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THE INFLUENCE OF A CONGESTED FIXTURE PERIOD ON PHYSICAL AND TECHNICAL PERFORMANCE DURING MATCHES WORLD CHAMPIONSHIP 2014¹

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Abstract

Introduction. The aims of the current study were to identify the influence of playing multiple games with a short recovery on physical and technical activity, which is one of the main determinants of soccer performance. **Material and methods.** We have examined the time-motion characteristics of the matches played in the group stage during the World Cup Brazil 2014. Footballers played five consecutive matches separated by 4 days. The examined 62 physical and technical performance profiles were: Central Defenders = 16, External Defenders = 14, Defensive Central Midfielders = 8, Offensive Central Midfielders = 6, External Midfielders = 11, and Forwards = 7. Four thresholds were used to evaluate distances run in four categories of the following running intensities: 0,0–14,0 km/h (walking and light-intensity running, Light-IR); 14,1–19,0 km/h (moderate-intensity running, MIR); 19,1–23,0 km/h (high-intensity running, HIR) and >23,1 km/h (Sprint). **Results.** Five technical variables were examined: shots, passes, successful passes, ball recoveries and clearances. It was shown that physical and technical activities were unaffected during the congested fixture period. There was a lack of statistical difference in the distance covered at different intensities by footballers playing particular positions on the pitch. Significant differences appeared in clearances activity, an element used in defensive game. They concerned only ED, CD and CMD. **Conclusion.** It is difficult to analyse performance in matches where recovery time between them is short. There should be carried out further studies that would determine possibilities of footballers to maintain high game performance in consecutive matches with a short recovery time as well as the influence of such periods on the technical activity.

Key words: performance analysis, elite soccer players, time-motion analysis, technical activity fixture congestion.

Анджей Сорока, Олександр Стула, Шимон Млинек. Вплив визначеного періоду навантаження на фізичне та технічне виконання під час чемпіонату світу з футболу 2014 р. **Вступ.** Метою дослідження є визначення впливу декількох ігор із коротким відновленням фізичної та технічної активності, що є одним з основних детермінантів футбольної гри. **Методи та матеріали.** Ми розглянули часові та рухові характеристики матчів групового етапу під час чемпіонату світу з футболу в Бразилії 2014 р. Футболісти відіграли п'ять послідовних матчів упродовж чотирьох днів. Досліджено 62 фізичні та технічні профілі виконання: центральні захисники = 16, Зовнішні захисники = 14, центральні півзахисники = 8, центральні атакуючі напівзахисники = 6, зовнішні півзахисники = 11 та Форварди = 7. Для оцінки використано чотири рівні наступних чотирьох категорій інтенсивності руху: 0,0–14,0 км/год (ходьба та пробіг легкої інтенсивності, Light-IR); 14,1–19,0 км/год (пробіг середньої інтенсивності, MIR); 19,1–23,0 км / год (висока інтенсивність пробігу, HIR) і > 23,1 км / год (Sprint). **Результати дослідження.** Розглянуто п'ять технічних змінних: удари, паси, успішні паси, відбирання м'яча та удари від воріт. Показано, що фізичні та технічні дії не зазнали впливу під час певного періоду навантаження. Відсутня є статистична різниця у відстані між футболістами, із різною інтенсивністю, котрі займають певні позиції на полі. Значні відмінності з'явилися в ударах від воріт, прийомів, що використовуються під час захисту. Вони стосуються тільки ED, CD і CMD. **Висновки.** Важко аналізувати ефективність футбольних матчів, коли час відновлення між ними короткий. Потрібно провести подальші дослідження, які б визначали можливості футболістів підтримувати високу продуктивність гри в послідовних матчах із коротким періодом відновлення, а також впливом таких періодів на технічну активність.

Ключові слова: аналіз продуктивності, футбольна еліта, аналіз руху за часом, навантаження визначеної технічної активності.

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Анджей Сорока, Александр Стула, Шимон Млинек. Влияние определенного периода нагрузки на физическое и техническое исполнение во время чемпионата мира по футболу 2014 г. Введение. Целью данного исследования является определение влияния нескольких игр с коротким восстановлением физической и технической активности, что есть одним из основных детерминант футбольной игры. **Методы и материалы.** Мы рассмотрели временные и двигательные характеристики матчей группового этапа во время чемпионата мира по футболу в Бразилии в 2014 г. Футболисты сыграли пять последовательных матчей в течение четырех дней. Исследованы 62 физические и технические профили выполнения: центральные защитники = 16; внешние защитники = 14; центральные полузащитники = 8, центральные атакующие полузащитник = 6, внешние полузащитники = 11 и форварды = 7. Для оценки использованы четыре уровня в следующих четырех категориях интенсивности движения: 0,0–14,0 км/ч (ходьба и пробег легкой интенсивности, Light-IR) 14,1–19,0 км/ч (пробег средней интенсивности, МИР) 19,1–23,0 км/ч (высокая интенсивность пробега, HIR) и > 23,1 км/ч (Sprint). **Результаты исследования.** Рассмотрены пять технических переменных: удары, пасы, успешные пасы, отбор мяча и удары от ворот. Показывается, что физические и технические действия не подвергаются воздействию во время определенного периода нагрузки. Отсутствующей есть статистическая разница в расстоянии между футболистами, с разной интенсивностью, которые занимают определенные позиции на поле. Значительные различия появились в ударах от ворот, приемах, используемых при защите. Они касаются только ED, CD и CMD. **Выводы.** Трудно анализировать эффективность футбольных матчей, когда время восстановления между ними есть коротким. Необходимо провести дальнейшие исследования, определяющие возможности футболистов поддерживать высокую производительность игры в последовательных матчах с коротким периодом восстановления, а также влиянием таких периодов на техническую активность.

Ключевые слова: анализ производительности, футбольная элита, анализ движения по времени, нагрузки определенной технической активности.

Introduction. Each year the number of matches played by the world elite players increases. Maintaining high activity of players during the season depends heavily on the ability to fast recovery of the organism and very good physical preparation to undertake further efforts [1–2]. Currently, playing two matches in a week or even more in a short period of time without the possibility of full physical recovery has become a norm [3].

There is a potential risk that the periods of match fixture congestion may lead to residual fatigue. The cause of this phenomenon lies in the inability to complete the players' physical recovery between successive matches [4]. In post-match time the players may suffer from muscle soreness resulting from micro-traumas, what in the case of the lack of full recovery may lead to muscle damage [5].

Previous research suggest that this period of successive matches does not induce a high level of fatigue on players [6–8], confirmed by the lack of significant differences in the total distance covered and particular intensities in matches played every few days and without a full recovery between them [9–10].

However, in this study we analyze physical and technical performance in a knockout stage as well as physical and technical capabilities in consecutive matches, where the gap break between them does not allow for a full physical recovery of players. The aims of the current study were to identify match performance physical profiles of players and analyze effects of a prolonged period of fixture congestion on technical activity, which is one of the main determinants of soccer performance.

There was a hypothesis that physical activity expressed as the length of distance covered and technical activity in footballers playing 5 matches with on average 4 days of recovery between them showed no significant differences. It is assumed that the level of physical preparation of the world elite players is at a very high level.

Material and Methods. To analyse the effect of repeated games on physical performance, we have examined the time-motion characteristics of the matches played in the group stage during the World Cup Brazil 2014. Footballers played five consecutive matches separated by 4 days: including 3 games in the group stage and 2 in the knockout stage. The players included in the study met two basic criteria: (1) completing at least 75 minutes in four or more matches, and (2) because the physical loading of goalkeepers differs from that of field players, they were not included in the study. Altogether, 62 physical and technical performance profiles were examined (Central Defenders (CD) = 16, External Defenders (ED) = 14, Defensive Central Midfielders (DCM) = 8, Offensive Central Midfielders (OCM) = 6, External Midfielders (EM) = 11, and Forwards (F) = 7). The study conforms to the code of ethics of the World Medical Association and the standards for research's recommendation of the Helsinki Declaration. The protocol was approved by the local university ethics committee. To ensure team and player confidentiality, all performance data were anonymised before analysis.

Match performance data were collected using a computerized multiple-camera tracking system (ProzoneSport Ltd[®], Leeds, UK). Player' movements were captured during matches by cameras positioned at roof level and analyzed using proprietary software to produce a dataset of each player's physical performance. The validity and reliability of this tracking system has been quantified to verify the capture process and data accuracy [11–13]. The total distance covered during all official matches was measured. Four thresholds were used to evaluate the distances run in four categories of running intensity: 0,0–14,0 km/h (walking and light-intensity running, Light-IR); 14,1–19,0 km/h (moderate-intensity running, MIR); 19,1–23,0 km/h (high-intensity running, HIR) and >23,1 km/h (Sprint). Five technical variables were examined: shots, passes, successful passes, ball recoveries and clearances. Operational definitions of these variables are presented in table 1 [14].

Table 1

Operational Definitions of the Technical Variables

Variables	Values of the Variables
Shots	An attempt to score a goal, made with any (legal) part of the body, both shots on goal, shots on target, shots blocked and shots from set piece.
Passes	All played passes with the ball
Effectiveness of passes	All positive passes with the ball
Ball Recoveries	Recovering the ball from the opponent in a direct duel
Clearances	Clearance of the ball from the football field in order to relieve pressure

All statistical analyses were conducted using the statistical package Statistica (version 10,0, Poland) SP. Results are expressed as means \pm standard deviations. Before using parametric tests, the Kolmogorov-Smirnov test completed by the Lilliefors' correction was used to evaluate normality of distribution of the data. A 1-way repeated measures ANOVA was used to compare outcome measures in each category of physical (overall distance covered and that in Light-IR, MIR, HIR and Sprint) and technical performance. Follow-up post-hoc Tukey's post hoc tests were performed when appropriate. Statistical significance was set at $p < 0.05$.

Results. The physical indicators across playing positions in the five successive matches are summarized in table 2. DCM and F did not show differences in their physical performance across the five consecutive matches. ED, OCM and EM covered higher total distances in the Match 1 compared with Match 2, Match 3, Match 4 and Match 5 ($p < 0,05$). Finally, ED and OCM covered higher distances in Light-IR in Match 1 compared with other Matches ($p < 0,05$).

When all the playing positions are analyzed jointly, footballers covered higher total distances in TD and MIR in Match 1 (10287,1 and 1636,2) vs. Match 4 (9855,3 and 1516,5) and Match 5 (9875,9 and 1446,0), Match 2 (10215,5 and 1610,4) vs. Match 4 and Match 5, Match 3 (10191,1 and 1610,6) vs. Match 4 and Match 5 ($p > 0,05$). Players covered higher distances in Light-IR in Match 1 (5962,7) vs. Match 4 (5767,1) and Match 2 (5941,9) vs. Match 4. Finally, distances covered in HIR were higher in Match 2 (2795,5) vs. Match 4 (2563,4) and Match 5 (2522,0) and Match 3 (2744,6) vs. Match 4 and Match 5 ($p < 0,05$). No differences were found in the distance covered by sprint (table 2).

The technical indicators across playing position in the five successive matches are summarized in table 3. OCM, EM and F did not show differences in their technical performance across the five consecutive. ED, CD and DCM reported differences in the number of clearances (Match 4 vs. Match 1, Match 2 and Match 3; Match 5 vs. Match 1 and Match 2 and Match 3). ($p < 0,05$). However, there is not a clear tendency of how playing multiple games modified this variable. No differences were found between matches in other technical variables.

Table 2

Changes in Measures of Physical Performance in Soccer Players During the World Cup Brazil 2014 According to their Playing Position

Variables and Position		Matches					Statistical Differences	
		Match 1	Match 2	Match 3	Match 4	Match 5	F	P
Overall	Total Distance	10287.1	10215.5	10191.1	9855.3	9875.9	3.324	0.017 ¹
	Walking and light-intensity running (Light IR)	5962.7	5941.9	5828.0	5767.1	5824.3	2.646	0.033 ²
	Moderate-intensity running (MIR)	1636.2	1610.4	1610.6	1516.5	1446.0	3.750	0.005 ¹
	High-Intensity Running (HIR)	2685.8	2795.5	2744.6	2563.4	2522.0	2.525	0.004 ³
	Sprint	32.8	35.2	37.0	34.2	34.3	1.798	0.012
External Defenders	Total Distance	10248.0	10184.3	10155.1	9908.2	9703.5	2.583	0.044 ⁴
	Walking and light-intensity running (Light IR)	5941.7	5878.1	5719.0	5731.2	5703.4	2.527	0.048 ⁵
	Moderate-intensity running (MIR)	1587.7	1600.0	1582.0	1575.7	1429.8	1.501	0.210
	High-Intensity Running (HIR)	2713.3	2768.6	2782.2	2581.9	2571.1	1.115	0.355
	Sprint	34.7	39.0	39.2	33.7	36.1	1.397	0.243
Central Defenders	Total Distance	9736.5	9756.8	9399.3	9285.5	9256.3	1.597	0.182
	Walking and light-intensity running (Light IR)	6095.4	6048.7	5862.7	5810.6	5903.8	1.689	0.159
	Moderate-intensity running (MIR)	1553.8	1548.8	1455.8	1385.8	1348.6	2.636	0.039 ⁶
	High-Intensity Running (HIR)	2091.3	2065.4	2101.9	2033.3	1945.2	1.884	0.120
	Sprint	22.3	26.1	25.8	26.0	24.7	1.174	0.327
Defensive Central Midfielders	Total Distance	11008.0	10603.1	10389.4	10397.1	10500.1	0.557	0.186
	Walking and light-intensity running (Light IR)	5989.6	5823.5	5559.9	5857.2	5887.7	0.820	0.513
	Moderate-intensity running (MIR)	1990.3	1908.1	1836.1	1782.1	1772.6	0.799	0.530
	High-Intensity Running (HIR)	3035.9	2873.6	2993.0	2805.3	2761.8	0.653	0.626
	Sprint	30.9	31.2	34.0	32.6	33.8	0.367	0.830
Offensive Central Midfielders	Total Distance	11131.3	10461.0	10844.2	9708.9	10060.1	2.832	0.037 ⁶
	Walking and light-intensity running (Light IR)	5960.8	5951.5	5908.0	5341.1	5725.7	3.358	0.018 ⁷
	Moderate-intensity running (MIR)	1944.7	1624.8	1831.6	1564.7	1554.2	1.933	0.124
	High-Intensity Running (HIR)	3213.7	2895.4	3097.0	2778.7	2780.2	1.158	0.344
	Sprint	35.4	38.7	39.4	35.6	36.6	0.290	0.882
External Midfielders	Total Distance	10613.0	10325.1	10578.0	10021.4	10082.3	2.522	0.047 ¹ (10) ₁
	Walking and light-intensity running (Light IR)	5991.7	5997.1	5980.7	5822.2	5864.8	0.555	0.695
	Moderate-intensity running (MIR)	1596.2	1508.8	1563.7	1420.7	1422.6	1.512	0.206
	High-Intensity Running (HIR)	3016.9	2835.1	3046.0	2782.9	2794.8	1.690	0.161
	Sprint	43.4	41.3	47.1	41.7	42.7	2.537	0.053
Forwards	Total Distance	9211.0	10216.0	10097.5	9877.2	9980.6	0.719	0.583
	Walking and light-intensity running (Light IR)	5637.3	5897.5	5907.9	5836.8	5814.0	0.259	0.902
	Moderate-intensity running (MIR)	1226.2	1490.0	1491.9	1392.1	1292.7	0.84 a ⁷	0.504
	High-Intensity Running (HIR)	2347.0	2830.7	2691.1	2649.2	2495.5	0.785	0.542
	Sprint	32.3	41.5	38.7	39.3	32.7	1.296	0.288

¹ Match 1 > Match 4 and > Match 5; Match 2 > Match 4 and > Match 5; Match 3 > Match 4 and > Match 5.
² Match 1 > Match 4; Match 2 > Match 4;
³ Match 2 > Match 4 and > Match 5; Match 3 > Match 4 and > Match 5;
⁴ Match 1 > Match 4 and > Match 5; Match 2 > Match 4 and > Match 5;
⁵ Match 1 > Match 5;
⁶ Match 1 > Match 4 and > Match 5;
⁷ Match 1 > Match 4; Match 2 > Match 4; Match 3 > Match 4;
⁸ Match 1 > Match 4 and > Match 5; Match 2 > Match 4 and > Match 5; Match 3 > Match 4 and > Match 5.

When all the playing positions are analyzed jointly, the number of passes and the effectiveness were different in Match 1 vs. Match 5 and Match 4 vs. Match 5. Finally, the number of clearances were different in Match 4 vs. Match 1, Match 2 and Match 3; Match 5 vs. Match 1 and Match 2 and Match 3 ($p < 0,05$) (table 3).

Table 3

Changes in Measures of Technical Performance in Soccer Players During the World Cup Brazil 2014 According to their Playing Position

Variables		Matches					Statistical Differences	
		Match 1	Match 2	Match 3	Match 4	Match 5	F	P
Overall	Shots	2.43	2.28	2.34	2.66	2.03	1.082	0.365
	Passes	48.65	43.12	43.74	50.62	40.64	3.532	0.007 ¹
	Successful Passes	40.84	34.23	34.78	39.56	30.83	3.891	0.004 ¹ (2)
	Ball Recoveries	1.11	0.90	1.21	1.06	1.26	1.107	0.352
	Clearances	1.98	2.09	2.09	3.32	2.97	3.486	0.009 ²
External Defenders	Shots	2.00	1.40	2.00	1.72	1.33	0.515	0.725
	Passes	55.81	51.06	48.66	59.93	50.18	1.423	0.234
	Successful Passes	44.87	39.81	37.53	45.50	36.93	1.298	0.278
	Ball Recoveries	1.37	1.50	1.53	1.75	1.62	0.173	0.951
	Clearances	2.06	2.25	2.66	4.50	4.06	3.578	0.007 ²
Central Defenders	Shots	1.71	1.25	1.08	1.33	1.20	1.471	0.230
	Passes	50.10	42.33	39.44	49.11	43.55	0.841	0.502
	Successful Passes	45.42	36.83	33.94	42.77	36.72	1.009	0.407
	Ball Recoveries	1.89	1.22	1.44	2.27	2.50	3.185	0.017 ²
	Clearances	5.73	5.38	5.38	7.50	6.98	2.845	0.038 ²
Defensive Central Midfielders	Shots	1.66	1.25	1.16	1.87	1.25	1.621	0.202
	Passes	61.63	48.38	49.45	56.15	42.92	1.987	0.178
	Successful Passes	55.72	40.61	42.90	48.78	36.23	1.483	0.219
	Ball Recoveries	1.63	1.40	1.72	1.36	1.32	0.223	0.924
	Clearances	1.63	1.61	1.72	3.14	2.92	3.026	0.024 ²
Offensive Central Midfielders	Shots	2.42	3.00	2.75	3.50	2.28	0.460	0.763
	Passes	58.88	53.12	65.45	71.28	51.23	0.955	0.442
	Successful Passes	50.22	42.87	53.09	55.28	37.22	0.997	0.420
	Ball Recoveries	0.67	1.02	0.81	0.85	0.59	0.268	9.896
	Clearances	0.44	0.62	0.72	0.71	0.66	0.105	0.979
External Midfielders	Shots	2.69	3.46	2.86	3.66	2.21	1.503	0.211
	Passes	44.56	41.93	37.81	47.37	34.18	1.719	0.154
	Successful Passes	35.56	32.37	28.06	33.31	24.24	1.626	0.176
	Ball Recoveries	0.56	0.43	0.81	0.76	0.81	0.483	0.747
	Clearances	0.43	0.93	0.31	0.93	0.68	1.309	0.274
Forwards	Shots	3.71	2.33	3.12	4.25	3.33	1.107	0.369
	Passes	33.12	29.08	32.08	31.33	27.50	0.468	0.758
	Successful Passes	24.88	19.33	22.87	22.33	19.23	0.554	0.588
	Ball Recoveries	0.66	0.22	0.37	0.33	0.62	0.713	0.588
	Clearances	0.22	0.44	0.62	1.02	1.04	2.841	0.098

¹ – Match 1 > Match 5; Match 4 > Match 5.

² – Match 4 > Match 1 and Match 2 and Match 3; Match 5 > Match 1 and Match 2 and Match 3.

Discussion. The study aimed to investigate the impact of playing multiple games with a short recovery time between matches on physical and technical performance in elite soccer players. The major findings was that physical and technical activities were unaffected during the congested fixture period.

The lack of statistical difference in the distance covered at different intensities by footballers playing on the particular position is in line with the studies [15–17]. However, it was shown that when all the playing positions are analyzed jointly, footballers covered higher total distances in TD and MIR in Match 1 vs. Match 4 and Match 5, Match 2 vs. Match 4 and Match 5, Match 3 vs. Match 4 and Match 5. Players covered higher distances in Light-IR in Match 1 vs. Match 4 and Match 2 vs. Match 4. Finally, distances covered in HIR were higher in Match 2 vs. Match 4 and Match 5 and Match 3 vs. Match 4 and Match 5. Some studies indicate that there may occur declines of physical performance in the case of periods of many games with short recovery time between them [18–21].

Concerning technical performance that have been analysed, these findings are in line with those²¹ based on studies of technical activities performance in six matches played without a possibility of complete physical recovery of players. They also showed no significant differences between matches, as well as the number of injuries during fixture congestion did not increase. interesting observation was that between M1 and M2 and M3 vs. M4 and M5 appeared significant differences in clearances activity, an element used in defense game. These significant differences concerned only players having in their match tasks mainly defensive actions that are ED, CD and CMD. No differences were found between matches in other technical variables.

It is very reasonable to conduct studies which analyse both physical and technical efficiency of the players as some researchers suggest that these are technical and not physical indicators which to a greater extent determine the sports level of a player or the position the team occupies in the ranking [22–24]. Nonetheless, physical indicators undoubtedly allow maintaining high technical efficiency of the players [25–27].

Conclusions. In conclusion, it can be stated that there are difficulties in the analysis of performance in matches where recovery time between them is short. The reason is that few players play in all successive matches, for example in four or five as they are subject to injuries or are excluded from the game due to infractions during earlier matches, or are changed to other players in order to recover before next matches. There should be carried out further studies that would determine possibilities of players to maintain high game performance in consecutive matches with a short recovery time as well as the influence of such periods on the technical activity and the level of succumbing to injuries. Supporting such studies with laboratory analyzes would even to a greater extent define behaviors of player's organism to the burden related to the frequency of playing matches.

References

1. Ekstrand J., Hägglund M., Waldén M. (2011). Injury incidence and injury patterns in professional football: the UEFA injury study. *British Journal of Sports Medicine* 45, 553–558.
2. Ekstrand J., Walden M., Hägglund M. (2004). A congested football calendar and the wellbeing of players: correlation between matexposure of European footballers before the World Cup 2002 and their injuries and performances during that World Cup. *British Journal of Sports Medicine* 38, 493–497.
3. Strudwick T. (2012). Contemporary issues in the physical preparation of elite players. In: Williams A, editor. *Science and Soccer: Developing Elite Performers*. London: Routledge 335–356.
4. Dupont G., Nedelec M., McCall A., McCormack D., Berthoin S., Wisløff U. (2010). Effect of 2 soccer matches in a week on physical performance and injury rate. *The American Journal of Sports Medicine* 38, 1752–1758.
5. Nedelec M., McCall A., Carling C., Legall F., Berthoin S., Dupont G. (2013). Recovery in soccer: Part II – Recovery strategies. *Sports Medicine* 43, 9–22.
6. Lago-Peñas C., Dellal A. (2010). Ball possession strategies in elite soccer according to the evolution of the match-score: the influence of situational variables. *Journal of Human Kinetics* 25, 93–100.
7. Krstrup P., Mohr M., Steensberg A., Bencke J., Kjaer M., Bangsbo J. (2006). Muscle and blood metabolites during a soccer game: implications for sprint performance. *Medicine and Science in Sports and Exercise* 38, 1165–1174.
8. Rampinini E., Impellizzeri F.M., Castagna C., Coutts A.J., Wisløff U. (2009). Technical performance during soccer matches of the Italian Serie A league: effect of fatigue and competitive level. *Journal of Science and Medicine in Sport* 12, 227–233.
9. Carling C., Orhant, E., LeGall F. (2010). Match injuries in professional soccer: inter-seasonal variation and effects of competition type, match congestion and positional role. *International Journal of Sports Medicine* 31, 21–26.
10. Rey E., Lago-Peñas C., Lago-Ballesteros J., Casais L., Dellal A. (2010). The effects of a congested fixture period on the activity of elite soccer players. *Biology of Sport* 27, 181–185.
11. Bradley P.S., O'Donoghue P., Wooster B., Tordoff P. (2007). The reliability of ProZone Match Viewer: a video-based technical performance analysis system. *International Journal of Performance Analysis in Sport* 7, 117–129.
12. Bradley P.S., Sheldon W., Wooster B., Olsen P., Boanas P., Krstrup P. (2009). High-intensity running in FA English Premier League soccer matches. *Journal of Sports Sciences* 27, 159–168.
13. Di Salvo V., Collins A., McNeill B., Cardinale M. Validation of ProZone: A new video-based performance analysis system. *In J Perform Anal Sport* 2006; 6: 108–19.

14. Liu H., Gómez M.A., Lago-Peñas C., Sampaio J. Match statistics related to winning in the group stage of 2014 Brazil FIFA World Cup. *J Sport Sci* 2015; 33:1205–13.
15. Djaoui L., Wong D. P., Pialoux V., Hautier Ch., Da Silva C. D., Chamari K, et al. Physical activity during a prolonged congested period in a top-class European football team. *Asian J Sports Med* 2014; 5: 47–53.
16. Lago-Peñas C., Rey E., Lago-Ballesteros J., Casáis L., Domínguez E. (2011). The influence of a congested calendar on physical performance in elite soccer. *The Journal of Strength and Conditioning Research* 25(8), 2111–2117.
17. Soroka A., Lago-Peñas C. (2016). The effect of a succession of matches on the physical performance of elite football players during the World Cup Brazil 2014. *International Journal of Performance Analysis in Sport* 16, 434–441.
18. Arruda A. F. S., Carling C., Zanetti V., Aoki M. S., Coutts A. J., Moreira A. (2015). Effects of a very congested match schedule on body load impacts, accelerations and running measures in youth soccer players. *International Journal of Performance Analysis in Sport* 10, 248–252.
19. Carling C., Gregson W., McCall A., Moreira A., Wong D. P., Bradley P. S. (2015). Match running performance during fixture congestion in elite soccer: Research issues and future directions. *Sports Medicine* 45(5), 605–613.
20. Carling C., Le Gall F., Dupont G. (2012). Are physical performance and injury risk in a professional soccer team in match-play affected over a prolonged period of fixture congestion? *International Journal of Sports Medicine* 33, 36–42.
21. Nedelec M., McCall A., Carling C., Legall F., Berthoin S., Dupont G. (2014). The influence of soccer playing actions on the recovery kinetics after a soccer match. *Journal of Strength and Conditioning Research* 28:1517–23.
22. Dellal A., Lago-Peñas C., Rey E., Chamari K., Orhant E. (2015). The effects of a congested fixture period on physical performance, technical activity and injury rate during matches in a professional soccer team. *British Journal of Sports Medicine* 49, 390–394.
23. Carling C. (2013). Interpreting physical performance in professional soccer match-play: Should we be more pragmatic in our approach? *Sports Medicine* 43(8), 655–663.
24. Castellano J., Blanco-Villaseñor A., Álvarez D. (2011). Contextual variables and time-motion analysis in soccer. *International Journal of Sports Medicine* 32(6), 415–421.
25. Bradley P. S., Archer D. T., Hogg B., Schuth G., Bush M., Carling C, et. al (2016). Tier-specific evolution of match performance characteristics in the English Premier League: it's getting tougher at the top. *Journal of Sports Sciences* 34(10), 980–987.
26. Carling C., Dupont G. (2011). Are declines in physical performance associated with a reduction in skill-related performance during elite soccer match-play? *Journal of Sports Sciences* 29(1), 63–71.
27. Rampinini E., Impellizzeri F. M., Castagna C., Azzalin A., Bravo D., Wisløff U. (2008). Effect of match-related fatigue on short-passing ability in young soccer players. *Medicine and Science in Sports and Exercise* 40 (5), 934–942.

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