

Physical activities according to playing positions, match outcome, and halves during the 2018 Soccer World Cup

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Abstract

The objective of this study was to compare the physical activities according to playing positions, match outcomes, and halves during the 2018 Soccer World Cup. The data reported by FIFA were used. Only players who played at least 90 min of the match were included. A total of 866 observations of 8 physical activities [i.e., total distance covered (m/min), distance covered (m/min) at different intensities: standing (<7 km/h), walking (7–15 km/h), jogging (15–20 km/h), running (20–25 km/h), high-speed running (>25 km/h), maximal speed (km/h), and quantity of sprints per match] were analyzed by a three-way ANOVA that considered five playing positions [i.e., central-defender (CD), full-backs (FB), midfielder-central (CM), wide-midfielder (WM), and center-forward (CF)], three match outcomes [i.e., won, lost, or drew], and two halves (i.e., first and second half). The obtained results indicated that WM of the teams that won covered more distance at high-speed running than WM of teams that ended drawing or losing. WM and FB traveled more distance at >25 km/h during both halves. The maximal speed of CD was lower when teams won compared to CD of losing teams. The players of winning teams covered more distance at <7 km/h during the two halves. Distance covered at 7–15 and 15–20 km/h intensities decreased during the second half for all playing positions; when teams drew or lost, the players covered less distance at >25 km/h during the second half. In conclusion, playing positions, match outcomes, and halves affect high-speed activities in modern soccer. High-speed running performed by players of lateral positions may differentiate team performance. This information can help to design and plan training for international tournaments.

Key Words: physical performance, match analysis, high-speed running, external load

Introduction

Match soccer analysis provides information about the physical activities, technical and tactical performance of teams and players during matches (Ade et al., 2016; Sarmiento et al., 2018). The profiles of physical activities performed by soccer players during elite tournaments have been studied in recent years because they are a part of multiple factors that may determine performance and success in a match or tournament (Bush et al., 2015; Chmura et al., 2017; Longo et al., 2019; Oliveira & Clemente, 2018). Some of the most analyzed physical activities performed by players have been the high-speed running, sprints, and maximal speed as well as activities of moderate and low intensity such as standing, walking, and jogging (Andrzejewski et al., 2018; Di Salvo et al., 2013; Tuo et al., 2019). Likewise, several studies have indicated that physical activities may be affected by contextual factors such as playing positions, match outcome, and halves (Aquino et al., 2017; Redwood-Brown et al., 2018; Rivilla-García et al., 2019).

During a full match of official tournaments, soccer players can cover a total distance of approximately 9000 to 12000 m (da Mota et al., 2016; Di Salvo et al., 2013). The distance traveled per minute played ranges between 100 to 118 m (Clemente et al., 2013; Tuo et al., 2019; Ugalde-Ramírez et al., 2018). Considering the intensity at which the running activities are performed, the distances traveled vary. For example, out of the total time played during a match, $5.7 \pm 2.3\%$ of the time players stood, $58.8 \pm 4.7\%$ walked, $26.2 \pm 3.6\%$ jogged, $6.6 \pm 1.6\%$ ran, and $2.7 \pm 0.8\%$ performed high-speed running (Di Mascio & Bradley, 2013). The average number of sprints reported by the players in the 2013-14 Spanish First Division was 25.27 ± 7.3 per match (Rivilla-García et al., 2019). Sprinting distances covered by professional players in European soccer leagues are 237 ± 123 m (Andrzejewski et al., 2013). Maximal speed peak oscillates are between 25 and 31 km/h (Chmura et al., 2017; Kalapotharakos et al., 2020).

The different tactics implemented caused changes in the demands of the players (Bush et al., 2015); likewise, the respective tactical roles of each playing positions affect physical activities (Clemente et al., 2013; Di Salvo et al., 2013; Ugalde-Ramírez et al., 2018). Midfielders travel 3% and 7% longer distance than attackers and defenders, respectively (Andrzejewski et al., 2012). All positions cover less total distance and distance at high-speed when teams have high percentage of ball possession (da Mota et al., 2015). Central-midfielders performed more high-intensity actions, while full-backs performed most repeated high-intensity bouts (Carling et

al., 2012). Players in central positions perform fewer sprints than players in lateral positions (Ingebrigtsen et al., 2015); central-defenders reach a lower maximal speed average, while forwards and full-backs reach higher speed (Kalapotharakos et al., 2020).

High physical and physiological demands of soccer games cause physical activities to vary throughout the match periods, which tends to reduce physical performance (Bradley & Noakes, 2013). Previous studies have demonstrated that the total distance covered is lower during the second half than during the first half for all playing positions (Rivilla-García et al., 2019). During the second half, it has been determined that players travel a greater distance standing and walking (Wehbe et al., 2014). Players reduce high-speed running during the second half and after intense periods (Bradley & Noakes, 2013; Rampinini et al., 2007); likewise, the number of accelerations performed during the second half (44 ± 12) is fewer compared to the first half (47 ± 12) (Ingebrigtsen et al., 2015). Physical performance can be affected by different situations, which occurred during the game (e.g., goals, expulsions, playing style, ball possession, and the level of the opponent), which cause the players to increase or decrease physical activities (Aquino et al., 2017; Redwood-Brown et al., 2018; Sarmiento et al., 2018).

Match status and match outcome can also condition the physical activities (Redwood-Brown et al., 2018). In the Brazilian league, players of winning teams showed higher total distance traveled, maximal speed, and high-intensity actions (Aquino et al., 2017). A previous study has reported that average speeds varied among drawing, winning, and losing teams; the speed of winning teams was 4.17% lower compared to teams that drew (Wehbe et al., 2014). The level of opposing team and match outcome also cause changes in the physical performance of players according to their playing position (Kalapotharakos et al., 2020). When the teams are winning, the central and wide-midfielders as well as forwards have higher participations during a match (Praça et al., 2019). In the German Bundesliga, it has been reported that when the teams won, the defenders and full-backs traveled less distance at high intensities, while the wide-midfielders and forwards performed more high-speeds running when the teams won (Andrzejewski et al., 2018; Chmura et al., 2018).

Because it is important to update knowledge about the demands of physical activities in soccer competitions, soccer world cups represent a good scenario to identify these trends (Wallace & Norton, 2014); thus, several studies using the data from previous world cups have analyzed physical activities according to the tournament phase, confederations, team performance, ball possession, and playing positions (Chmura et al., 2017; Clemente et al., 2013; da Mota et al., 2016; Tuo et al., 2019; Ugalde-Ramírez et al., 2018). Despite the abovementioned evidence, there are no studies that analyzed physical activities according to playing positions, match outcomes, and halves. This study seeks to address this limitation in knowledge; therefore, the objective of this study was to compare the physical activities according to playing positions, match outcomes, and halves during the 2018 Soccer World Cup.

Materials and methods

For this study, the data reported by FIFA for the 2018 World Cup were used. The data for the 32 national teams that participated were accessed and freely downloaded from the following link: <https://www.fifa.com/worldcup/archive/russia2018/matches/>. Only the data for 59 matches were used. A total of 5 matches with extra time were not included. A total of 379 professional soccer players, who played at least 90 min during the game, were considered. Goalkeepers were excluded. A total of 866 observations were analyzed. This study was conducted by following the ethical standards established by the Declaration of Helsinki.

Physical activities

For each player and each match, FIFA (2018) reported the following eight physical activities: a) total distance covered (TD) and b) distances covered at different intensity. These were classified into five intensities: standing (<7 km/h), walking (7–15 km/h), jogging (15–20 km/h), running (20–25 km/h), and high-speed running (>25 km/h). These indicators were expressed in meters by minute played (m/min), as has been reported in previous studies (Clemente et al., 2013; Tuo et al., 2019; Vigne et al., 2013; Ugalde-Ramírez et al., 2018), c) quantity of sprints performed per match, and d) maximal speed expressed in km/h. The physical activities in each match were collected using a real-time optical tracking system operated at 25 frames per second. The reliability of this technology and data in soccer world competitions have been confirmed by previous studies (Linke et al., 2018). Recently, several investigations have been performed using these data (Chmura et al., 2017; Clemente et al., 2013; da Mota et al., 2016; Tuo et al., 2019; Ugalde-Ramírez et al., 2018).

Playing positions

The playing positions were divided into five groups: central-defender (CD), full-back (FB), central-midfielder (CM), wide-midfielder (WM), and center-forward (CF). These groups have been evaluated in previous studies (Praça et al., 2019; Rivilla-García et al., 2019). To define these playing positions, players' heatmaps during each game were used (Praça et al., 2019). The sample, which was specific for each position, consisted of 92 CD (observation= 225), 89 FB (observation= 211), 99 CM (observation= 221), 57 WM (observation= 120), and 42 CF (observation= 89).

Match outcome Each team was classified into three categories according to its match outcome, i.e., won, lost, or drew.

Halves All data were divided into the first and second half and then analyzed.

Statistical Analysis The data were reported as the mean ± standard deviation. The normality of the data was evaluated using the Kolmogorov-Smirnov test ($p > 0.05$), histograms, and Q-Q plots. A mixed analysis of variance (three-way ANOVA) of 5 playing positions × 3 match outcomes × 2 halves was applied. When required, specific differences were identified using Bonferroni post-hoc tests. Partial eta squared (η^2) was used to quantify effect sizes between differences. The η^2 thresholds were rated as: 0.01 small, 0.06 medium, and 0.14 large (Richardson, 2011). The level of accepted significance was $p < 0.05$. The SPSS statistics program, version 23.0 (SPSS Inc., U.S.A.) was used for all analyses.

Results

The three-way mixed factorial ANOVA analysis showed only a significant interaction between playing positions × match outcomes × halves in the distance covered at high-speed running (>25 km/h) [$F_{(8,851)} = 4.027$; $p < 0.001$; $\eta^2 = 0.036$, *small*]. Bonferroni post-hoc tests revealed that WM of the teams that won covered more distance at intensity >25 km/h than WM of teams that lost or drew ($p < 0.05$). WM and FB traveled more distance during both halves ($p < 0.05$). CD covered more distance during the second half when the teams lost ($p < 0.05$) (Table 1).

Table 1. Distance covered (m/min) at high-speed running (>25 km/h) by the players according to playing positions, match outcomes, and halves

Match outcome	Match halves	Central-Defender (CD)	Full-Backs (FB)	Central-Midfielder (CM)	Wide-Midfielder (WM)	Center-Forward (CF)
Lost	1st	1.30 ± 0.74 ^{2,4,5}	2.61 ± 1.46 ^{1,3}	1.55 ± 1.12 ^{2,4,5}	2.80 ± 1.40 ^{1,3}	2.54 ± 1.50 ^{1,3}
	2nd	1.59 ± 0.86 ^{a,2,4}	2.64 ± 1.09 ^{1,3,5}	1.34 ± 0.85 ^{2,4}	2.50 ± 1.44 ^{a,1,3}	1.87 ± 1.50 ²
Drew	1st	1.43 ± 0.80 ^{2,4}	3.10 ± 1.27 ^{1,3,5}	1.54 ± 0.94 ^{2,4}	2.73 ± 1.37 ^{2,3}	2.67 ± 1.48
	2nd	1.09 ± 0.71 ^{2,4}	2.23 ± 1.12 ^{1,3}	1.25 ± 1.05 ^{2,4}	2.19 ± 1.69 ^{a,2,3}	2.22 ± 0.89
Won	1st	1.21 ± 0.83 ^{2,4,5}	2.93 ± 1.50 ^{1,3,5}	1.58 ± 1.26 ^{2,4}	2.99 ± 1.56 ^{1,3,5}	1.97 ± 1.15 ^{1,2,4,5}
	2nd	1.10 ± 0.71 ^{c,2,4,5}	2.41 ± 1.50 ^{1,3,4}	1.41 ± 0.99 ^{2,4,5}	3.21 ± 1.17 ^{b,c,1,2,3,5}	2.37 ± 1.16 ^{1,3,4}

Letters denote differences between match outcomes, $p < 0.05$; this is different from teams that won=^a, drew=^b, and lost=^c. ^ydenotes differences between halves, $p < 0.05$. The numbers denote differences between playing positions, $p < 0.05$; this is different from CD=¹, FB=², CM=³, WM=⁴, and CF=⁵.

Table 2 shows a significant interaction between playing positions and match outcomes at maximal speed (km/h) ($F_{(8,851)} = 2.519$; $p = 0.010$; $\eta^2 = 0.023$, *small*). The Bonferroni post-hoc test showed that CD of the winning teams reached a maximal speed that was lower than that of CD of the losing teams ($p = 0.004$). WM and FB of the winning teams and FB and WM of the losing teams had a higher maximal speed than other positions ($p < 0.05$). When teams drew, CM showed a lower maximal speed than FB ($p < 0.001$) and CD ($p = 0.029$).

Table 2. Physical activities performed by the players according to playing positions and match outcomes

	Match outcome	Central-Defender (CD)	Full-Backs (FB)	Central-Midfielder (CM)	Wide-Midfielder (WM)	Center-Forward (CF)
Total distance (m/min)	Lost	94.00 ± 7.04	101.44 ± 9.39	109.03 ± 8.40	104.06 ± 9.95	98.30 ± 9.38
	Drew	94.01 ± 5.68	104.04 ± 5.91	111.70 ± 8.04	105.07 ± 8.96	93.38 ± 8.54
	Won	93.07 ± 6.36	103.49 ± 7.75	110.19 ± 8.15	103.92 ± 9.10	98.13 ± 8.03
Standing (<7 km/h) (m/min)	Lost	38.68 ± 2.99	37.68 ± 3.00	35.89 ± 3.21	38.36 ± 2.99	39.85 ± 3.48
	Drew	38.64 ± 2.89	36.96 ± 2.99	35.41 ± 3.28	37.39 ± 1.92	39.66 ± 2.66
	Won	39.31 ± 3.06	38.60 ± 2.64	36.74 ± 3.67	39.46 ± 2.74	40.31 ± 3.24
Walking (7–15 km/h) (m/min)	Lost	39.46 ± 6.14	41.55 ± 6.22	49.79 ± 7.08	41.80 ± 7.61	38.66 ± 8.52
	Drew	39.74 ± 5.44	43.44 ± 4.30	51.71 ± 6.28	43.74 ± 5.33	35.15 ± 7.21
	Won	39.23 ± 6.17	42.90 ± 5.73	49.75 ± 6.63	40.91 ± 6.40	37.68 ± 6.82
Jogging (15–20 km/h) (m/min)	Lost	10.51 ± 2.25	13.96 ± 2.61	16.40 ± 3.36	14.62 ± 3.64	12.15 ± 2.57
	Drew	10.60 ± 2.02	14.48 ± 2.98	17.59 ± 4.04	14.82 ± 2.84	10.77 ± 2.72
	Won	9.87 ± 2.41	13.27 ± 2.40	16.50 ± 3.66	13.91 ± 3.87	12.08 ± 2.72
Running (20–25 km/h) (m/min)	Lost	3.89 ± 1.21	6.13 ± 1.31	5.50 ± 1.48	6.61 ± 1.52	5.42 ± 1.31
	Drew	3.76 ± 0.63	6.51 ± 1.53	5.60 ± 1.83	6.66 ± 2.04	5.34 ± 0.99
	Won	3.51 ± 0.99	6.06 ± 1.44	5.63 ± 1.73	6.57 ± 1.42	5.35 ± 1.21
High-speed running (>25 km/h) (m/min)	Lost	1.45 ± 0.66	2.63 ± 1.09	1.45 ± 0.80	2.66 ± 1.11	2.21 ± 1.36
	Drew	1.26 ± 0.50	2.66 ± 1.04	1.39 ± 0.88	2.45 ± 1.33	2.45 ± 1.03
	Won	1.16 ± 0.63	2.67 ± 1.28	1.50 ± 0.96	3.11 ± 1.14	2.18 ± 0.94
Maximal speed (Km/h)*	Lost	27.27 ± 1.92 ^{a,2,4}	28.44 ± 1.72 ¹	26.53 ± 1.86 ^{2,4,5}	28.29 ± 1.72 ^{1,3}	27.70 ± 2.23 ³
	Drew	27.17 ± 1.98 ^a	28.19 ± 1.55 ³	26.42 ± 2.16 ^{2,5}	27.91 ± 2.19	28.57 ± 2.22 ³
	Won	26.37 ± 2.10 ^{2,4,5}	28.41 ± 1.86 ^{1,3}	26.62 ± 1.90 ^{4,5}	29.11 ± 1.99 ^{1,3,5}	27.77 ± 1.81 ^{1,3,5}
Sprints (Quantity /match)	Lost	22.37 ± 7.22	36.17 ± 8.64	29.08 ± 8.72	39.29 ± 8.80	32.88 ± 9.57
	Drew	23.08 ± 11.91	38.00 ± 9.36	29.68 ± 10.40	38.33 ± 13.06	32.11 ± 8.65
	Won	20.22 ± 6.63	36.40 ± 9.19	30.39 ± 10.70	38.94 ± 8.47	31.20 ± 7.84

*indicates a significant interaction $p < 0.05$. The letters denote differences between match outcomes, $p < 0.05$; this is different from the teams that won=^a, drew=^b, and lost=^c. The numbers denote differences between playing positions, $p < 0.05$; this is different from CD=¹, FB=², CM=³, WM=⁴, and CF=⁵.

Table 3 shows significant interactions between playing positions and match halves at intensities <7 km/h [$F_{(4,851)} = 6.949$; $p < 0.001$; $\eta^2 = 0.032$, *small*], 7–15 km/h [$F_{(4,851)} = 2.616$; $p = 0.034$; $\eta^2 = 0.012$, *small*], and 15–20 km/h [$F_{(4,851)} = 7.251$; $p < 0.001$; $\eta^2 = 0.033$, *small*]. Post-hoc analysis showed that at the intensity of <7

km/h, CF covered more distance, while CM traveled the least distance during both halves ($p < 0.05$). At the intensities of 7–15 and 15–20 km/h, CM traveled more distance, while CD and CF covered less distance compared to the other positions during both halves ($p < 0.05$). During the second half, FB and CM increased distance traveled at the intensity of <7 km/h ($p < 0.05$); at the intensities of 7–15 and 15–20 km/h, all playing positions decreased distance covered ($p < 0.05$).

Table 3. Physical activities performed by the players according to playing positions and match halves

	Match halves	Central-Defender (CD)	Full-Backs (FB)	Central-Midfielder (CM)	Wide-Midfielder (WM)	Center-Forward (CF)
Total distance (m/min)	1st	96.47 ± 7.55	105.95 ± 8.73	113.74 ± 9.39	107.72 ± 10.53	100.85 ± 9.23
	2nd	90.89 ± 7.12	100.16 ± 8.06	106.33 ± 9.01	100.83 ± 10.16	94.72 ± 9.46
Standing (<7 km/h) (m/min)*	1st	38.82 ± 3.19 ^{2,3}	37.63 ± 3.09 ^{1,3,5}	35.40 ± 3.58 ^{1,2,4,5}	38.40 ± 2.92 ^{3,5}	40.06 ± 3.66 ^{2,3,4}
	2nd	39.08 ± 3.41 ³	38.27 ± 3.30 ³	36.88 ± 3.83 ^{1,2,4,5}	38.88 ± 3.33 ³	40.07 ± 3.56 ^{2,3}
Walking (7–15 km/h) (m/min)	1st	41.83 ± 6.77 ^{1,2,3,4}	44.69 ± 6.69 ^{1,3,5}	53.13 ± 7.56 ^{1,2,4,5}	44.24 ± 7.69 ^{1,3,5}	39.69 ± 8.98 ^{1,2,3,4}
	2nd	37.12 ± 6.20 ^{2,3}	40.31 ± 5.94 ^{1,3,5}	47.20 ± 7.37 ^{1,2,4,5}	39.40 ± 7.31 ^{3,5}	35.97 ± 7.43 ^{3,4}
Jogging (15–20 km/h) (m/min)	1st	10.75 ± 2.56 ^{1,2,3,4,5}	14.36 ± 2.95 ^{1,3,5}	17.81 ± 4.15 ^{1,2,4,5}	15.30 ± 4.02 ^{1,3,5}	12.69 ± 2.95 ^{1,2,3,4}
	2nd	9.75 ± 2.56 ^{2,3,4}	13.16 ± 2.88 ^{1,3,5}	15.50 ± 3.72 ^{1,2,4,5}	13.49 ± 3.81 ^{1,3,5}	11.30 ± 2.90 ^{1,2,3,4}
Running (20–25 km/h) (m/min)	1st	3.76 ± 1.28	6.41 ± 1.73	5.83 ± 2.01	6.89 ± 1.71	5.57 ± 1.39
	2nd	3.64 ± 1.24	5.91 ± 1.66	5.32 ± 1.17	6.32 ± 1.94	5.18 ± 1.53
High-speed running (>25 km/h) (m/min)*	1st	1.28 ± 0.79	2.83 ± 1.45	1.56 ± 1.15	2.86 ± 1.45	2.26 ± 1.35
	2nd	1.29 ± 0.81	2.47 ± 1.29	1.35 ± 0.93	2.74 ± 1.42	2.17 ± 1.29
Maximal speed (Km/h)	1st	26.72 ± 2.81	28.59 ± 2.31	26.52 ± 2.55	28.44 ± 2.59	27.78 ± 2.81
	2nd	26.99 ± 2.60	28.19 ± 2.23	26.59 ± 2.45	28.67 ± 2.35	27.87 ± 2.31
Sprints (Quantity/half)	1st	10.47 ± 3.97	18.65 ± 5.67	15.05 ± 5.87	19.86 ± 5.24	16.44 ± 4.78
	2nd	11.06 ± 6.10	17.91 ± 5.19	14.66 ± 5.45	19.15 ± 6.14	15.49 ± 5.28

*indicates a significant interaction, $p < 0.05$; ¹denotes differences between the halves, $p < 0.05$. The numbers denote differences between playing positions, $p < 0.05$; this is different from CD=¹, FB=², CM=³, WM=⁴, and CF=⁵.

Table 4 shows significant interactions between match outcomes and match halves at the intensities of <7 km/h [$F_{(2,851)} = 6.901$; $p = 0.001$; $\eta^2 = 0.016$, *small*] and >25 km/h [$F_{(2,851)} = 4.904$; $p = 0.008$; $\eta^2 = 0.011$, *small*]. The Bonferroni post-hoc analysis showed that during the two halves, players of winning teams covered more distance at <7 km/h than players of teams with different match outcome ($p < 0.05$). In addition, when the teams drew or lost, the players covered more distance at >25 km/h during the first half than during the second half ($p < 0.001$).

Table 4. Physical activities performed by the players according to match outcomes and match halves

	Match halves	Lost	Drew	Won
Total distance (m/min)	1st	104.95 ± 11.41	106.69 ± 9.84	104.90 ± 10.96
	2nd	98.99 ± 10.20	98.92 ± 10.90	98.72 ± 10.23
Standing (<7 km/h) (m/min)*	1st	37.62 ± 3.58	36.74 ± 3.40 ^a	38.17 ± 3.66 ^b
	2nd	37.89 ± 3.70 ^a	37.74 ± 3.43 ^a	39.12 ± 3.54 ^{b,c}
Walking (7–15 km/h) (m/min)	1st	45.39 ± 9.01	47.02 ± 7.87	45.14 ± 8.66
	2nd	40.79 ± 8.16	41.25 ± 7.80	40.35 ± 7.61
Jogging (15–20 km/h) (m/min)	1st	14.36 ± 4.17	14.95 ± 4.40	13.92 ± 4.26
	2nd	13.06 ± 3.66	13.13 ± 4.14	12.26 ± 3.84
Running (20–25 km/h) (m/min)	1st	5.55 ± 1.97	5.81 ± 2.04	5.47 ± 2.05
	2nd	5.28 ± 1.79	5.12 ± 2.11	5.03 ± 1.90
High-speed running (>25 km/h) (m/min)*	1st	2.03 ± 1.36 ^y	2.16 ± 1.31 ^y	2.03 ± 1.45
	2nd	1.94 ± 1.21	1.66 ± 1.19	1.91 ± 1.33
Maximal speed (Km/h)	1st	27.40 ± 2.78	27.72 ± 2.84	27.45 ± 2.68
	2nd	27.69 ± 2.26	27.16 ± 2.61	27.44 ± 2.73
Sprints (Quantity/half)	1st	15.51 ± 6.08	15.88 ± 6.41	15.47 ± 6.27
	2nd	15.52 ± 5.69	15.50 ± 8.29	14.84 ± 6.16

*indicates a significant interaction, $p < 0.05$. ^ydenotes differences between the halves, $p < 0.05$. The letters denote differences between match outcomes, $p < 0.05$; this is different from the teams that won=^a, drew=^b, lost=^c.

Discussion

The objective of this study was to compare the physical activities according to playing positions, match outcomes, and halves during the 2018 Soccer World Cup. In this study, the physical activities in terms of the distances traveled are within parameters that have been reported in previous investigations using the data from the World Cup of South African 2010 (Clemente et al., 2013), Brazil 2014 (Chmura et al., 2017; Ugalde-Ramírez et al., 2018), and European competitions (Longo et al., 2019; Vigne et al., 2013).

The main results of this study revealed a significant interaction among playing positions \times match outcome \times halves. The WM of the winning teams covered more distance at high-speed running (>25 km/h) (Table 1). A previous study paper (Chmura et al., 2018) has shown that the WM of the winning teams covered more distance at speed ranges between 21–24 and >24 km/h compared to the players of the same position but with the results of losing and drawing. Likewise, the number of sprints was higher when the teams won, and the players traveled more distance during the offensive play (Andrzejewski et al., 2018). Another study showed that CM, WM, and CF players performed more physical actions when the teams were in winning situations owing to higher interaction and cooperation of these players in the team's game dynamics (Praça et al., 2019). Many offensive plays that generate goal options for the teams are initiated in the lateral zones of the field in which WM play, and many of these attack options begin with movements and displacement at high-intensity (Ade et al., 2016; Chmura et al., 2018).

In addition, the results of this study showed that players in external positions (WM and FB) traveled more distance at the intensity of >25 km/h. In the Spanish soccer league, it was determined that WM and FB traveled the greatest distance at speeds >21 km/h and performed approximately 30 sprints per game (Rivilla-García et al., 2019). In the Norwegian soccer league, players in the lateral positions traveled more distance at sprint speed (≥ 25.2 km/h) than central positions players (Ingebrigtsen et al., 2015). Likewise, this study showed that FB and WM players reached higher maximal speed than other playing positions, which agrees with previous studies, which reported that FB reached higher maximal speed than CD and CM (Ade et al., 2016; Di Mascio & Bradley, 2013; Kalapotharakos et al., 2020).

When the teams lost, CD reached a significantly higher maximal speed compared to the winning teams (Table 2). Likewise, the CD of the lost teams covered more distance at the intensity of >25 km/h (Table 1). Previous studies on Australian soccer teams have observed a lower average maximal speed when the teams won (Wehbe et al., 2014). Likewise, these results are similar to those for the German Bundesliga players during the 2014/15 domestic season; specifically, it has been reported that the CD of the losing teams performed more sprints and traveled more distance at sprint speed (≥ 22.6 km/h, >1.0 s) mainly during defensive actions (Andrzejewski et al., 2018). Without ball possession, CD exerted more efforts closing the opposition running than other positions (Ade et al., 2016).

Both during the first and second half, CM traveled the least distance standing (<7 km/h) and the greatest distance at the intensities of 7–15 km/h and 15–20 km/h, while CD and CF covered the least distance at the abovementioned intensities (Table 3). The total and sprint distances are lower during the second half for CD and CF, and the total distance covered is less than FB and CM (Rivilla-García et al., 2019). In UEFA competitions, the forwards covered less distance at <21 km/h than midfielders (Andrzejewski et al., 2012). In general, CM covered a greater distance throughout a match; however, a high percentage of this distance was covered at moderate intensities (Bush et al., 2015). In French League 1 matches, it has been determined that CM traveled a higher percentage of distance at the speed of 7.2–19.7 km/h, while the lowest percentage of distance was traveled at the speed of <7.1 km/h compared to other positions (Carling et al., 2012). CM participate a lot in offensive and defensive situations of the game; these physical activities demand moderate to high intensities, and a low percentage of time played is spent in standing situations (Clemente et al., 2013; Di Salvo et al., 2013).

During the second half, FB and CM increased distance traveled at the intensity of <7 km/h. In European competitions, it has been reported that during the second half, the distance traveled by FB and WM at the intensity of <7 km/h increased by 5.9% and 3.8%, respectively (Ingebrigtsen et al., 2015). In this study, all playing positions covered less distance at the intensities of 7–15 and 15–20 km/h during the second half (Table 3). The total distance decreased during the second half for all field positions (Rivilla-García et al., 2019). It has been reported that during second periods of the matches, a reduction of 10.9% in running at >19.7 km/h occurred (Wehbe et al., 2014). These changes in physical activities are associated with the manifestations of fatigue suffered by players due to the continual high physical demands of competition and short recovery periods between and after efforts, which can affect the physical performance (Bradley & Noakes, 2013; Di Mascio & Bradley, 2013). In, the efforts performed during the second half may be conditioned by the efforts performed during the first half (Rampinini et al., 2007). In this sense, the players who trend to cover less distance at high-intensities during the first half, for the second half increase the meters traveled at high-intensity, while conversely, the players who performed more efforts at high-intensity in the first periods, performed less high-intensity activities during the second half (Rampinini et al., 2007). However, these changes may be conditioned by the score and other factors such as the playing style of each team, quality of opponents, or even expulsions of players (Aquino et al., 2017; Redwood-Brown et al., 2018; Sarmento et al., 2018).

Considering the effect of match outcome during the halves, the distance of high-speed running (>25 km/h) was higher for the CD of losing teams than for the CD of winning teams during the seconds half (Table 1). A previous study indicated that the players of winning teams ran fewer meters at the speed of >22 km/h during defensive actions compared to the players of losing and drawing teams (Andrzejewski et al., 2018). Another factor that could have affected these results was the goals. Specifically, goal differences (positive or negative) affect the physical efforts of players (Redwood-Brown et al., 2018). It has been determined that during matches that were won with a goal differential of ≥ 3 , the high-speed running of CD decreased by 10–17% compared to competitive matches (goal differential ≤ 1) (Bradley & Noakes, 2013). When a team has a score advantage, it is

common to observe pacing strategies by the players, which may explain an increase in the distance traveled at the intensity of <7 km/h by the winning teams. When teams are winning, players decreased effort, trying to walk or jog more to conserve energy for high-intensity actions (Bradley & Noakes, 2013). A common approach that teams implement is to increase ball possession. Teams cover less distance when they have high ball possession (da Mota et al., 2015; Oliveira & Clemente, 2018). Teams increase ball possession by reducing displacements at submaximal and maximal speeds (Vigne et al., 2013).

Conclusions

The obtained results show that during the 2018 World Cup, the high-intensity activities of players were essential elite soccer competences. High-speed running performed by players of lateral positions can better differentiate team performance. The match outcome and score may generate higher or lower physical effort by players in their quest to counter offensive or defensive actions of their rivals during the game.

In the Soccer World Cup, the physical activities of players differed between playing positions. The external position players performed more travel at high-speed running compared to internal position players. Physical activities vary between halves mainly because workload competitions generate fatigue. Therefore, the physical preparation of players must be of high level to meet the demands of competition without forgetting that different playing positions require different training.

Finally, additional research is needed that considers other situational factors and technical actions to help understand the role of physical efforts by the players and teams during elite competitions; these studies will provide information that can be used to design and plan training before participating in international tournaments.

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