

Influence of match location, competitive level and match outcome on running performance in professional soccer players

Influências do mando de jogo, nível competitivo e resultado da partida sobre o desempenho físico em jogadores profissionais de futebol

Gabriel Colatto Sagaz¹, Lourenço Zini Moreira Aresi¹, Bruno Luiz Souza Bedo², Filipe Mesquita³, Paulo Roberto Pereira Santiago^{2,3}, Angelo Melim Azevedo¹, Helder Souza¹, Eder Gonçalves¹, Rodrigo Aquino¹

1. Centro de Educação Física e Desportos, Universidade Federal do Espírito Santo, Vitória, ES, Brazil
2. Faculdade de Medicina de Ribeirão Preto, Universidade de São Paulo, Ribeirão Preto, SP, Brazil
3. Escola de Educação Física e Esporte de Ribeirão Preto, Universidade de São Paulo, Ribeirão Preto, SP, Brazil

ABSTRACT

Introduction: The context of soccer matches (e.g., match location, competitive level, match outcome) can impact the players' physical performance. **Aim:** To investigate the effects of the match location, competitive level and match outcome on match running performance in professional Brazilian players. **Methods:** The performance data were monitored in 16 male soccer players of the same team during the following championships: 1st Division of the Capixaba Championship 2020 (n = 8 matches; n = 64 individual observations) and; 1st and 2nd Phases of the Brazil Cup 2020 (n = 2 matches; n = 16 individual observations). The match running performance was calculated using Global Positioning System: 1) total distance covered; 2) total distance covered in high-intensity; 3) total distance covered in high-acceleration. The t-test for independent measurements was used to compare the home vs away, national vs. state, and win vs. loss matches. The magnitude of the effects (ES) was calculated using Cohen's "d". Multiple linear regression was used to estimate the relative contribution of independent variables to the variation of dependent variables. **Results:** The matches played at "home" resulted in greater physical demands compared to "away" (p < 0,001–0,01, ES = moderate–very large). Matches at the national level required greater running demands than matches at the state level (p < 0,001, ES = very large). Winning matches were more physically demanding compared to losing matches (p < 0,001–0,002, ES = very large). **Conclusion:** Coaches can use this information to prescribe training sessions that are more representative of the match context.

Keywords: task performance and analysis; geographic information systems; exercise; sports nutrition sciences.

RESUMO

Introdução: O contexto das partidas de futebol (e.g., mando de jogo, nível competitivo, resultado da partida) pode impactar no desempenho físico dos jogadores. **Objetivo:** Investigar os efeitos do mando de jogo, nível competitivo e resultado final sobre o desempenho físico em jogadores profissionais. **Métodos:** Foram monitorados 16 jogadores da mesma equipe durante a participação em duas competições: 1ª Divisão do Campeonato Capixaba de 2020 (n=8 partidas; n=64 observações individuais), 1ª e 2ª Fase da Copa do Brasil de 2020 (n=2 partidas; n=16 observações individuais). O desempenho físico foi obtido usando o Sistema de Posicionamento Global: distância total percorrida; distância total percorrida em alta intensidade; distância total percorrida em alta aceleração. Foi utilizado o teste-t para medidas independentes. A magnitude do efeito (ES) foi calculada usando o "d" de Cohen. A regressão linear múltipla foi usada para estimar a contribuição relativa das variáveis independentes para a variação das variáveis dependentes. **Resultados:** Os jogos realizados "em casa" resultaram em maior demanda física em comparação aos jogos "fora de casa" (p<0,001–0,01, ES=moderado–muito grande). Os jogos a nível nacional exigiram mais fisicamente dos jogadores em comparação aos jogos a nível estadual (p<0,001, ES=muito grande). Partidas com vitória apresentaram maior exigência física quando comparado as partidas com derrota (p<0,001–0,002, ES=muito grande). O local da partida e o nível competitivo têm maiores contribuições relativas para as variações na distância total (R²=29%) e na distância em alta aceleração (R²=46%). **Conclusão:** Os treinadores podem usar essas informações para prescrever sessões de treinamento mais representativas ao contexto de jogo.

Palavras-chave: análise de desempenho e tarefas; sistemas de informação geográfica; exercício físico; ciências da nutrição e do esporte.

Received: 2th Jun 2020; Accepted: 30th Apr 2021.

Correspondence: Rodrigo Aquino, Universidade Federal do Espírito Santo, Av. Fernando Ferrari, 514 Goiabeiras 29075-910 Vitória ES aquino.rlq@gmail.com

Introduction

The match analysis is often used in team sports (e.g., soccer) to obtain objective information about the players' and teams' performance and can assist coaches in planning training sessions more in line with match demands. In addition, information of match running performance (e.g., total distance covered at high-speed running) is important physical performance indicator [1-3]. A classic study about the evolution of match physical demands showed that the total distance covered at high-speed running and the number of passes increased 50% across seven seasons of the England Premier League (season 2006-07 to season 2012-13) [4]. This growth can affect the behavior of ball possession during the matches, as a greater number of successful passes can result in higher possession values [5].

In Brazil context, there are few studies that characterized match running performance in professional soccer players [6]. In 2007, Barros, Misuta [7] verified that the players cover $\sim 10000 \pm 1024$ meters during the games, being $1,128 \pm 361$ meters in high intensity (≥ 19.0 km/h) in games of the 1st Division of the Brazilian Championship. Twelve years later, Vieira *et al.* [8] observed similar values for total distance covered (10147 ± 971 meters); however, the authors demonstrated an increase of $\sim 71\%$ in high-speed distances during 1st Division of the São Paulo State Championship. This increase in match intensity can impact the match outcome. Faude *et al.* [9] showed that 83% of goals during the German National League were preceded by some high-intensity action. In Brazil, two studies observed that matches that resulted in a victory during the 3rd and 4th Divisions of the Brazilian National Championship had greater actions in high-intensity compared to games with defeat [6,10]. Furthermore, previous studies demonstrated that match location (i.e., home vs. away) and competitive level (i.e., different divisions) can influence players' performance [11,12].

Regarding the match location, studies have shown that home matches resulted in greater physical and technical-tactical performance compared to away matches [13,14]. For example, higher values of total distance covered in high-speed running and teams' ball possession were verified in home vs. away matches [3,13,15]. These results can be explained by the familiar environment of playing at home and a more solid playing style [16,17]. Regarding the competitive level, the results in the scientific literature are divergent. In Europe (i.e., Union of European Football Associations (UEFA) and Italian League), high-level players covered greater distances in high-speed running compared to low-level players [18,19]. In contrast, Aquino *et al.* [11] showed higher values of high-speed actions in lower divisions (e.g., 4th Division of the Brazilian National Championship) vs. Upper division (i.e., 1st Division of the São Paulo State Championship).

Despite the existence of previous studies in Brazilian soccer demonstrating the effects of contextual variables on the physical and technical-tactical performance of professional players [6,10,11,20], the data are restricted to teams from São Paulo, which does not guarantee "nomothetic" observational designs [21]. Therefore, more

studies are needed at different competitive levels (state and national championships). This information can be crucial for sports coaches and scientists in understanding the real physical and technical-tactical demands according to the match context in Brazilian soccer. Thus, the aim of this study was to investigate the effects of match location (home vs. away), competitive level (state vs. national) and match outcome (won vs. loss) on match running performance during the 1st Division of the Capixaba Championship (edition 2020) and the Continental Cup in Brazil (edition 2020).

Methods

Participants and match sample

Match running performance data (80 individual observations) were monitored in 16 professional outfield male soccer players (mean \pm standard deviation; age: 25 ± 10 years; height: 177.1 ± 9.2 cm; body mass: 82.3 ± 7.5 kg) of the same team during two competitions: 1st Division of the 2020 Capixaba Championship ($n = 8$ matches; $n = 64$ individual observations), 1st and 2nd Phases of the 2020 Continental Cup in Brazil ($n = 2$ matches; $n = 16$ observations). As an inclusion criterion, only data from players who participated in ≥ 80 minutes were analyzed. In the present study, a previous sample calculation was not performed, as it is a follow-up of the entire season of the analyzed team. However, based on the study of Aquino *et al.* [6] and based on the results found in the present study for the comparisons of the total distance covered between the win (10019.6 ± 832.1 m) vs. loss matches (8322.4 ± 1238.6 m), there is a real power = 0.82, with an effect size of 1.60 and an $\alpha = 0.05$ for the match sample size. This study complies with the Code of Ethics of the World Medical Association (approved by the Swansea University Ethics Advisory Board), approved by the Research Ethics Committee of the University of São Paulo at School of Physical Education and Sport of Ribeirão Preto (protocol 108137/2015) and was carried out in accordance with the Declaration of Helsinki. Written informed consent was obtained from all players prior to the proceedings.

Measures

Dependent variables: Global Positioning System (GPS) devices were used (QSTARZ - 5 Hz, Taipei, Taiwan) [6]. GPS technology has been widely used to measure running performance in team sports and its accuracy and reliability have been previously determined [22,23]. Although the low acquisition frequency of the devices used in this study (5 Hz) could potentially underestimate the total distance covered at high speed running compared to computerized optical tracking [24], the quality control analyzes that we performed showed good reliability (coefficient of variation $\pm 5\%$). All players used the same unit throughout the competition season [25].

The GPS devices were attached between the upper scapulae approximately at the T3-4 junction and were activated 15 minutes before the matches. After the matches, data were downloaded using the software (QStarz International Co., GPS

View, version 1.2.24) and exported to CSV format for further analysis in the Matlab® environment (The Math Works Inc Natick, USA). Using specific scripts [10], the geographic coordinates were converted into Cartesian coordinates (x, y) and smoothed by a Butterworth digital filter (third order; cutoff frequency = 0.4 Hz) for later calculation of the total distance covered (TD; meters), total distance covered in high speed running (HSR; ≥ 18 km/h; meters) and total distance covered in high acceleration ($> 2\text{m/s}^2$; meters). The third-order Butterworth filter with a cut-off frequency of 0.4 Hz was used to smooth the positional data according to a quality control assessment of the GPS units in a pilot study and in previous research.

Independent variables: three independent variables were considered [10,11]: 1) match location (“home” vs. “away”); 2) competitive level (state vs. national championship) and; 3) match outcome (loss vs. win). Regarding the match location, during the 1st Division of the 2020 Capixaba Championship, 1st and 2nd Phases of the 2020 Continental Cup in Brazil, 10 matches were monitored, including seven home matches (n = 56 observations) and three away matches (n = 24 observations). Regarding the competitive level, data were collected from eight matches at the state level (n = 64 observations) and two games at the national level (n = 16 observations). Over the two competitions analyzed, the reference team in this study had nine wins (n = 72 observations) and one loss (n = 8 observations).

Statistical analysis

The normality and homogeneity of variance of the data were confirmed by the Kolmogorov-Smirnov and Levene tests, respectively. Therefore, the results were analyzed and presented as mean and standard deviation (SD). To compare the dependent variables (total distance, high-speed running, and high-acceleration) according to match location, competitive level and match outcome, the t-test for independent measures was used. The magnitude of the effect (Effect Size [ES]) was calculated using Cohen’s “d” [26]. The values of “d” were considered as: $d < 0.1$ (trivial), $0.1 < d < 0.2$ (small), $0.2 < d < 0.5$ (moderate), $0.5 < d < 0.8$ (large), $d > 0.8$ (very large). Multiple linear regression (stepwise method) was used to estimate the relative contribution of the independent variables (match location, competitive level, and match outcome) to the variation of the dependent variables. Data for regression analysis assumed homoscedasticity, independence, normal distribution, and no multicollinearity between the independent variables. The level of significance was set at 5% ($p < 0.05$). Analyzes were performed using the software IBM SPSS Statistics, for Windows, version 22.0 (IBM Corporation).

Results

Table I shows the effects of contextual variables on the match running performance over the season. Home matches resulted in greater physical demands compared to away matches ($p < 0.001-0.01$, ES = moderate-very large). Win matches pre-

sented higher physical demands than loss matches ($p < 0.001$ - 0.002 , ES = very large). Furthermore, national level matches presented greater physical demands compared to state level matches ($p < 0.001$, ES = very large).

Multiple linear regression analysis showed that all regression coefficients were significant ($p < 0.05$). Regarding the relative contribution of each independent variable, we verified that 29%, 8% and 6% of the total variance of the total distance covered was explained by the match location, competitive level, and match outcome, respectively. In relation to the total distance covered in high-speed running, 22% and 8% of its total variance was explained by the competitive level and the match outcome, respectively. Finally, 46% and 6% of the total variance of the high acceleration was explained by the competitive level and match location, respectively.

Table I - Effects of contextual variables on physical performance in professional soccer players (mean \pm standard deviation)

Variables	Match running performance								
	Total distance covered (m)	p	ES	High-speed running (m)	p	ES	High acceleration (m)	p	ES
Match location									
Home (n = 7 matches)	10212.3 \pm 802.41	< 0.001	0.21	869.5 \pm 109.7	0.01	0.62	399.9 \pm 81.4	< 0.001	1.22
Away (n = 3 matches)	9004.3 \pm 948.9			801.3 \pm 108.1			318.9 \pm 46.0		
Match outcome									
Win (n = 9 matches)	10019.6 \pm 832.1	< 0.001	1.60	862.3 \pm 107.4	0.001	1.30	384.7 \pm 78.6	0.002	1.32
Loss (n = 1 matches)	8322.4 \pm 1238.6			730.3 \pm 95.9			293.1 \pm 58.6		
Competitive level									
National (n = 2 matches)	10745.4 \pm 450.8	< 0.001	1.45	957.9 \pm 67.0	< 0.001	1.82	486.2 \pm 28.0	< 0.001	3.00
State (n = 8 matches)	9625.9 \pm 988.4			821.8 \pm 105.7			347.9 \pm 65.1		

Note: ES = Effect Size; High-speed running = total distance covered above 18 km/h; High acceleration = total distance covered above 2 m/s²

Discussion

The aim of the present study was to examine the effects of match location (home vs. away home), competitive level (state vs. national) and match (loss vs. win) on the match running performance in a professional Brazilian soccer team. In addition, the relative contributions of each independent were analyzed. The results showed that home, winning, and national level matches presented greater running

demands compared to their counterparts. Furthermore, we verified that the match location and the competition level have greater relative contributions to the variations in the total distance ($R^2 = 29\%$) and in the total distance covered in high acceleration ($R^2 = 46\%$), respectively.

Few studies have analyzed the independent and interactive effects of match contextual variables on running performance in professional players in Brazilian soccer [15,17,27]. Our data for the total distance covered (i.e., $TD = 9849.9 \pm 1010.3$ m) are similar to the values found in professional soccer players from Serie A of the Brazilian National Championship in the 2007 season ($TD = 10012 \pm 1924$ m) [7] and the 1st Division of the São Paulo Championship in the 2016/2017 season ($TD = 10147 \pm 971$ m) [8]. However, we verified lower values for the distance covered at high speed running ($HSR = 849.1 \pm 113$ m) compared to matches of the 1st Division of the São Paulo Championship in the 2015/2016 season ($HSR = 1924.9$ m) [8].

Research about the influence of match location on players' performance has been received extensive coverage in the last two decades [13,15,28]. Previous studies showed that teams change their playing style and match strategies according to the match location [3,5,28,29]. Therefore, the match location was considered an important factor that influence offensive and defensive performance in soccer [30,31]. For example, Thomas *et al.* [32] showed that the home advantage occurred in 60.7% of the 4426 matches in the English Football Premiership. Lago and Martín [5] showed that teams playing at home have more possession than visiting teams, using data from 170 matches from the Spanish Football League (season 2003-4). The same behavior was found by several other studies [27,33,34], in line with our findings. In this study, home matches presented greater running outputs than away matches. Previous research in sports psychology has listed some factors that may explain this behavior, such as spectators effects [35,36], familiarity with the location and absence of travel [37]. In addition, the tactical strategy adopted by the team at home (i.e., controlling the match with ball possession strategy) may explain this advantage [5]. In fact, players must adapt physiologically and psychologically to different match scenarios. For example, Pollard [16] showed that players are more familiar with the installation and environment when playing at home, which can result in more positive physiological and psychological states [38].

Another important variable to explain the results refers to the competitive level. In this study, when the analyzed team played the national championship, we observed greater TD and match intensity (higher values of high-speed running and high acceleration). Similar findings were reported by Rampinini, Coutts [19], in a study of players from a semi-finalist UEFA Champions League club. This behavior seems to be more physically demanding due to the need to "surprise" and "uncontrol" the opposing team's playing style, making it difficult for opponents to retrieve the ball, which indicates that players must be physically prepared to play against strong opponents. Although there are studies showing that matches against weak opponents have a higher percentage of possession than matches against strong opponents. This

demonstrates that stronger teams dominate possession against their weaker opponents and, therefore, print less intensity of play [3,15,34]. This can be explained by the system and style of play adopted by the team, preferring to “control” the game by maintaining possession of the ball. This style is known as positional attack, in which the team has a slower game, usually using short passes and seeking to create spaces between the opposing defensive lines [3].

Regarding the match outcome, there are two possible reasons to explain the lower match intensity when the analyzed team lost. First, Lago [3], in a case study of the Espanyol Fútbol Club (season 2005-2006), showed that ball possession was greater when the team was losing vs. winning. This can be explained by the change in the team formation and playing style adopted by the team, preferring to “control” the game by positional attack. Under these conditions, it is suggested that players present low running intensity, as demonstrated in the present study, in which the variables that determine the intensity of the game (high-speed and high acceleration) were significantly lower when the team lost. In addition, Moura *et al.* [39] showed reduced values of team surface area without vs. with ball possession in professional Brazilian soccer. Therefore, as reduced tactical performance is expected to occur simultaneously with reduced physical performance [40], an excessively defensive strategy, such as when the team mainly adopts a more compact style of play and/or without possession of the ball for a long time, can reduce the running demands.

Overall, this study supports the criticisms of Mackenzie and Cushion [30], that highlight the importance of considering the contextual factors of the match in the analysis of soccer performance. Coaches can use this information to prepare their teams for the specific competitive situation in which they will play [15]. Therefore, coaches must be aware that the physical demands of the match are influenced by match location, competitive level, and match outcome. This information allows the creation of strategies to maximize the athletes’ physical performance during the matches.

It is important to highlight that this study has some limitations. First, the fact that the influence of the contextual variables of the match was followed by only one team limits the generalizability of the data. Second, there is a lack of information in this study about possible influences of other variables related to the match context, such as team formation (1-4-4-2, 1-4-3-3), and technical-tactical performance indicators. However, several studies have evaluated the influence of contextual variables on technical-tactical performance [14,27,41,42]. Third, the match sample size for each independent variable were different and this can be considered a limitation of this study. However, previous studies with the same observational design often show this sampling difference, largely due to real observation throughout the season, which makes it difficult to balance the number of matches for each context analyzed [3,6,10-13].

Conclusion

The findings of this study are new and provide pertinent information about physical requirements during soccer season. The analyzed players covered greater total distance, distance in high-speed running (> 18 km/h) and distance in high acceleration (> 2 m/s²) in home location, national level and when win the matches. Coaches can use this information to prescribe more representative training sessions, and to adapt post-match recovery strategies in relation to the physical requirements during the matches. Further studies in Brazilian soccer can consider tactical-technical indicators and include other contextual variables (e.g., coach change, travel).

Conflict of interest

No conflict of interest with relevant potential.

Financing source

Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP; processos: 2019/17729-0; 2014/16164-5) e Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) – Código de financiamento 001.

Author's contributions

Conception and design of the research: Sagaz CS, Aresi LZ, Azevedo AM, Souza H, Aquino R. **Data collection, statistical analysis and writing of the manuscript:** Sagaz CS, Aresi LZ, Bedo B, Mesquita F, Santiago PRP, Gonçalves E, Azevedo AM, Souza H, Aquino R. **Critical review of the manuscript:** Sagaz CS, Aresi LZ, Gonçalves E, Aquino R. **Publication of the document:** Sagaz CS, Aresi LZ, Aquino R.

Acknowledgement

Our thanks to the Vitória Football Club (Espírito Santo State). In addition, our thanks to the Prof. Dr. Danilo Sales Bocalini and Prof. Dr. Ubirajara de Oliveira for the suggestions.

References

1. Hughes MD, Bartlett RM. The use of performance indicators in performance analysis. *J Sports Sci* 2002;20(10):739-54. doi: 10.1080/026404102320675602
2. Carling C, Williams AM, Reilly T. *Handbook of soccer match analysis: A systematic approach to improving performance*. London: Psychology Press; 2005.
3. 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(13):1463-9. doi: 10.1080/02640410903131681
4. Barnes C, Archer D, Hogg B, Bush M, Bradley P. The evolution of physical and technical performance parameters in the English Premier League. *Int J Sports Med* 2014;35(13):1095-100. doi: 10.1055/s-0034-1375695
5. Lago C, Martín R. Determinants of possession of the ball in soccer. *J Sports Sci* 2007;25(9):969-74. doi: 10.1080/02640410600944626
6. Aquino R, Martins GHM, Vieira LHP, Menezes RP. Influence of match location, quality of opponents, and match status on movement patterns in Brazilian professional football players. *J Strength Cond Res* 2017;31(8):2155-61. doi: 10.1519/JSC.0000000000001674
7. Barros RM, Misuta MS, Menezes RP, Figueroa PJ, Moura FA, Cunha SA, et al. Analysis of the distances covered by first division Brazilian soccer players obtained with an automatic tracking method. *J Sports Sci Med* 2007;6(2):233.
8. Vieira LHP, Aquino R, Moura FA, de Barros RM, Arpini VM, Oliveira LP, et al. Team dynamics, running, and skill-related performances of Brazilian U11 to professional soccer players during official

- matches. *J Strength Cond Res* 2019;33(8):2202-16. doi: 10.1519/JSC.0000000000002577
9. Faude O, Koch T, Meyer T. Straight sprinting is the most frequent action in goal situations in professional football. *J Sports Sci* 2012;30(7):625-31. doi: 10.1080/02640414.2012.665940
 10. Aquino R, Carling C, Vieira LHP, Martins G, Jabor G, Machado J, et al. Influence of situational variables, team formation, and playing position on match running performance and social network analysis in Brazilian professional soccer players. *J Strength Cond Res* 2020;34(3):808-17. doi: 10.1519/JSC.0000000000002725
 11. Aquino R, Vieira LHP, Carling C, Martins GH, Alves IS, Puggina EF. Effects of competitive standard, team formation and playing position on match running performance of Brazilian professional soccer players. *International Journal of Performance Analysis in Sport* 2017;17(5):695-705. doi: 10.1080/24748668.2017.1384976
 12. Lago-Peñas C. The role of situational variables in analysing physical performance in soccer. *J Hum Kinet* 2012;35(1):89-95. doi: 10.2478/v10078-012-0082-9
 13. Lago-Peñas C, Dellal A. Ball possession strategies in elite soccer according to the evolution of the match-score: the influence of situational variables. *J Hum Kinet* 2010;25:93-100. doi: 10.2478/v10078-010-0036-z
 14. Lago-Peñas C, Lago-Ballesteros J. Game location and team quality effects on performance profiles in professional soccer. *J Sports Sci Med* 2011;10(3):465.
 15. Almeida CH, Ferreira AP, Volossovitch A. Effects of match location, match status and quality of opposition on regaining possession in UEFA Champions League. *J Hum Kinet* 2014;41(1):203-14. doi: 10.2478/hukin-2014-0048
 16. Pollard R. Home advantage in football: A current review of an unsolved puzzle. *Open Sports Sci J* 2008;1(1). doi: 10.2174/1875399X00801010012
 17. Liu H, Gómez M-A, Gonçalves B, Sampaio J. Technical performance and match-to-match variation in elite football teams. *J Sports Sci* 2016;34(6):509-18. doi: 10.1080/02640414.2015.1117121
 18. Mohr M, Krstrup P, Bangsbo J. Match performance of high-standard soccer players with special reference to development of fatigue. *J Sports Sci* 2003;21(7):519-28. doi: 10.1080/0264041031000071182
 19. Rampinini E, Coutts AJ, Castagna C, Sassi R, Impellizzeri F. Variation in top level soccer match performance. *Int J Sports Med* 2007;28(12):1018-24. doi: 10.1055/s-2007-965158
 20. Vieira LHP, Aquino R, Lago-Peñas C, Martins GHM, Puggina EF, Barbieri FA. Running performance in Brazilian professional football players during a congested match schedule. *J Strength Cond Res* 2018;32(2):313-25. doi: 10.1519/JSC.0000000000002342
 21. Argilaga MTA, Villaseñor AB, Mendo AH, López JLL. Diseños observacionales: ajuste y aplicación en psicología del deporte. *Cuad Psicol del Deporte* 2011;11(2):63-76.
 22. Barbero-Álvarez JC, Coutts A, Granda J, Barbero-Álvarez V, Castagna C. The validity and reliability of a global positioning satellite system device to assess speed and repeated sprint ability (RSA) in athletes. *J Sci Med Sport* 2010;13(2):232-5. doi: 10.1016/j.jsams.2009.02.005
 23. Coutts AJ, Duffield R. Validity and reliability of GPS devices for measuring movement demands of team sports. *J Sci Med Sport* 2010;13(1):133-5. doi: 10.1016/j.jsams
 24. Randers MB, Mujika I, Hewitt A, Santisteban J, Bischoff R, Solano R, et al. Application of four different football match analysis systems: A comparative study. *J Sports Sci* 2010;28(2):171-82. doi: 10.1080/02640410903428525
 25. Jennings D, Cormack S, Coutts AJ, Boyd LJ, Aughey RJ. Variability of GPS units for measuring distance in team sport movements. *Int J Sports Physiol Perform* 2010;5(4):565-9. doi: 10.1123/ijsp.5.4.565
 26. Cohen J. *Statistical power for the behavioural sciences*. Hillsdale, NY: Lawrence Erlbaum; 1988.
 27. Taylor JB, Mellalieu SD, James N, Shearer DA. The influence of match location, quality of opposition, and match status on technical performance in professional association football. *J Sports Sci* 2008;26(9):885-95. doi: 10.1080/02640410903131681
 28. Lago-Ballesteros J, Lago-Peñas C. Performance in team sports: Identifying the keys to success in soccer. *J Hum Kinet* 2010;25(1):85-91. doi: 10.2478/v10078-010-0035-0
 29. Lago-Peñas C, Lago-Ballesteros J, Rey E. Differences in performance indicators between winning and losing teams in the UEFA Champions League. *J Hum Kinet*. 2011;27(1):135-46. doi: 10.2478/v10078-011-0011-3
 30. Mackenzie R, Cushion C. Performance analysis in football: A critical review and implications for

- future research. *J Sports Sci* 2013;31(6):639-76. doi: 10.1080/02640414.2012.746720
31. Sarmento H, Marcelino R, Anguera MT, Campaniço J, Matos N, Leitão JC. Match analysis in football: a systematic review. *J Sports Sci* 2014;32(20):1831-43. doi: 10.1080/02640414.2014.898852
32. Thomas S, Reeves C, Davies S. An analysis of home advantage in the English Football Premiership. *Percept Mot Ski* 2004;99(3Suppl):1212-6.
33. Jones P, James N, Mellalieu SD. Possession as a performance indicator in soccer. *Int J Perform Anal Sport* 2004;4(1):98-102.
34. Bloomfield J, Polman R, O'donoghue P. Effects of score-line on team strategies in FA Premier League Soccer. *J Sports Sci* 2005;23(2):192-3.
35. Agnew GA, Carron AV. Crowd effects and the home advantage. *Int J Sport Psychol* 1994;25(1):53-62.
36. Dowie J. Why Spain should win the world cup. *New Scientist* 1982;94(1309):693-5.
37. Pace A, Carron AV. Travel and the home advantage. *Can J Sport Sci* 1992;17(1):60-4.
38. Poulter DR. Home advantage and player nationality in international club football. *J Sports Sci* 2009;27(8):797-805. doi: 10.1080/02640410902893364
39. Moura FA, Martins LEB, Anido RDO, De Barros RML, Cunha SA. Quantitative analysis of Brazilian football players' organisation on the pitch. *Sports Biomech* 2012;11(1):85-96. doi: 10.1080/14763141.2011.637123
40. Moura FA, Martins LEB, Anido RO, Ruffino PRC, Barros RM, Cunha SA. A spectral analysis of team dynamics and tactics in Brazilian football. *J Sports Sci* 2013;31(14):1568-77. doi: 10.1080/02640414.2013.789920
41. Tucker W, Mellalieu DS, James N, Taylor BJ. Game location effects in professional soccer: A case study. *International Journal of Performance Analysis in Sport* 2005;5(2):23-35.
42. Moura FA, Martins LEB, Cunha SA. Analysis of football game-related statistics using multivariate techniques. *J Sports Sci* 2014;32(20):1881-7. doi: 10.1080/02640414.2013.853130