Technical and physical performance across five consecutive seasons in elite European Soccer

Article *in* International Journal of Sports Science & Coaching · March 2022

DOI: 10.1177/17479541221089247

4 authors:

Ryland Morgans
I.M. Sechenov First Moscow State Medical University

Patrick Orme
Bristol City FC

Eduard Bezuglov
I.M. Sechenov First Moscow State Medical University

Rocco Di Michele
University of Bologna

Original research article

International Journal of Sports Science & Coaching

International Journal of Sports Science & Coaching
1–9

DOI: 10.1177/17479541221089247
journals.sagepub.com/home/spo
SAGE

Technical and physical performance across five consecutive seasons in elite European Soccer

Ryland Morgans[1,2], Patrick Orme[3], Eduard Bezuglov[1,2], and Rocco Di Michele[4]

Abstract

The technical and physical demands of elite soccer match-play may vary considerably across a season and from season-to-season in relation to a myriad of factors. The aim of this study was to investigate the technical and physical performance trends over five consecutive seasons (2016–2021) for twenty-two soccer players from a team participating in an elite European league, the Russian Premier League (RPL). Match data were recorded and analysed via an Optical Tracking System, and a selection of technical and physical performance variables were examined. From matches analysed, we observed small within-season changes (ES 0.17 to 0.37) for technical performance variables, and small to moderate changes (ES 0.31 to 0.86) for physical performance variables. Dribbles, percentage of successful dribbles, total distance covered, high-intensity and sprint distances, and maximal acceleration showed an average increase from the 2016–2017 to the 2018–2019 season, followed by a decrease in the subsequent seasons. Conversely, tackles, high-intensity accelerations and peak acceleration showed a decreasing trend from the 2016–2017 to the 2020–2021 season. Moderate to large correlations ($r = -0.58$ to 0.46) were apparent between changes in technical and physical variables. In summary, we observed between-season changes in match technical and physical variables in a RPL team, while there were no differences between the first and second phases of the season. The present findings may provide coaches with knowledge about long-term variations in technical and physical match performance, that can be practically useful to assess and interpret change in individual and team performance.

Keywords

Association football, seasonal variations, match performance, technical, fitness, fatigue, performance analysis, soccer

Introduction

Soccer is a multi-faceted sport which requires players to be able to undertake complex technical actions alongside various movement patterns involving numerous physical competencies whilst being able to execute tactical instructions in response to the constantly changing external stimuli of the game.[1] In recent years, partly due to the advancement of technology capable of automatically collecting appropriate data, there has been an upsurge in the number of studies exploring technical and physical performances during soccer match-play. Investigations have included assessments of the differences in technical and physical performance between teams competing at different competitive levels.[2,3] Previous studies also assessed the effects of changing tactical formations on performance,[4] and the impact of situational variables such as the percentage of possession of the ball that a team has on physical and technical outcomes.[5]

The technical and physical demands of soccer match-play have changed considerably over the last couple of

Reviewers: Liam Anderson (University of Birmingham, UK)
Conall Murtagh (Liverpool Football Club, UK)

[1]PFC CSKA, Moscow, Russia Federation
[2]Department of Sports Medicine and Medical Rehabilitation, Sechenov First Moscow State Medical University of the Ministry of the Russia Federation, Moscow, Russia Federation
[3]Sport Science and Medical Department, Bristol City FC, Bristol, UK
[4]Department of Biomedical and Neuromotor Sciences, University of Bologna, Bologna, Italy

Corresponding author:
Ryland Morgans, Department of Sports Medicine and Medical Rehabilitation, Sechenov First Moscow State Medical University of the Ministry of the Russia Federation, 119991 Moscow, Russia Federation.
Email: rylandmorgans@pfc-cska.com

decades. Barnes *et al.*[6] identified an upwards trend in physical and technical performance in teams from the English Premier League. Wallace and Norton,[7] in an analysis of World Cup final matches, showed that several indicators related to game speed, such as ball speed and passing rate, have gradually increased from 1966 to 2010, resulting in more physically demanding match-play. Historically it would appear that teams that are technically more proficient would be able to retain possession of the ball for longer periods of the match. In turn, this would reduce the physical demands placed on that team's players, whilst simultaneously increasing the physical demands placed on the opposition players.[5] As tactical trends and playing systems have developed over time, there is now a larger demand on players even when their team is in possession of the ball. This is generally due to an increased need for players to move with greater intensity to create space to receive the ball away from more physically capable opposition players or to make attacking runs to exploit spaces left by opposition defenders.[6] The physical outcomes of players may also be driven by the style of play and the formation employed by the team, that is likely to effect certain playing positions more than others.[8–10]

Further to the style of play implemented by the team, there are various other factors that may influence technical and physical performance during individual matches, over the season, and from one season to the next. Within each individual match, factors such as the current score-line,[11] substitutions of players,[12,13] fatigue of players,[14] and the weather[15,16] may all alter performance. Across the season and from season-to-season the league table position of the team,[17] a change of manager or coaching staff,[18] and players missing prolonged periods through injury[19] may all influence the technical and physical performance of the team. Further research is required to fully understand how these factors impact technical and physical performance. Moreover, understanding the relationship between technical and physical performance at the elite level of soccer is vitally important when developing appropriate training programmes for soccer teams and the individuals involved in those teams. It is also important to understand how the aforementioned factors may affect the technical and physical demands placed on players so that training can be prescribed effectively. Therefore, improving training methods, concurrently with nutritional strategies, injury prevention programmes, as well as players and team cohesion, this may lead to long-term enhancements of technical and physical match performance and thus greater overall performance. Therefore, the aim of this study was to investigate the technical and physical performance trends over five consecutive seasons (2016–2021) in a team participating in an Elite European soccer league, the Russian Premier League (RPL).

Method

Participants

Twenty-two male professional outfield soccer players (Mean ± *SD*, age at start of 2016–2017 season 24 ± 7 years, stature 1.83 ± 0.06 m, mass 79.4 ± 6 kg) from a RPL team formed the sample. The sample were selected based on the number of matches they played in each season and across five consecutive seasons (2016–2017 to 2020–2021). The RPL is typically split into two distinct periods. The first phase can be sub-divided into preseason (4-weeks) starting mid-June and competition (20-weeks) concluding in mid-December. The second phase commences after a 4-week winter break and also has two definite periods consisting of preseason (5-weeks) commencing mid-January and competition (20-weeks) finishing in mid-May. All data evolved as a result of employment in which players were routinely monitored over the course of the competitive season. Nevertheless, approval for the study from the club was obtained[20] and ethics was approved by the local Ethics Committee of Sechenov University (N 22–21 dated 12/12/2021). To ensure confidentiality, all data were anonymised before analysis.

Procedure

The sample group consisted of outfield players only (defenders n = 9, midfielders n = 9, and forwards n = 4). In each season, 15 home league matches and 15 away league matches were played. Only data recorded during home and away league matches from the RPL were included in the present study. Participant data were only included in the analyses when time spent on the field exceeded 75 min of the match. For any examined season (or phase of the season), players were considered for that specific season (or phase of the season), if they competed, based on the inclusion criterion of 75 min playing time, in six (20%) or more league matches. Only players with match data from at least two out of the five examined seasons were included in the sample. The participants competed in a median of 60% (range = 20 to 97%) of league matches across any of the examined seasons. A total of 1022 individual match data points was examined including all five seasons, with a median of 43 matches per player (range = 16 to 128).

Data collection

League match data across each season were recorded and analysed via a two-camera Optical Tracking System (InStat, Moscow, Russia) to report technical and physical performance data. The matches were filmed using two full HD, static cameras positioned on the centre line of the field, not less than 3-metres from the field and 7-metres in

height. A consistent 25Hz format was provided. Data were linearly interpolated to 50Hz, smoothed using a 5-point moving average and then down-sampled to 10Hz, which allowed analysis of all player actions with and without the ball. The installation process, reliability and validity of InStat have been reported previously by FIFA Electronic Performance Tracking Systems (EPTS) programme.[21] The InStat Analysis Software System was used to measure and analyse technical and physical performance.

Changes in match technical variables across each season were assessed using the following: total number of passes (made by one individual); pass completion (total number of passes made by one individual as a percentage of successful attempts); total number of dribbles; percentage of successful dribbles; tackles; and percentage of tackles won. These variables showed good to excellent reliability when assessed within the InStat System, as previously reported.[22] The physical match activity profile included: time on pitch (mins); total distance covered (m); high intensity distance (m; total distance covered 5.5–7 m/s); sprint distance (m; total distance covered >7 m/s); number of high-intensity accelerations (peak speed 5.5–7 m/s); number of maximal accelerations (peak speed >7 m/s); and peak acceleration (m/s^2). All variables obtained were predetermined in the InStat Software.

Data analyses

The statistical analysis was performed using the software R, version 3.6.1 (R Foundation for Statistical Computing, Vienna, Austria). For all examined variables, means were compared between the first phase of the season, including matches played from the start of the season to the mid-season winter break (July to December, $n = 17$ to 20 out of 30 matches), and the second phase of the season, including matches played after the mid-season break (March to May, $n = 10$ to 13 out of 30 matches). Student's t-tests were used to determine statistical difference, with alpha set at $p < 0.05$. Mean differences standardised by the between-subject standard deviation were assessed to determine the effect size (ES), and were evaluated according to the following scale: <0.2, trivial; 0.2–0.6, small; 0.6–1.2, moderate; 1.2–2.0, large; 2.0–4.0, very large; >4.0 extremely large.[23] Comparisons were made separately for each examined season, using only data from players who belonged to the team in that season. To test for changes across the examined regular seasons, linear mixed models were used, with season as fixed factor and random intercepts for individual players. Estimates were made of differences between seasons for all examined variables. When there was a significant ($p < 0.05$) effect of season, Tukey's post-hoc tests were used to determine which seasons differed. Correlations between changes in technical and changes in physical variables were examined with Pearson's r correlation coefficients. All difference data available from the sample players were included in the correlation analysis. The magnitude of the r-correlation coefficient was interpreted as follows: <0.1, trivial; 0.1–0.3, small; 0.3–0.5 moderate; 0.5–0.7, large; 0.7–0.9, very large; >0.9 extremely large.[23]

Results

The mean values for the analysed technical variables in the first versus second phase of each examined season are presented in Figure 1. During the 2017–2018 season, there was a significantly small (ES = 0.37) decrease in the number of passes between the two phases of the season, while there was a significantly small (ES = 0.14) increase in the 2019–2020 season. A significant decrease was also observed in the 2018–2019 season for the number of dribbles (ES = 0.26, small). No other significant differences were observed between the first and second phase of the examined seasons for technical variables.

The comparison of physical variables between the first versus second phase of the season for all examined seasons are shown in Figure 2. Total distance was significantly higher in the second vs. first phase of the season in the 2016–2017 (ES = 0.65, moderate) and 2020–2021 (ES = 0.52, small) seasons, while it was higher in the first phase of the 2019–2020 season (ES = 0.86, moderate). A moderate (ES = 0.65) significant increase was observed for high-intensity distance in the second versus first phase of the 2018–2019 season. The number of high-intensity accelerations was significantly higher in the first phase of the 2018–2019 season versus the second phase of this season (ES = 0.88, moderate). Conversely, in the 2019–2020 season was a significant decrease in the second versus first phase of the season (ES = 0.52, small) in the number of high-intensity accelerations. Maximal accelerations were higher in the first versus second phase of the 2016–2017 season (ES = 0.31, small), although higher in the second versus first phase of the 2017–2018 season (ES = 0.31 small). No significant changes between phases of the season were observed for total pitch time, sprint distance, and peak acceleration (Figure 2).

The mean values of technical variables across the examined seasons are shown in Table 1. There were no significant changes for number of passes and successful passes. Conversely, dribbles were higher in the 2018–2019 season than in all other seasons, with significant differences between the 2019–2020 and 2020–2021 seasons. Successful dribbles were highest in the 2018–2019 season, which differed significantly from the 2019–2020 season. The number of tackles made decreased across seasons, notably the 2016–2017 season (4.2 ± 1.3 tackles) was significantly higher than the 2019–2020 (3.2 ± 1.2 tackles) and 2020–2021 (2.8 ± 0.6 tackles) seasons. Nevertheless, no significant differences were observed

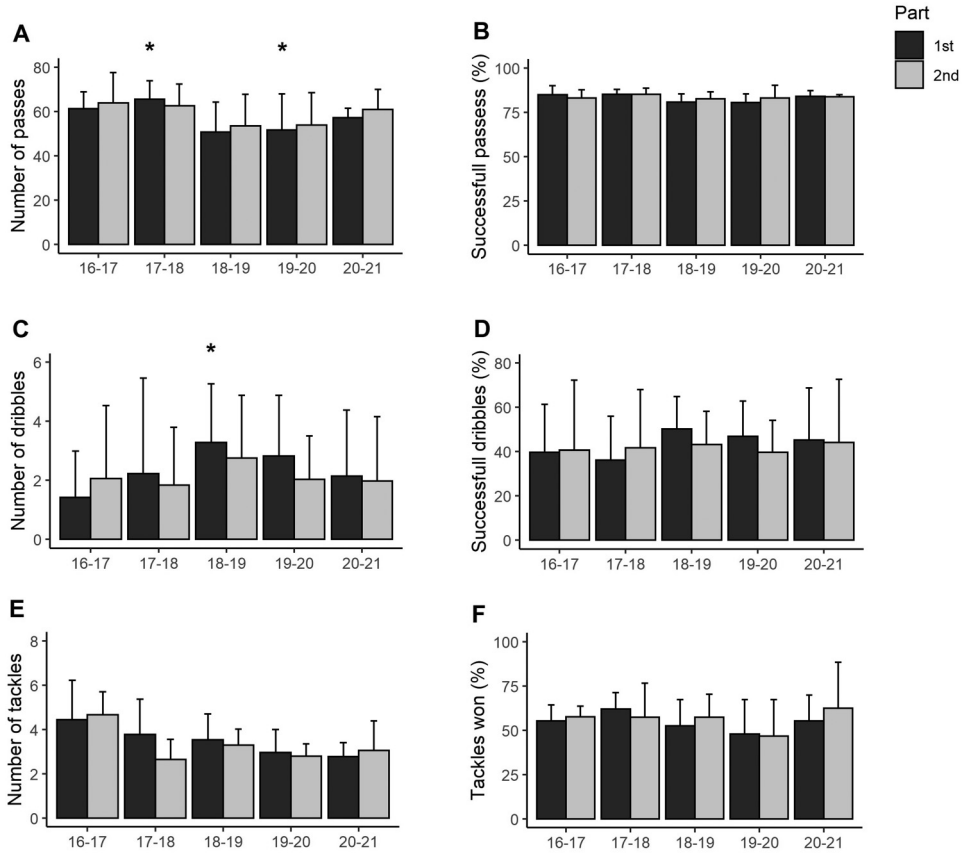

Figure 1. Mean and standard deviation values for technical variables in the two phases of the season, for all examined seasons. *denotes a significant ($p < 0.05$) difference between the first and the second phase of the season.

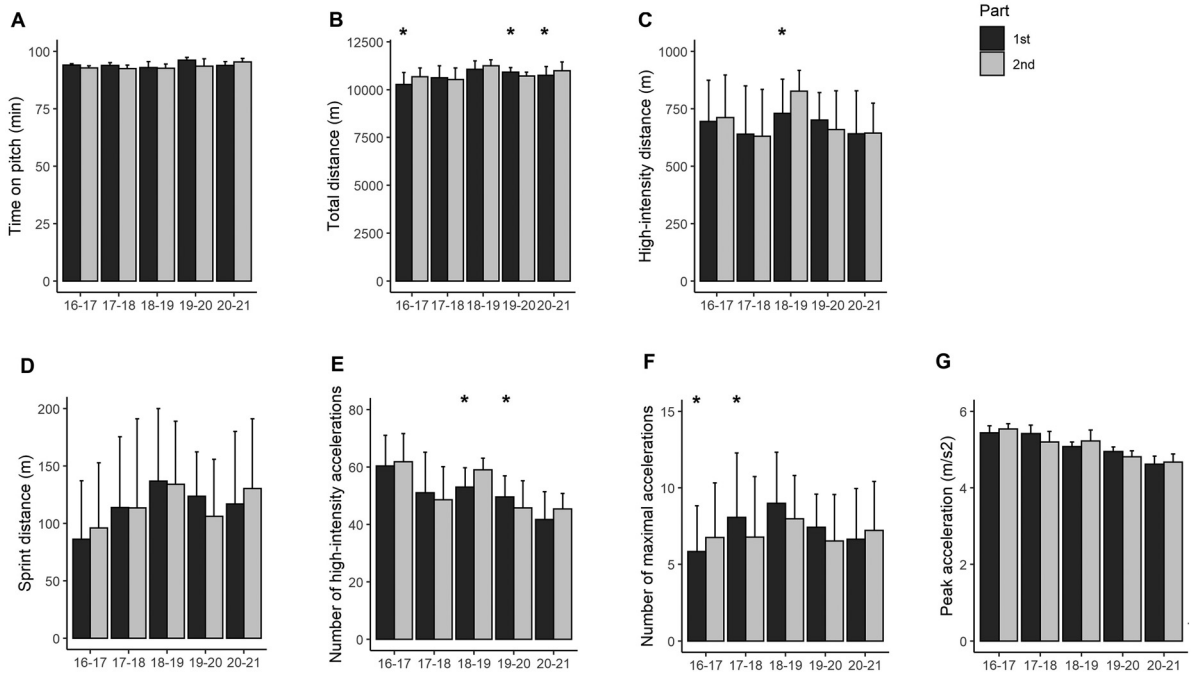

Figure 2. Mean and standard deviation values for physical variables in the two phases of the season, for all examined seasons. *denotes a significant ($p < 0.05$) difference between the first and the second phase of the season.

Table 1. Mean ± standard deviation of technical variables in the five examined seasons.

Season	Passes (n)	Successful passes (%)	Dribbles (n)	Successful dribbles (%)	Tackles (n)	Tackles won (%)
2016–2017	59 ± 11	83.9 ± 5.9	2.1 ± 2.4	43.1 ± 19.7	4.2[cd] ± 1.3	59.8 ± 11.6
2017–2018	55 ± 13	82.1 ± 5.2	2.5 ± 2.4	38.5 ± 13.5	3.6 ± 1.0	54.6 ± 15.5
2018–2019	50 ± 13	82.4 ± 3.7	2.9[cd] ± 1.9	49.0[c] ± 16.5	3.4 ± 1.0	53.2 ± 13.1
2019–2020	51 ± 13	83.7 ± 4.9	2.1 ± 1.7	37.6 ± 20.1	3.2 ± 1.2	51.2 ± 15.9
2020–2021	55 ± 10	84.5 ± 2.5	1.9 ± 2.0	42.6 ± 19.2	2.8 ± 0.6	54.1 ± 15.8

[a]denotes a significant difference ($p < 0.05$) vs. 2017–2018; [b] denotes a significant difference ($p < 0.05$) vs. 2018–2019; [c] denotes a significant difference vs. 2019–2020; [d] denotes a significant difference ($p < 0.05$) vs. 2020–2021.

between seasons for the percentage of tackles won (Table 1).

The mean values of physical variables across seasons 2016–2017 to 2020–2021 are presented in Table 2. Total playing time, sprint distance, and the number of maximal accelerations showed no significant differences between seasons. Conversely, total distance showed an increase from 2016–2017 to 2018–2019, with significant differences between 2016–2017 and both 2017–2018 and 2018–2019 seasons. However, there was a significant decrease in the 2019–2020 and 2020–2021 seasons, where both showed a lower total distance than the 2018–2019 season. A similar decrease was observed for high-intensity distance, with the last examined seasons (2019–2020 and 2020–2021) showing significantly lower high-intensity distances than 2016–2017 and 2018–2019. Also, the number of high-intensity accelerations showed a notable decrease, with the 2016–2017 season higher (61 ± 11 accelerations) than all other seasons. Furthermore, the last seasons (2019–2020 and 2020–2021), showed values lower than both 2017–2018 and 2018–2019. The peak acceleration data purported a similar decreasing trend across seasons, with the 2016–2017 and 2017–2018 seasons showing greater peak acceleration than more recent seasons 2018–2019 to 2020–2021. Moreover, the peak acceleration in the 2018–2019 season (5.1 ± 4.8 m/s^2) was greater than that of the 2019–2020 and 2020–2021 seasons.

Correlations between changes in physical and technical variables are highlighted in Table 3. An increase in total distance covered is associated with a decreased percentage of successful passes with a large correlation ($r = -0.58$), and with increased dribbles, percentage of successful dribbles, tackles and tackles won, all with moderate correlations. Similarly, increased high-intensity distance was moderately correlated to decreased passes ($r = -0.32$) and percentage of successful passes ($r = -0.47$), and to increased dribbles ($r = 0.31$). Moderate relationships were observed between changes in sprint distance and percentage of successful passes ($r = -0.27$), with increasing sprint distance associated to decreased percentage of successful passes. Changes in sprint distance also showed moderate positive correlations with changes in dribbles ($r = 0.35$) and successful dribbles ($r = 0.34$). Very similar correlations were observed between changes in maximal accelerations and changes in successful passes ($r = -0.32$) and dribbles ($r = 0.44$) as well as successful dribbles ($r = 0.43$). A moderate, negative relationship ($r = -0.34$) was observed between changes in high-intensity accelerations and passes. Changes in peak acceleration were also positively correlated with changes in number of passes ($r = 0.26$).

Discussion

The present study aimed to examine a selection of match-play technical and physical performance variables in soccer players from a team participating in an elite European league, the RPL. The analysis was conducted over a period of five consecutive seasons, to assess within- and between-season changes of match-related technical and physical performance. Taken together, the results showed limited differences for all examined variables between the first and second phase of the season in every examined season. Conversely, there were trends towards a decrease or an increase from season-to-season for some of the technical and physical variables. Also, the correlation analysis revealed some evident relationships, although only moderate magnitude in most cases between changes in technical and physical variables.

Within-season analysis

Our results showed for all examined variables and seasons no systematic differences between the first and the second phase of the season (Figure 1 and Figure 2) were reported. We observed only small and moderate changes, arguably related to casual variations in player's seasonal performance in each phase of the season associated with contextual factors previously validated such as match location, differing quality of opponent, match status[24] and changes in the team's style of play.[25] Our findings agree with previous observations of unaltered physical match performance across a season in the English Championship League.[26] In contrast, other more recent studies highlighted that players were able to maintain total distance across a season but all sprint (>7m/s) and high intensity (5.5–7m/s) physical match performance variables significantly changed across

Table 2. Mean ± standard deviation of physical variables in the five examined seasons.

Season	Time on pitch (min)	Total distance (m)	High-intensity distance (m)	Sprint distance (m)	High-intensity accelerations (n)	Maximal accelerations (n)	Peak acceleration (m/s^2)
2016–2017	93 ± 1	10479[ab] ± 460	715[cd] ± 177	96 ± 44	61[abcd] ± 11	6.6 ± 2.7	5.5[bcd] ± 0.1
2017–2018	93 ± 2	10787 ± 541	705 ± 181	111 ± 50	56[cd] ± 13	7.9 ± 3.1	5.4[bcd] ± 0.2
2018–2019	93 ± 2	11160[cd] ± 315	783[cd] ± 160	129 ± 55	56[cd] ± 9	8.1 ± 2.9	5.1[cd] ± 0.1
2019–2020	94 ± 2	10879 ± 490	675 ± 195	109 ± 42	47 ± 12	6.6 ± 2.5	4.8 ± 0.3
2020–2021	93 ± 3	10817 ± 446	651 ± 224	117 ± 60	44 ± 12	6.8 ± 3.5	4.6 ± 0.2

[a]denotes a significant difference ($p < 0.05$) vs. 2017–2018; [b] denotes a significant difference ($p < 0.05$) vs. 2018–2019; [c] denotes a significant difference vs. 2019–2020; [d] denotes a significant difference ($p < 0.05$) vs. 2020–2021.

Table 3. Correlation between changes in physical variables and changes in technical variables.

	Passes (n)	Successful passes (%)	Dribbles (n)	Successful dribbles (%)	Tackles (n)	Tackles won (%)
Total distance (m)	−0.02	−0.58*	0.46*	0.14	0.30*	0.40*
High-intensity distance (m)	−0.32*	−0.47*	0.31*	0.23	0.17	0.11
Sprint distance (m)	0.05	−0.27*	0.35*	0.34*	0.18	−0.07
High-intensity accelerations (n)	−0.34*	−0.18	0.07	0.15	0.11	−0.02
Maximal accelerations (n)	−0.05	−0.32*	0.44*	0.43*	0.18	−0.06
Peak acceleration (m/s^2)	0.26*	0.05	0.10	0.06	0.00	0.05

*significantly different from 0 ($p < 0.05$).

the season,[17] especially at the end of a season in the German Bundesliga[27] and in the English Championship League.[28] This could possibly be attributed to accumulating fatigue and a decrease in neuromuscular function as the season progresses. A significant characteristic of the RPL is the presence of a long winter mid-season break (approximately 9 weeks), that may allow an opportunity to minimise the negative effects of accumulative fatigue, thus providing a rationale to mainly unaltered physical performance in the second phase of all examined seasons when compared to the respective first phase. Moreover, different from most other European premier soccer leagues, the winter break allows the RPL teams to have a 4-week period of rest followed by a 5-week preseason before the commencement of the second phase of the season. The opportunity to train for several weeks in a period when no official matches are played, may have a beneficial result for optimally training physical capacities, potentially leading to unaltered physical performance during matches in the subsequent phase of the season.

Between-season analysis

The analysis of match-related technical and physical performance from the 2016–2017 to the 2020–2021 season highlighted, for the number of high-intensity accelerations and peak acceleration, a decrease across seasons. Although, total distance, high-intensity distance, sprint distance and the number of maximal accelerations showed an increase from 2016–17 to the 2018–2019 season, followed by an evident decrease in the last examined seasons (2019–2020 to 2020–2021).

Also, between-season variations were observed in the examined technical variables. In particular, the number of tackles won decreased from a mean of 4.2 ± 1.3 (2016–2017) to a mean of 2.8 ± 0.6 (2020–2021). Dribbles and the percentage of successful dribbles showed an increase from 2016–17 to the 2018–2019 season, followed by a decline in the following seasons (2019–20 and 2020–21). A possible explanation for these findings is related to the individual playing characteristics (technical, physical, age, injury history) of the examined players in the last versus previous investigated seasons. Previous authors have shown an overall decrease in physical match-performance in older elite soccer players, especially those 30 years of age and more.[29–31]

Indeed, consistent with the above notion, a significant percentage (40%) of the players included within the present sample had turned 30 years before the start of the

2019–2020 season. A decrease in match running variables could also be explained by an improved organisation of the team tactically, as the coaching staff in the examined RPL team in the present study remained consistent over the five consecutive seasons. Previous research stated that, in Italy Serie A, the top ranked teams tend to cover less distances than lower-ranked teams.[2] Such observation is probably due to better technical ability and tactical awareness of higher-ranked teams, allowing them to maintain longer periods of ball possession and decrease the distances covered. Although, from a purely physical perspective, football training modifications can be implemented to ensure a physical stimulus is appropriately maintained whilst also focusing on recovery modalities during a training week for older players. Corroborating this finding, an analogous decreasing trend of match-related physical variables was observed in a successful Italy Serie A team over a period of three consecutive seasons, when the team maintained the same coaching staff, probably leading to gradually improving the playing organisation over consecutive seasons.[32] Nevertheless, those authors observed a decrease only for the slower speed distances (walking to high-intensity running), whereas they showed no significant changes across seasons regarding the very high-intensity running (>19 km/h).

As in other countries, the RPL championship was suspended in February 2020 due to the Covid-19 pandemic. The 2019–2020 championship was resumed several months later, although this was reflected in a very short summer pre-season at the beginning of the 2020–2021 season. The amended training and fixture schedule, combined with other Covid-19 related issues, may have been relevant factors contributing to decreased physical match performance.[33,34] This is consistent with our observations for some of the examined variables in the 2019–2020 and 2020–2021 seasons when compared with the 2018–2019 season.

Correlations between changes in physical and technical variables

The correlation analysis allowed us to observe some relationships between changes in technical and physical variables occurring throughout the examined period. While some authors have shown pertinent relationships between technical and physical match variables in elite soccer,[35,36] this was, to the best of our knowledge, the first study in which these relationships examined the between-season changes in key match performance variables. Changes in the percentage of successful passes showed small to large negative correlations with changes in technical variables (Table 3). This observation is consistent with previous reports[2,32] that higher tactical awareness, reflected in greater percentage of successful passes, produced lower physical demands and thus lower data of physical match performance indicators. Interestingly, the variation in the number of dribbles was positively correlated with changes in physical actions associated with high to maximum intensity (See Table 3). Arguably, dribbling actions require high-intensity running or sprinting. Thus, for potentially technical or tactical reasons related to the team's style of play, the number of dribbles during a match may decrease across a specific season compared to previous one(s), this will reflect in the number of high-intensity and sprinting actions and thus a decrease in high-intensity and sprint distances will be evident.

Limitations

While previous findings have emphasised the importance of universally accepted and standardised speed zones for monitoring in team sport athletes,[37] the current authors propose that the use of global, as opposed to individualised, running speed thresholds is a limitation of this research and previously reported.[28] Other notable limitations include the absence of training load, fatigue, and fitness profiling data. Furthermore, the present study was conducted assessing only one team where the coaching staff remained consistent over the study period. Thus, a limitation is that the findings may not generalise to all RPL teams because other teams may have had different training and coaching approaches and different technical and physical player characteristics in the squad.

Conclusion

In summary, we observed some relevant between-season changes in the selected match-related technical and physical variables in a RPL team, while there were no substantial differences between the first and second phases of the season. Despite limited to analysis of a single team, this study is, to our knowledge, the first to have assessed the trends of technical and physical performance over an extended period (five consecutive seasons). Future research should examine a wider selection of technical and physical indicators of match performance, and extend the analysis to the elite Premier League (all teams). This type of analysis would allow a more in-depth understanding of within- and between-season trends of match performance, to identify possible contemporary trends in RPL players' and team performance, such as those observed in the UEFA Champions League from the 2009–2010 to the 2017–2018 season.[38]

Practical applications

The present findings may provide coaches with knowledge about long-term variations in technical and physical match performance, that can be practically useful to assess and

interpret change in individual and team performance. These findings could also provide an opportunity to design practical training interventions to increase the technical and physical proficiency of individual players where appropriate overload is offered and subsequent adaptation and development is achieved. Additionally, for practitioners working with a team over a sustained period of time where a high percentage of squad players are over 30 years of age possibly an individually tailored recovery strategy may be beneficial to sustain performance. Furthermore, a better standard may not require a significantly greater physical capacity in players although coaches and managers should develop a tactical strategy that suits the technical and physical ability of players that is sustainable during consecutive seasons.[39]

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

ORCID iDs

Ryland Morgans https://orcid.org/0000-0003-2007-4827
Patrick Orme https://orcid.org/0000-0002-5822-0079

References

1. Yang G, Leicht AS, Lago C, et al. Key team physical and technical performance indicators indicative of team quality in the soccer Chinese Super League. *Res Sports Med* 2018; 26: 158–167.
2. Rampinini E, Impellizzeri FM, Castagna C, et al. Technical performance during soccer matches of the Italian serie A league: effect of fatigue and competitive level. *J Sci Med Sport* 2009; 12: 227–233.
3. Dellal A, Chamari K, Wong DP, et al. Comparison of physical and technical performance in European soccer match play: FA Premier League and La Liga. *Eur J Sports Sci* 2011; 11: 51–59.
4. Schuth G, Carr G, Barnes C, et al. Positional interchanges influences the physical and technical match performance variables of elite soccer players. *J Sports Sci* 2016; 34: 501–508.
5. Bradley PS, Lago-Penas C, Rey E, et al. The effect of high and low percentage ball possession on physical and technical profiles in English FA Premier League soccer matches. *J Sports Sci* 2013; 31: 1261–1270.
6. Barnes C, Archer DT, Hogg B, et al. The evolution of physical and technical performance parameters in the English premier league. *Int J Sports Med* 2014; 35: 1095–1100.
7. Wallace JL and Norton KI. Evolution of world cup soccer final games 1966-2010. Game structure, speed and play patterns. *J Sci Med Sport* 2014; 17: 223–228.
8. Arjol-Serrano JL, Lampre M, Díez A, et al. The influence of playing formation on physical demands and technical-tactical actions according to playing positions in an elite soccer team. *Int J Environ Res Public Health* 2021; 18: 4148. doi:10.3390/ijerph18084148
9. Tierney PJ, Young A, Clarke ND, et al. Match play demands of 11 versus 11 professional football using Global Positioning System tracking: variations across common playing formations. *Hum Mov Sci* 2016; 49: –8.
10. Bradley PS, Carling C, Archer D, et al. The effect of playing formation on high-intensity running and technical profiles in English FA Premier League soccer matches. *J Sports Sci* 2011; 29: 821–830.
11. Ponce-Bordón JC, Díaz-García J, López-Gajardo MA, et al. The influence of time winning and time losing on position-specific match physical demands in the top one spanish soccer league. *Sensors* 2021; 21: 6843.
12. Hills SP, Barrett S, Thoseby B, et al. Quantifying the peak physical match-play demands of professional soccer substitutes following pitch-entry: assessing contextual influences. *Res Q Exerc Sport* Epub ahead of print 8 Oct 2020. doi: 10.1080/02701367.2020.1823308
13. Giménez JV, Leicht AS and Gomez MA. Physical performance differences between starter and non–starter players during professional soccer friendly matches. *J Hum Kinet* 2019; 69: 283–291.
14. Rey E, Kalén A, Lorenzo-Martínez M, et al. Elite soccer players do not cover less distance in the second half of the matches when game interruptions are considered. *J Strength Cond Res* Epub ahead of print 17 Dec 2020. doi: 10.1519/JSC.0000000000003935
15. Nassis GP, Brito J, Dvorak J, et al. The association of environmental heat stress with performance: analysis of the 2014 FIFA world cup Brazil. *Br J Sports Med* 2015; 49: 609–613.
16. Chmura P, Konefal M, Andrzejewski M, et al. Physical activity profile of 2014 FIFA world cup players, with regard to different ranges of air temperature and relative humidity. *Int J Biometeorol* 2017; 61: 677–684.
17. Morgans R, Adams D, Mullen R, et al. Changes in physical performance variables in an English championship league team across the competitive season: the effect of possession. *Int J Perf Anal Sport* 2014; 14: 493–503.
18. Guerrero-Calderón B, Owen A, Morcillo JA, et al. How does the mid-season coach change affect physical performance on top soccer players? *Physiol Behav* 2021; 232: 113328.
19. Windt J, Ekstrand J, Khan KM, et al. Does player unavailability affect football teams' match physical outputs? A two-season study of the UEFA champions league. *J Sci Med Sport* 2018; 21: 525–532.
20. Winter EM and Maughan RJ. Requirements of ethics approval. *J Sports Sci* 2009; 27: 85.
21. FIFA. Handbook of test methods for Electronic Performance Tracking Devices. http://quality.fifa.com/media/172234/2019-handbook-of-test-methods-epts.pdf (2019, accessed 28 Nov 2021).
22. Kubayi A and Larkin P. Technical performance of soccer teams according to match outcome at the 2019 FIFA Women's World Cup. *Int J Perf Anal Sport* 2020; 20: 908–916.
23. Hopkins W, Marshall S, Batterham A, et al. Progressive statistics for studies in sports medicine and exercise science. *Med Sci Sports Exercise* 2009; 41: 3–13.
24. Lago C. The influence of match location, quality of opposition, and match status on possession strategies in professional association football. *J Sports Sci* 2009; 27: 1463–1469.

25. Aquino R, Munhoz MGH, Palucci VLH, et al. Influence of match location, quality of opponents, and match status on movement patterns in Brazilian professional football players. *J Strength Cond Res* 2017; 31: 2155–2161.
26. Morgans R, Adams D, Mullen R, et al. Technical and physical performance over an English championship league season. *Int J Sports Sci Coaching* 2014; 9: 1033–1042.
27. Chmura P, Konefał M, Wong DP, et al. Players' physical performance decreased after two-thirds of the season: results of 3 consecutive seasons in the German first Bundesliga. *Int J Environ Res Public Health* 2019; 16: 2044.
28. Springham M, Williams S, Waldron M, et al. Large reductions in match play physical performance variables across a professional football season with control for situational and contextual variables. *Front Sports Act Living* 2020; 2: 570937.
29. Sal de Rellán–Guerra A, Rey E, Kalén A, et al. Age–related physical and technical match performance changes in elite soccer players. *Scand J Med Sci Sports* 2019; 29: 1421–1427.
30. Zhou C, Lorenzo A, Gómez MA, et al. Players' match demands according to age and playing position in professional male soccer players. *Int J Perf Anal Sport* 2020; 20: 389–405.
31. Lorenzo-Martínez M, Corredoira FJ, Lago-Peñas C, et al. Effects of age on match-related acceleration and deceleration efforts in elite soccer players. *Int J Sports Med* 2021; 42:1274–1280
32. Vigne G, Dellal A, Gaudino C, et al. Physical outcome in a successful Italian Serie A soccer team over three consecutive seasons. *J Strength Cond Res* 2013; 27: 1400–1406.
33. Rampinini E, Martin M, Bosio A, et al. Impact of COVID-19 lockdown on professional soccer players' match physical activities. *Sci Med Foot* 2021; 5: 44–52.
34. Radzimiński L, Padrón-Cabo A, Konefal M, et al. The influence of COVID-19 pandemic lockdown on the physical performance of professional soccer players: an example of German and Polish leagues. *Int J Environ Res Public Health* 2021; 18: 8796.
35. Filetti C, Ruscello B, D'Ottavio S, et al. A study of relationships among technical, tactical, physical parameters and final outcomes in elite soccer matches as analyzed by a semi-automatic video tracking system. *Percept Mot Skills* 2017; 124: 601–620.
36. Modric T, Versic S, Sekulic D, et al. Analysis of the association between running performance and game performance indicators in professional soccer players. *Int J Environ Res Pub Health* 2019; 16: 4032.
37. Gabbett TJ. Use of relative speed zones increases the high-speed running performed in team sport match play. *J Strength Cond Res* 2015; 29: 3353–3359.
38. Yi Q, Liu H, Nassis GP, et al. Evolutionary trends of players' technical characteristics in the UEFA champions league. *Front Psychol* 2020; 11: 1032.
39. Morgans R, Adams D, Mullen R, et al. A comparison of physical and technical match performance of a team competing in the English championship league and then the English premier league following promotion. *Int J Sports Sci Coaching* 2015; 10: 543–549.