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

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Comparison of differences in physical and technical match-play performance in the English Championship and English Premier League

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ABSTRACT

The aim of this study was to compare the differences in physical and technical match performance of a team competing in the English Championship League (ECL) and the English Premier League (EPL) over consecutive seasons. Measures were obtained from time-motion analysis of home league matches (n = 23 and n = 19) between August and May of 2009/10 and 2010/11 seasons. 23 male professional outfield soccer players (age = ± yrs, height = ± m, mass = ± kg) volunteered. No difference between leagues was found for total, high intensity or sprint distance. Players made 6 more passes in the EPL compared to the ECL. Pass completion and team possession was no different the ECL and EPL. The time between matches was however 57 hours less for ECL matches compared to the EPL. Time between matches was inversely related ($P = 0.0133$) to pass frequency where for every additional 50 hours recovery between matches 4 less passes were made. In summary, a playing style that is sustainable over consecutive seasons regardless of the standard of competition may promote success in the ECL and EPL.

Key words: Soccer, motion analysis, level of competition
INTRODUCTION

Soccer players’ performance depends on the interaction of technical, tactical, physical and psychological factors (Stølen et al., 2005). The physical and technical profile of top-level professional soccer match-play has been well documented (Bangsbo et al., 2006; Mohr et al., 2003; Rampinini et al., 2007; Rampinini et al., 2008; Reinzi et al., 2000; Bradley et al., 2010; Bradley et al., 2009; Di Salvo et al., 2009).

Physical performance provides a significant contribution to top-level soccer match-play. Several studies (Bangsbo et al., 1991; Mohr et al., 2003; Bradley et al., 2009) have reported an increase in high intensity distance covered during a match and this variable is related to the standard of competition (Bangsbo et al., 1991; Mohr et al., 2003; Bradley et al., 2009) and is sensitive to the variations in stages of the competitive season (Mohr et al., 2003; Rampinini et al., 2007) and the tactical role of players (Rampinini et al., 2007). Although, technical and tactical capabilities are also considered important for success in soccer (Rampinini et al., 2008), it may be suggested that physical performance is a result of the technical and tactical strategy employed (Bangsbo, 1994). However, the technical demands of soccer match-play performance are often neglected (Dellal et al., 2011). There has been considerable research (Bangsbo et al., 1994; Mohr et al., 2003; Krustrup et al., 2005; Di Salvo et al., 2006; Di Salvo et al., 2009; Bradley et al., 2009; Bradley et al., 2011) that have examined the match activity profiles of the English Premier League (EPL) that claims to be the most intensive league in the world. It can be expected then, that EPL matches will produce greater total and high intensity distances than observed in lower divisions in English soccer (Bangsbo et al., 1991; Mohr et al., 2003; Reinzi et al., 2000).

Promotion to the EPL is expected to be a challenge and avoiding immediate
relegation is a priority for newly promoted clubs. With limited budgets promoted
teams are generally restricted to retain players from the previous season and therefore
players need to quickly adapt to the reported increased physical and technical
demands of the EPL (Andersson et al., 2008; Carling et al., 2008). The suggested
increasing physical, technical, and tactical demands (Andersson et al., 2008; Carling
et al., 2008) in different professional leagues (English: Bradley et al., 2010; Italian
and Danish: Mohr et al., 2003; Swedish: Andersson et al., 2008; Spanish: Di Salvo et
al., 2007) have been reported. To cope with these increasing match demands, soccer
players must possess an adequate anthropometric and fitness profile (Hoff and
Helgerud, 2004; Reilly et al., 2000; Reilly, 2005). Furthermore, these capacities must
be maintained during a 9-10 month competition period (Gamble, 2006) where soccer
players should be able to consistently perform (Silva et al., 2013). The ability to
assess the physical and technical performance of a team competing at different levels
of competition would be practically useful and enhance our knowledge of the
differences between standards of competitive soccer match-play and importantly
provide a framework to prepare promoted teams. Interestingly, no studies have
compared the differences between the physical and technical performance of a team
competing in the ECL and EPL over consecutive seasons.

The seasonal effect for match running distances vary considerably (Gregson et
al., 2010) and several authors (Mohr et al., 2003; Rampinini et al., 2007) suggest that
distances were higher at the end than at the start of the season. Although seasonal
variations in physical match performance have been analysed (Mohr et al., 2003;
Rampinini et al., 2007), these investigations report limited findings with the main
emphasis on physical differences. Therefore, an assessment of a team over two
competitive seasons at differing standards of match-play will provide a more detailed
analysis of any seasonal variations in match-related physical and technical

Furthermore, a significant factor between the differing standards of
competition is the reduced number of league matches in the EPL compared to the
ECL, 38 versus 46 league matches respectively. Since short recovery periods may
affect physical performance, the need for appropriate recovery has been documented
in the ECL (Morgans et al., in press). Therefore, when analysing the differences
between leagues the time between matches was controlled.

The aim of this study was to compare the differences in physical and technical
match performance of a team competing in the ECL and the EPL over consecutive
seasons. Further allowing a more detailed assessment of the demands of different
standards of competition within English domestic soccer. This could also support the
implementation of specific training programmes that are appropriate to different
standards of play (Dellal et al., 2011). In support of recent research, it was anticipated
that differences between competitive leagues would be evident, highlighted in the
physical and technical performance during the EPL season.

METHOD

PARTICIPANTS

7 male professional outfield soccer players (mean age = ± years, height = ± m, mass
= ± kg) formed a sample of convenience that represented the core playing group.
The core playing group were selected based on the number of matches they completed
in both seasons. The study was approved by the University Human Research Ethics
Committee and the professional soccer club from which the participants volunteered.

Commented [M1]: How many players were used
The participants appeared in the majority of the 43 home league matches over the ECL (n = 24) and EPL (n = 19) season (median appearances = ??, range = ?? matches). The time (hours) between matches and the number of matches played by month for each participant are shown in Figure 1. The core group consisted of outfield players only (defenders n = ?, midfielders n = ?, and forwards n = ?). Out of the total matches played (n = 86) over both seasons, 43 were home league matches, the remaining were away league fixtures (n = 43) or domestic cup (n = 9) competitions. Only data recorded during home league matches from the ECL and EPL were included in the present study. Participant data were only included in the analyses when time spent on the field exceeded 75 minutes of the match. Based on the inclusion criterion of a minimum of 75 minutes playing time, the participants competed in a median of ??% (range = ??%) of home league matches over consecutive seasons.

DATA COLLECTION

The matches were filmed using eight cameras positioned around the stadium at roof height at a sampling frequency of 25Hz, which allowed analysis of all player actions with and without the ball. Home league match data over consecutive seasons were recorded and analysed via a multi-camera computerised tracking system (Amisco Pro®, Sport-Universal Process, Nice, France) to report physical and technical performance data. The installation process, reliability and validity of Amisco Pro® have been reported previously (Caldwell, and Peters, 2009; Di Salvo et al., 2006). The Amisco Pro® Sports Analysis Software System was used to measure and analyse...
Physical activities over consecutive seasons were recorded to describe the physical demands of match-play: time on pitch (mins), total distance covered (m), sprint distance (m) (total distance covered >23 km-h\(^{-1}\)), and high intensity distance (m) (total distance covered 19.1-23.0 km-h\(^{-1}\) plus sprint distance).

Technical variables included: possession (total time the team had possession of the ball, divided by ball in play time), total number of passes (total number of passes made by the team) and pass completion (total number of successful passes made by the team as a percentage).

Analysis of physical and technical performance variables was performed using JMP version 9.0 discovery software (SAS Institute, JMP Statistical Discovery, NC, USA). To test for changes across the full regular season a repeated measures design linear mixed model using Restricted Maximum Likelihood (REML) method for fitting (fixed factors = season; and hours between matches; random factor = participant) was used. Estimates based on the least square means were reported alongside standard error (SE). Comparisons were reported as least square mean differences and 95% confidence intervals (CI).

RESULTS

Descriptive statistics (mean ± SE) for physical and technical performance, team possession, and time between matches by league are presented in Table 1.

No difference between leagues was found for total distance (138 m, 95%CI = -82 to 358, \(P = 0.2179\)), high intensity distance (3 m, 95%CI = -51 to 56, \(P = 0.9208\)), and sprint distance (19 m, 95%CI = -20 to 57, \(P = 0.3445\)).
The players made 6 (95%CI = 0 to 11, \( P = 0.0326 \)) more passes in the EPL compared to the ECL. Pass completion was no different (1.2%, 95%CI = 0.9 to 3.2, \( P = 0.2583 \)) between the ECL and EPL.

Team possession was no different (-3%; 95%CI = -7 to 1; \( P = 0.1712 \)) between the ECL and EPL. The time between matches was however 57 hours (95%CI = 41 to 72; \( P < 0.0001 \)) less for ECL matches compared to the EPL.

Time between matches was inversely related (\( P = 0.0133 \)) to pass frequency where for approximately every additional 50 hours between matches 4 less passes were made. No other variables were related to the time between matches (see Table 1).

The main findings of this study suggest that no significant differences were found between the physical and technical performance of a team competing in the ECL and the EPL over consecutive seasons.

DISCUSSION

The aim of this study was to compare the differences in physical and technical match performance of a team competing in the ECL and the EPL over consecutive seasons. The demands of top-level soccer have been well documented (Reinzi et al., 2000; Mohr et al., 2003; Rampinini et al., 2007, Rampinini et al., 2008; Di Salvo et al., 2007, Gregson et al., 2010, Taylor et al., 2008; Dellal, et al., 2011; Di Salvo et al., 2009; Lago-Peñas et al., 2011) and variation in performance data has been reported between competitive levels (Mohr et al., 2003; Rampinini et al., 2007). It was anticipated that differences between competitive leagues would result in an increase in the physical and technical performance required to compete in the EPL season.

The main findings of this study suggest that no significant differences were found between the physical and technical performance of a team competing in the
ECL and EPL in consecutive seasons. Although the time between matches was however 57 hours (95%CI = 41 to 72 hours; \( P < 0.0001 \)) less for ECL matches compared to the EPL.

The total distance covered in the ECL and EPL was 10923 ± 415m and 11061 ± 1238m respectively, which are within the range of previously reported team data from various professional leagues (Carling et al., 2008; Dellal et al., 2010; Di Salvo et al., 2009), suggesting that aerobic capacity is essential to compete in the ECL and EPL. Although importantly there was not a significant difference between ECL and EPL, while Rienzi et al. (2000) reported that when a single match was analysed, total distance covered by South American professional players was 1000m less than EPL players, which was attributed to the technical demands associated with a different style of play. Adopting a style of play that demands greater total distances covered may increase the risk of residual fatigue over the season and reduce the capacity of the team to perform at the same intensity without significant changes in team selection (Morgans et al., in press).

Silva et al. (2013) suggest that successful teams have the capacity to sustain sprint efforts and high intensity running distances over the season. These actions have previously been outlined and constitute the more crucial moments of the match (Mohr et al., 2003) and contribute directly to winning possession of the ball and to scoring or to conceding goals (Morgans et al., in press) which have been cited as vital to team success (Reilly et al., 2000). Although, when this study examined a team competing in the ECL and EPL in consecutive seasons, the total \( (P = 0.9992) \), high intensity \( (P = 0.7465) \) and sprint \( (P = 0.7872) \) distances were clearly similar for the study team in both leagues. Although it must be noted that the stable style of play and the overall possession of the study team in both leagues are significant variables when providing a rationale for this finding.
In contrast, Rampinini et al. (2007) presented data indicating that top-level soccer teams covered greater total and high intensity distances when competing against higher quality opponents. Therefore, the current findings may suggest that regardless of the league, similar total, high intensity and sprint distances reported by the study team may be linked to technically efficient and physically capable players, a consistent style of play and the tactical strategy employed, which evidently maintains the physical demands of match-play regardless of the standard of competition. Dellal et al. (2011) suggest that the total distance covered by players may not be considered an important discriminator of performance across top-level English and European leagues.

For high intensity distance, no significant differences were found between leagues ($P = 0.7465$). The distance covered at high intensity by players in the ECL was $607 \pm 69$ m compared to $610 \pm 69$ m in the EPL ($3 \text{ m}, 95\% \text{CI} = -51$ to $56$, $P = 0.9208$). Similar to high intensity distance, no significant differences were found for sprint distance between leagues ($P = 0.7872$). The distance covered sprinting by players in the ECL was $322 \pm 48$ m compared to $304 \pm 48$ m in the EPL ($19 \text{ m}, 95\% \text{CI} = -20$ to $57$, $P = 0.3445$). Bradley et al. (2010) suggest that the increased intensity and high intensity running performed in the EPL when compared with other top-level European leagues could be explained by technical differences and tactical strategies (Bradley et al., 2010, Russell et al., 2013), while this result also provides greater evidence that the study teams consistent style and tactical model is a significant factor to ensure minimal physical variance between leagues. Rampinini et al. (2008) further found that players from more successful teams covered less total and high intensity distances compared to players from less successful teams. These results (Rampinini et al., 2008) are in contrast with previous research (Mohr et al.
that reported top-level Italian players performed more high intensity activity than lower level professional players participating in the Danish League (Mohr et al. 2003). Silva et al. (2013) further suggest that successful teams have the capacity to sustain sprint efforts and high intensity running distances over the season. These actions have previously been outlined and constitute the more crucial moments of the match (Mohr et al., 2003) and contribute directly to winning possession of the ball and to scoring or to conceding goals (Morgans et al., in press), which have been cited as vital to team success (Reilly et al., 2000).

Therefore, it may be suggested that the study team quickly adapted to the physical demands of the higher level of competition in the EPL. A viable explanation was their ability to maintain possession of the ball consistently across both leagues, while more time to recover between matches in the EPL when compared to the ECL was evident. In support of this notion, the time between matches was 57 hours (95%CI = 41 to 72 hours; \( P < 0.0001 \)) less in the ECL compared to the EPL, while team possession was no different (-3%; 95%CI = -7 to 1; \( P = 0.1712 \)) between leagues. Pass frequency during the EPL season increased by 6 passes (95%CI = 0 to 11, \( P = 0.0326 \)) was also reported. Further, hours between matches was inversely related (\( P = 0.0133 \)) to pass frequency where for approximately every additional 50 hours between matches, 4 less passes were made. Pass completion reported no significant differences (1.2%, 95%CI = 0.9 to 3.2, \( P = 0.2583 \)) between the ECL (86 ± 1%) and EPL (87 ± 1%).

In support of our technical findings, Redwood-Brown (2008) studied the frequency of passing and the percentage of successful passes five minutes before and after a goal was scored. These results (Redwood-Brown, 2008) indicate that accurate passing not only retains possession, but may also lead to goal scoring opportunities,
thus increasing successful match outcome. Furthermore, Lago-Peñas et al. (2011) analysed 250 UEFA Champions League matches (between 2007 to 2010) and found that successful teams maintain possession through high frequency and accuracy of short passes which led to increased shots on target and so the likelihood of winning improved.

However, Collett (2013) suggested that while time in possession and total number of passes predicted team success in league and international competitive matches, both variables were poor predictors for individual matches once team quality and home advantage were accounted for. To contextualise this, team possession in the present study over the ECL and EPL season was 62 ± 1% and 59 ± 1% respectively. Therefore, on average the team was without possession for only 38% and 41% of match time in each league. This clearly allowed consistent physical and technical performance to be maintained in both seasons, as the physical demands are greater when out of possession and defending (Morgans et al., in press). Our results are supported in the literature, Morgans et al. (in press) found total distance covered by the team when in possession was 72 m/min less ($P < 0.0001$) than when out of possession, possibly allowing players to maintain physical and technical performance during matches and across the season due to the high percentage of team possession.

Many authors concur that successful teams generally maintain higher ball possession (Carling, Williams and Reilly, 2005; Adams et al, 2013; Redwood-Brown, 2008) than the opposition. One plausible argument why less successful teams have reduced ball possession may be due to match or cumulative fatigue (Rampinini et al., 2008). This may suggest that fatigue inhibits the players’ ability to move quickly to create space to receive the ball and execute a pass at speed and reduces their decision-making capabilities, as opposed to a lack of technical proficiency. Therefore, factors
that explain the consistent technical match performance evident in the present study may be improved match fitness, specific technical adaptations to the demands of competitive match-play in the different leagues (Rampinini et al. 2007) and the increased number of hours between matches in the EPL allowing for enhanced recovery between matches. The consistent team possession may also be interpreted as an indication of the high technical competency of the players, reflected in the consistently high pass completion, and the possession style of play adopted by the study team regardless of the standard of competition and opposition.

The major difference between previous studies (Mohr et al. 2003; Rampinini et al., 2007) and our results are that all players involved in the present study competed in the same team over consecutive seasons at different standards of competition (ECL and EPL). While, Mohr et al. (2003) compared the physical match performance between teams from separate leagues, our findings further extend previous research (Mohr et al, 2003; Rampinini et al., 2008; Rampinini et al., 2008; Silva et al., 2013) highlighting that sustained physical and technical performance over a season at different standards of competition are crucial, while maintaining consistent team possession are important components to make a successful transition from ECL to EPL. Although the influence of team and opposition tactics should be considered within the context of these results, our results suggest that the technical skills for success in top-level professional soccer in English leagues are: team possession, pass frequency and pass completion, while a stable style of play will result in more consistency within the physical variables regardless of the level of competition.

Our findings support the inferences made that the ability to maintain physical and technical performance are crucial to team success (Hoffman et al., 2003). Recently it has also been suggested that distances covered at a range of thresholds has
proven dependent on match contextual factors. Lago-Peñas et al. (2011) highlighted that when winning, Spanish professional soccer players performed less high intensity activity than when losing. These findings (Hoffman et al., 2003; Lago-Peñas et al., 2011) support the notion that players have the capability to increase their work-rate based on the match score-line. Similar findings have also been reported (Bloomfield et al., 2007; O’Donoghue and Tenga, 2010).

The physical and technical match performance variables used in this study have previously been reported in relation to players tactical role or playing position within top-level teams (Bangsbo et al., 1991; Di Salvo et al., 2006; Mohr et al., 2003; Rienzi et al., 2000), although various methodological differences between studies make accurate comparisons of these studies difficult (Rampinini et al., 2007). The study team’s home league matches were analysed over two consecutive seasons competing in both the ECL and EPL. Therefore, these methodological differences were not present due to a standardised approach to data collection and analysis. Furthermore, sufficient data was gathered and the use of the same analysis system was employed therefore minimising analysis system differences (Dellal et al., 2011).

CONCLUSION

Previous research has suggested that physical and technical demands are related to the standard of competition. However, no study has examined a team competing in two competitive leagues of differing standards in consecutive seasons. The sustained total, high intensity and sprint distances and consistent team possession, pass frequency and pass completion across both leagues, may be attributed in part to the possession-based style adopted by the study team. The present study provides information for coaches and managers who need to develop a playing style and strategy that suit the players...
and is sustainable across consecutive seasons regardless of the standard of competition.

Physical capabilities allow players to perform activities both in and out of possession and to maintain high intensity actions (Bangsbo et al., 2006, Helgerud et al., 2001, Bangsbo, 1994, Williams and Reilly, 2000), although the overall performance in top-level soccer matches is usually determined by the technical and skill-related abilities of players (Rampinini et al., 2008). Therefore, technical and tactical abilities are widely considered to be important determinants of soccer performance (Rampinini et al., 2008) and are thus concurrently analysed in the present study.

REFERENCES


Mohr, M., Krustup, P. and Bangsbo, J. Match performance of high-standard soccer
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Table 1. Descriptive statistics (mean ± SE) for team possession, time between matches, technical and physical performance by league.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>ECL</th>
<th>EPL</th>
<th>Parameter estimate</th>
<th>Std Error</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Possession (%)</td>
<td>62 ±1</td>
<td>59 ± 1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Time between matches</td>
<td>115 ± 5</td>
<td>171 ± 5*</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Pass frequency</td>
<td>50 ± 7</td>
<td>56 ± 7*</td>
<td>-0.066</td>
<td>0.023</td>
<td>0.0045</td>
</tr>
<tr>
<td>Pass completion (%)</td>
<td>85.7 ± 1.4</td>
<td>86.9 ± 1.4</td>
<td>-0.016</td>
<td>0.008</td>
<td>0.0585</td>
</tr>
<tr>
<td>Total Distance (m)</td>
<td>10923 ± 415</td>
<td>11061 ± 1238</td>
<td>0.001</td>
<td>0.918</td>
<td>0.9992</td>
</tr>
<tr>
<td>High intensity distance (m)</td>
<td>607 ± 69</td>
<td>610 ± 69</td>
<td>0.072</td>
<td>0.223</td>
<td>0.7465</td>
</tr>
<tr>
<td>Sprint distance (m)</td>
<td>322 ± 48</td>
<td>304 ± 48</td>
<td>0.044</td>
<td>0.162</td>
<td>0.7872</td>
</tr>
</tbody>
</table>

*P<0.05