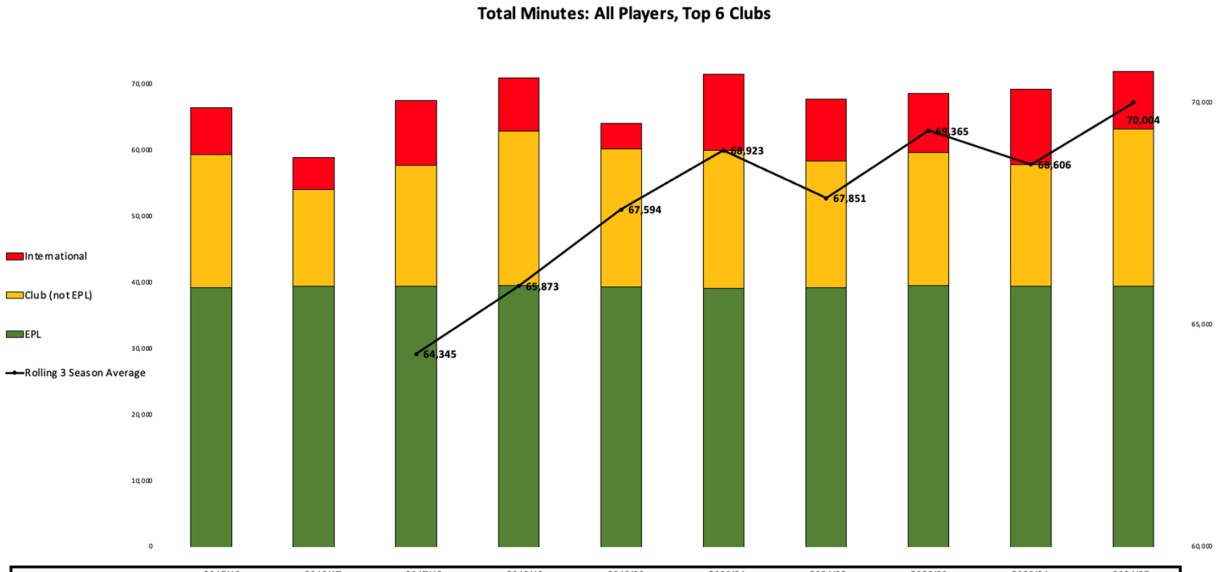
Between the 2015/2016 and 2024/2025 seasons, a fluctuation can be seen in total match minutes (2019/2020: 53360–2023/2024: 60329; figure 4). The rolling 3-season average shows an increase in demands in the most recent seasons for all players and the T11 players. Match minutes in EPL players (those with a minimum of five games and >270 mins) rose by 13% (+6,969 minutes), with a 4% increase (+2185 min) when comparing the 2015/2016 and 2023/2024 seasons, with 2024/2025 showing a reduction to normative values for all player seasonal minutes. However, the trends look to increase more so when international tournaments are scheduled (eg, FIFA World Cup), causing an increase in the 3-season rolling average. Fluctuations occurred over the 10-year period, with the last five seasons showing a significant increase in 2023/2024 (13%; +6969 min). This is equivalent to an additional 2.76 games per player (6969 min/101 min per game/25-man squad). However, not all minutes were distributed equally across all players, with some playing significantly more. In 2023/2024, average match minutes per game rose by 5.0 minutes compared with 2015/2016 (table 2), equating to an extra two games (190 min) per team in the EPL. This increase excludes European and international competitions, which have been suggested elsewhere could add up to five additional games a season, through extended match durations alone.[10] A similar trend was observed during the FIFA World Cup 2022.[24] The reduction in game time during the 2024/2025 season led to a slight decrease in match demands. However, successful teams were required to play more matches overall due to the expanded schedules of UEFA[5] and FIFA[6 25] competitions (figure 6), with T6 team's players being the most affected by match minute exposure.

Analysis also shows overall match minutes were primarily driven by non-EPL club and national team competitions (figure 4), with larger increases occurring in the last three seasons. The introduction of the UEFA Nations League competition (2018/2019) has contributed to increases in international match minutes. Prospectively, the top players are expected to face substantial increases in match minutes due to current UEFA Champions League changes[5] and planned expansion of competitions such as the FIFA World Cup[6] and FIFA Club World Cup.[25] Figure 5 shows that this trend is already occurring with a 9% rise in the 3-season rolling average for T6 players. Throughout the match minutes trends, the teams that are required to play in European competition and progress to the latter stages are the teams that will have players with greater exposure.

Minutes played by T11 players also increased, with a 9.7% rise (+3659 min) over the last five seasons, largely driven by non-EPL and international matches (figure 4). The increase is below that associated with all players in 2023/2024 (+13%; +6969 min), suggesting greater squad rotation. T11 players have a higher share of EPL minutes, averaging 73% of the total minutes, with 59% of the total share in non-EPL club minutes, suggesting rotation happens more in these competitions. The expansion of substitutions (3–5 per match) looks to have helped provide further opportunity for squad management. However, those playing full matches may face higher demands than in previous seasons, as substitutes typically play at a higher intensity,[26] which requires those playing the full game to match this intensity. This may explain why T11 players' minutes increased less than the total player pool (figure 4). The growing prevalence of squad rotation is also suggested by the stable match minutes for T11 players, despite overall increases. However, this study does not account for injury and illness surveillance data, which could mean that increased rotation may be a response to more frequent player absence due to injuries or illness. Future research should examine these trends alongside injury and illness surveillance data to better understand the relationship between match demands and player health.

Top 6 hit hardest as match congestion grows

The proportion of congested minutes has also risen significantly for all players (figure 5). Between 2015/2016 and 2024/2025,



	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25
EPL	39,265	39,518	39,514	39,582	39,338	39,121	39,299	39,578	39,476	39,480
Club (not EPL)	20,119	14,585	18,279	23,346	20,895	20,953	19,154	20,129	18,430	23,836
International	7,090	4,885	9,781	8,129	3,919	11,486	9,387	8,989	11,376	8,718
Total	66,474	58,988	67,574	71,057	64,152	71,560	67,840	68,696	69,282	72,034
Rolling 3 Season Average			64,345	65,873	67,594	68,923	67,851	69,365	68,606	70,004
% Increase on 2017/18 Rolling 3 Season Average				2%	5%	7%	5%	8%	7%	9%

Figure 6 Seasonal distribution of match minutes for all players (≥5 appearances and >270 min in the English Premier League (EPL) from the top six clubs (T6). Stacked bars represent minutes accumulated in the EPL, other domestic/European club competitions and international fixtures. The line graph indicates the rolling 3-season average, with percentage differences shown relative to the 2017/2018 baseline.

the 3-season rolling average of congested minutes has increased (+1415 min). Dense fixture periods are known to negatively affect physical performance[27] and increase injury risk.[28] Practitioners and governing bodies must be aware of the potential impact on player health and closely monitor the injury and wellness trends in the coming seasons.

Congested minutes for T6 teams fluctuated season-to-season, likely due to progression in European and domestic cup competitions. The more successful teams play more, particularly in the latter stages of the season. For example, T6 teams experienced a substantial increase in match congestion minutes in the 2022/2023 and 2024/2025 seasons. Additional games in UEFA and FIFA competitions look to continue to increase match congestion, as displayed in figure 5 (+4494 congested minutes in the 2024/2025 season compared with the season before). It was estimated that players involved could face an increase of 11% in match load in the 2024/2025 season,[10] with an increase of 4% shown for T6 teams and a 29% increase in the 3-season rolling average when compared with 2015/2016–2017/2018 averages. The T6 congestion stays between 17% and 29% in comparison to all players between 12% and 20% per season, highlighting the extra strain the T6 teams have with increasing success. This may require adaptation to current training, recovery and rotation strategies to optimise performance and minimise the impact on player health. Within clubs, enhanced emphasis should be placed on both physical (neuromuscular) and psychological (wellness) responses to the increased demands, helping to inform governing bodies and players' unions.

Clinical implications for the players

Players are now required to run more, at higher intensity and more frequently. With the expansion of both European and international competitions, 'elite/world-class' players are particularly vulnerable.[29] T6 team players, who already play more minutes (both total and congested; figure 6), are likely to be most affected. Monitoring player responses to these increased stressors, through subjective reports and neuromuscular testing (eg, kinetic and kinematic analysis of jump testing), will be critical. Additionally, players in this category face increased travel demands, such as long-haul flights and time zone changes, which add 'hidden stressors'.[30] This trend may not be confined to the EPL but could be seen across top teams worldwide. However, more experienced international players tend to adapt better to these demands than younger players, indicating habitual adaptation over time.[31]

Due to the increased frequency of matches, players will need to prioritise rest and recovery to enhance readiness,[32 33] increase performance[34] and minimise injury risk.[35] Recovery modalities have been shown to mitigate the effects of high-stress activities,[36] helping players return to a state of readiness for their next performance.[37] Recovery strategies can be highly individual, with personal preference and compliance key in maximising benefits.[33]

Clinical implications for management and support staff

Physical preparation will be a key focus for practitioners to help support players to handle the increased running load demands, improving their ability to adapt to heightened physical and mental stress. While an increase in running load can elevate injury risk,[38] the relationship between stress and injury is complex.[39] Higher running loads may also lead to residual fatigue,[40] which can negatively affect player performance.[41] Practitioners will need to continuously reassess the evolving demands on players and adjust training methods accordingly. This could

involve modifying the intensity, volume, duration, density and variability of training stimuli to better equip players to handle the increasing demands of the game. Additionally, training programmes may need to be further individualised, within the team setting, to address specific player needs.[42]

With increased player usage, player rotation may become a more common strategy for coaching teams to manage their squads. If this approach is adopted, we may see a reduction in match minutes for key players (T11) per team, per season. It may also require T6 teams to increase the size of their playing squads to allow for greater rotation. Coaching and performance teams will need to carefully monitor playing time and running load distribution across the squad, alongside players' physiological responses, to optimise readiness during dense fixture periods. This will require teams to pay greater attention to the overall quality and preparedness of the entire squad, rather than just the starting lineup.

Future recommendations

With the current expansions of both UEFA, FIFA club and national team competitions in the coming seasons, it is crucial to closely monitor player performance and health. Football clubs and policymakers should assess how players respond to the increased seasonal demands through methods such as subjective questionnaires and standardised procedures of assessing neuromuscular responses to load. A key strategy for informed decision-making is the implementation of injury and illness surveillance studies, which can provide the necessary data to ensure that policies are grounded in evidence and promote player well-being.

As the T6 teams are most affected, it is suggested that they look at rotation possibilities, which may require an increase in squad sizes. This could potentially affect the training model to prepare teams more effectively, focusing on a much more individualised approach. Clubs must observe how their players are coping with the increased demands required by players to help determine future protocols for these individuals.

Study limitations

This paper focuses primarily on the extensive running load demands in football,[43] although the sport's intermittent multi-directional nature is also a critical factor.[44] The optical tracking technologies used in this study have certain limitations, particularly in accurately measuring acceleration and deceleration efforts.[45] Two different optical tracking providers were used, and despite previous evidence of interchangeability between providers,[41] issues have been identified.[46 47] The findings suggest that changes between providers may account for some of the observed increases in trends, especially in higher speed zones (figure 1). Understanding the interchangeability between tracking providers is essential for maintaining consistency in trend analysis, as this issue is likely to persist over time.

Additionally, this paper does not track individual players but rather groups them by season. This approach was necessary due to the high turnover of management and playing squads.[17] For the measurement of match minutes and congested minutes, minute cut-offs for full games and extra time were applied. However, the optical tracking data indicate that match durations often exceed 96 min, further complicating longitudinal analysis.

Furthermore, this study does not examine the effect of increasing running load demands on injury, illness or mental health. These represent important areas for future research, as understanding the broader implications of rising physical demands is critical for player welfare and performance management.

CONCLUSION

Running load demands in the EPL have significantly increased and are likely to continue increasing. With the current and proposed expansion of the global football calendar, fixture congestion is expected to become more pronounced than previously, especially impacting top players who participate in more matches and tournaments. Player health will need to be closely monitored to assess any potential effects.

To address these challenges, practitioners, players and governing bodies must begin planning how to manage these increasing demands and ensure players are consistently ready to perform. Regular analysis of trends, alongside injury and illness surveillance, player wellness and monitoring individual adaptive responses to load, will be essential in understanding the impact of these intensifying demands.

Future research should explore whether the increase in match minutes and running load contributes to maladaptive responses, such as injury. Fans expect to see players perform at their peak in every game, so maintaining optimal player preparation and prioritising their health will be crucial.

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Patient and public involvement Patients and/or the public were not involved in the design, conduct, reporting or dissemination plans of this research.

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