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ORIGINAL RESEARCH

Comparisons of running and accelerometry based measures between playing positions in touch rugby. A case study of an amateur male team

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Abstract

Background: The main objective of the present study was to quantify the external load of the games that belong to a national tournament by comparing playing positions. A secondary objective consisted in comparing the match-to-match variations. **Methods**: Fourteen players (four links, four middles and six wings) were included (age: 39.36 ± 5.83 years; body mass index: 26.65 ± 4.13). Participants were monitored during a tournament. Through Gpexe pro2, the following measures were collected and relativized per minute: total distance, forward distance, backward distance, zone 1 (0–1.50 m/s), zone 2 (1.50–3.00 m/s), zone 3 (3.00–4.00 m/s), zone 4 (4.00–5.50 m/s), zone 5 (5.50–7.00 m/s) and zone 6 (>7.00 m/s), the number of accelerations and decelerations, impacts and jumps. The absolute values of maximal speed, maximal acceleration speed and maximal deceleration speed were also used for analysis. **Results**: The main findings showed meaningful higher values of zone 4 (16.18 ± 1.89 *vs.* 5.56 ± 3.53), zone 5 (2.91 ± 0.81 *vs.* 0.38 ± 0.38), zone 6 (0.35 ± 0.24 *vs.* 0.00 ± 0.00), deceleration (0.56 ± 0.21 *vs.* 0.19 ± 0.12), maximal speed (23.56 ± 1.90 *vs.* 18.84 ± 1.24) and forward distance (102.20 ± 13.45 *vs.* 67.42 ± 17.40) for middles than wings ($p < 0.05$), with large to very large effect sizes. In addition, no differences were found when comparing external load data from all matches. **Conclusions**: The findings of this study showed a clear tendency of higher values for middles than links and wings which provides a deeper understanding of the positional activity profile of an Amateur Portuguese team allowing practitioners to adjust training with the common external load experienced in a tournament. Moreover, the analysis of match-to-match comparison revealed no differences through the competition day, which means a proper fatigue management.

Keywords

Deceleration; External load; Fatigue; High-speed running; Link; Load quantification; Match load; Middle; Sprint; Wing

1. Introduction

Touch rugby (TR) is a well recognized internationally sport considering the "Touch World Cup" and the 47 country members of the Federation of International Touch [1]. Some regions have adapted conventional rugby for beginners of any age through TR [2]. This sport is a variation of conventional rugby where the contact components have been removed. However, it continues to be a high-intensity sport [3], as the players' running intensities proved to be higher when compared to other rugby variations such as the rugby sevens [4, 5], rugby league [6] and rugby union [7] in which seven, 13 or 15 athletes, respectively, participate in the game. This fact can be justified by the elimination of the game duration and the unlimited number of substitutions.

TR is played with two teams of six players, on a field with a maximum size of 70 m × 50 m, excluding touch areas and substitution areas on both sides. In a professional scenario, each team has eight substitute players who are on standby in the substitution areas and can replace players on the field during the match, at any time. The touch rule applies when a touch is made to defend the attack. This can be done by any type of legal body contact between the defender and the ball carrier (attacker). After the touch, the entire defensive team move back 5 m from this mark as quickly as possible to a legal position (otherwise the defensive team will be called for a foul and ball moves to the other team). Each team can make six touches in each possession of the ball before changing possession [8].

Each official game has two 20-minute periods, consisting of high-intensity activities interspersed with low-intensity activities or passive recovery [9, 10]. However, scientific research in this modality is scarce and often focuses on high-level professional players. For example, Beaven *et al.* [10] observed greater game intensities in higher-level players. Particularly, international players, compared to regional ones, had higher high-speed running performance, more average and peak speed, exhibiting a lower proportion of low-to-high-speed movements (*i.e.*, they showed less rest after each sprint), having covered more distance through high-speed running.

Recently, it was found that contextual factors such as the game position [8] and the sex [9, 11] of the participants were decisive in the external load analysis. For instance, wings covered more total distance (1676.66 ± 444.80 m) than links (1311.35 ± 223.59 m) and middles (1383.52 ± 246.55 m) by a large effect, which was mainly attributed to walking and jogging (<4.00 m/s). Meanwhile, the middles covered more running distance (4.00–5.50 m/s) than other positions [8]. Regarding sex, women tend to cover more total distance than men. However, men cover greater high intensity running distances (>4 m/s) than women [9, 11].

The variables described above are part of the external load control that refers to the specific physical demands provided by the game [12]. In this way, monitoring individual external load makes it possible to assess its suitability for training and competition demands, maximizing performance and avoiding chronic fatigue [13]. This is even more relevant considering the Portuguese amateur context in which a competition day can include five to six matches (in the same day) with zero or few minutes of recovery between matches (*e.g.*, 20–60 min) [14]. In fact, it would be relevant to analyse if there are a decrease from match to match due to the accumulated fatigue across the day. Furthermore, analysing amateur athletes with higher mean age could be more relevant for Portuguese context, once the competition can include a wide range of ages (*e.g.*, >18 years old). For instance, previous research analysed three TR games over a two-day international, including training and match demands, however no comparisons were made from match to match [8].

For this reason, it is important to study what the physical demands of the external load of amateurs are and to understand whether some contextual variables such as the players' positions interfere in its interpretation. Furthermore, there is no available research in Portuguese context. Therefore, the main objective of the present study was to quantify the external load of a competition day and to compare playing positions. A secondary objective consisted in comparing the match-to-match variations. It was hypothesised that external load differs considering the position and that external load may decrease from match to match.

2. Materials and methods

2.1 Design

In this observational case study, TR players from an Amateur Portuguese team were monitored during the competition day (one national tournament) which included five matches. The monitorization consisted in external load quantification. The first four matches had a duration of 15 minutes (7 min 30 s each half) while the last match had 25 minutes (12 min 30 s each half). In some of those matches, there was an extra minute of compensation which was included for analysis. The matches took place at the same day at 11:00 AM, 12:20, 12:40, 14:00 and 14:30, respectively, in a grass field of 50 × 45 m. The weather conditions were stabilized through the day (13 °C, 68% of relative humidity, with no wind and no rain). The competition included 10 teams, and the final classification of the analysed team was fifth place.

Before each match, a standardized warm-up controlled by the coach was applied. The warm-up included running at moderate pace for 10 minutes, 5 strengthening exercises, 5 dynamic stretching exercises, and 3 submaximal sprints [15]. After the last match a cool down session was made. Nonetheless, warm-ups and cool down phases were excluded from the analysis. No recovery strategy between matches was employed.

2.2 Participants

Fourteen amateur TR players (age: 39.36 ± 5.83 years; body mass: 84.14 ± 15.02 kg; body height: 1.77 ± 0.09 m; body mass index (BMI): 26.65 ± 4.13) participated in the current study [16–19]. All players have a minimum experience of three years and five of the players participated in the national team. For better context, all players participated in one or two training sessions per week that were managed by the coach of the team.

The participants belonged to a convenience sample and since all external load data was relativized by each minute of participation, all players were included. Considering the discrete roles, players were grouped into one of three positional groups: middles, links, and wings as described before [20]. From the players included, four were links, four were middles, and six were wings. Furthermore, since six wings were part of the study, two of them were left out of each match which means that in each match, only 12 players participated. In addition, there were no exclusion criteria and there were no injuries.

Prior to data collection, the club, coaches and participants were fully informed of the study design and signed an informed consent form. The study followed the ethical guidelines for human study as suggested by the Declaration of Helsinki. Furthermore, the study was approved by the Research Ethics Committee of the Polytechnic Institute of Santarém, Santarém, Portugal, (No. 29-2023ESDRM).

2.3 External load quantification

To collect external load, participants were fitted with a GPExe pro2 player tracking device (Exelio srl, Udine, Italy, firmware version 99), held in a customized vest in which the device was placed between their scapulae. The device was turned on 30 minutes before the 1st match. After the 5th match, the devices were turned off and the data were process with the GPExe web app (version 8.4.1, Exelio SRL, Udine, Italy). The GPExe pro2 includes a global positioning system sensor sampling at 18.18 Hz, together with a 120 Hz triaxial accelerometer, a 120 Hz triaxial gyroscope and an 80 Hz triaxial magnetometer, which collectively ascertain movement direction and orientation. During data collection, the mean ± standard deviation of the number of satellites was 8.8 ± 0.49 (with a range from 7 to 11). This device was previously considered valid and reliable for team sports [21, 22]. Tan *et al.* [21] showed a range of reliability from 2.4 to 13.4% in all movement directions while Šašek *et al.* [22] showed a range from 1.4 to 2.8% in curvilinear sprint to the left, from 1.8 to 2.9% in curvilinear sprint to the right and 1.5 to 3.6% in linear sprint.

The following distance measures were collected and relativized per minute: total distance, forward distance (represents the total distance covered om the forward direction), backward distance (represents the total distance covered on the backward direction), zone 1 (0–1.50 m/s), zone 2 (1.50–3.00 m/s), zone 3 (3.00–4.00 m/s), zone 4 (4.00– 5.50 m/s), zone 5 (5.50–7.00 m/s) and zone 6 (>7.00 m/s). The number of accelerations and decelerations, which were defined by changing a speed of 1.00 m/s^2 in 0.50 s, impacts and jumps were also collected and relativized per minute [8]. Finally, the absolute values of maximal speed, maximal acceleration speed and maximal deceleration speed.

2.4 Statistical analysis

Descriptive statistics are presented as mean ± standard deviation (SD). The normality of the different variables was analysed (and not confirmed) using the Shapiro-Wilk test. Thus, Kruskal-Wallis was applied to compare different playing positions and Friedman analysis of variance to compare the five matches. Whenever a significant result was found, pairwise comparisons were conducted through Bonferroni adjustment *Post Hoc*. Significant results were considered at $p < 0.05$. When a significant result was detected, Hedges' effect size was calculated to determine the effect magnitude based on the difference between two means divided by the standard deviation according to the data. The results were categorised based on the following criteria: <0.2 = trivial effect, 0.2–0.6 = small effect, 0.6–1.2 = moderate effect, 1.2–2.0 = large effect, and >2.0 = very large effect [23].

All statistical procedures were executed in IBM SPSS Statistics for Windows (version 27.0, Armonk, NY, USA: IBM Corp).

3. Results

Table 1 presents the mean ± SD and the comparisons among playing positions for all variables. It also characterizes all variables per team. The following variables presented meaningful higher values with very large effect sizes for middles than wings: zone 4, zone 5, zone 6, deceleration and maximal speed. Moreover, forward distance was also higher for middles than wings with a large effect size. Figs. 1,2 show a visualization of the playing positions comparisons.

Table 2 presents the comparisons among the five matches for the whole team which reveal no meaningful results (all, $p > 0.05$).

4. Discussion

The aims of the present study were to quantify the external load of a competition day and to compare playing positions. A secondary objective consisted in analysing the match-to-match variations. This seems to be the first study to analyse an amateur TR team in the Portuguese context in which the main findings showed higher values of zone 4, zone 5, zone 6, deceleration, maximal speed and forward distance for middles than other positions, with meaningful results between middles and wings. In addition, and despite the non-significant results, the following trend was consistent for all variables: middles > links > wings. There were only two exceptions in which middles > wings > links regarding backward distance and links > middles > wings regarding number of jumps which can be attribute to more dives performed by links to score a point. Considering the secondary aim, there were no differences when comparing external load from all matches.

With respect to playing position comparisons, the present findings were in opposition to other research that found higher external load values for wings, specifically in walking, jogging, and running at <4.00 m/s [24]. The same happened for another study that found the same trend and justified it with the lower match duration and the higher number of links and middles (n = 11) when compared with wings (n = 3) [8]. This similar situation also occurred in the present study in which six wings participated, but these players presented lower external load values. Possible justifications could be associated with the reduced mean age, BMI and field size (23.71 years, 21.85 kg/m^2, 70 × 50 m) [8] when compared to the present study (39.36 years, 26.65 kg/m^2, 50 × 45 m, respectively).

Moreover, a previous research showed greater distance for middles compared with other positions at zone 4 and 5 which could be associated with the need to cover more space and, consequently, using higher running speeds [8, 11]. This was also corroborated by the present study. All these findings were probably associated with the style of play and the team's tactic in which the team organizes its attack by middle of the field, using middles and links while wings were only used to finish the play and score a point.

The present study also showed that there were more decelerations than accelerations regardless of the position. This was previously supported by another investigation that justified it as a determinant action to win the match [8]. This type of action occurs when players slow or stop their centers of mass and regain balance in response to an external stimuli or distractions [25, 26]. For instance, when a team is attacking, the defending team needs to touch an attacking player which consequently makes the whole defending team stop quickly and change their direction. This can also happen if the ball switches to the defending team. Considering that contact phases are not allowed and that after a touch, the ball-carrier needs to slow down and put the ball on the ground between feet, the ability to decelerate quickly instead of running with momentum is emphasized in TR [8]. Therefore, the higher decelerations can be associated with defensive style of play that cause athlete to move forward and running backwards 5 m when touching the opposing team [8].

Regarding the inexistence differences across match to match, it seems that the substitution rule plays a key factor, since it can be unlimited which consequently contributes for better attacks and defensive actions [27]. If a player tends to stay in the field too many times, it will probably decrease its performance by reducing distances at high intensity running speeds which was observed in rugby union [28] and rugby sevens [4]. Therefore, the rolling substitution is a key factor of the game to avoid accumulated fatigue while it also helps reducing the injury risk [29].

TABLE 1. Playing position comparisons.

Variable	Team	Link	Middle	Wing	*p*-value*	*p*-value[#]	Effect size[#]
Duration (min)	8.70 ± 1.17	9.01 ± 1.29	7.60 ± 0.00	9.23 ± 1.09	0.200	-	-
Total distance (m/min)	126.63 ± 32.48	115.55 ± 16.45	165.78 ± 21.75	107.91 ± 23.49	**0.018**	Link *vs.* Middle: 0.067 Link *vs.* Wing: >0.999 Middle *vs.* Wing: **0.024**	- - Middle *vs.* Wing: **2.53**
Zone 1 (m/min)	51.56 ± 11.05	46.60 ± 14.09	59.63 ± 1.32	49.48 ± 10.97	0.224	-	-
Zone 2 (m/min)	45.81 ± 11.20	38.96 ± 6.40	55.39 ± 7.37	43.98 ± 12.40	0.069	-	-
Zone 3 (m/min)	21.00 ± 10.22	18.71 ± 6.92	32.00 ± 8.84	15.20 ± 7.38	**0.028**	Link *vs.* Middle: 0.273 Link *vs.* Wing: >0.999 Middle *vs.* Wing: **0.024**	- - Middle *vs.* Wing: **2.11**
Zone 4 (m/min)	9.90 ± 6.15	10.13 ± 6.70	16.18 ± 1.89	5.56 ± 3.53	**0.049**	Link *vs.* Middle: 0.816 Link *vs.* Wing: 0.651 Middle *vs.* Wing: **0.044**	- - Middle *vs.* Wing: **3.53**
Zone 5 (m/min)	1.50 ± 1.43	1.75 ± 1.64	2.91 ± 0.81	0.38 ± 0.38	**0.047**	Link *vs.* Middle: >0.999 Link *vs.* Wing: 0.416 Middle *vs.* Wing: **0.048**	- - Middle *vs.* Wing: **11.77**
Zone 6 (m/min)	0.15 ± 0.21	0.19 ± 0.18	0.35 ± 0.24	0.00 ± 0.00	**0.026**	Link *vs.* Middle: >0.999 Link *vs.* Wing: 0.272 Middle *vs.* Wing: **0.027**	- - Middle *vs.* Wing: **2.38**
Acceleration (nr/min)	0.23 ± 0.18	0.24 ± 0.21	0.40 ± 0.15	0.11 ± 0.07	0.069	-	-
Deceleration (nr/min)	0.34 ± 0.22	0.36 ± 0.16	0.56 ± 0.21	0.19 ± 0.12	**0.021**	Link *vs.* Middle: 0.757 Link *vs.* Wing: 0.412 Middle *vs.* Wing: **0.018**	- - Middle *vs.* Wing: **3.70**
Maximal acceleration speed (m/s)	3.22 ± 0.32	3.24 ± 0.45	3.31 ± 0.11	3.15 ± 0.35	0.700	-	-
Maximal deceleration speed (m/s)	4.16 ± 1.01	4.04 ± 0.97	4.96 ± 0.84	3.69 ± 0.92	0.207	-	-
Maximal speed (km/h)	20.91 ± 2.67	21.35 ± 2.55	23.56 ± 1.90	18.84 ± 1.24	**0.022**	Link *vs.* Middle: 0.524 Link *vs.* Wing: 0.615 Middle *vs.* Wing: **0.018**	- - Middle *vs.* Wing: **2.57**
Forward distance (m/min)	80.40 ± 18.89	78.08 ± 7.17	102.20 ± 13.45	67.42 ± 17.40	**0.014**	Link *vs.* Middle: 0.710 Link *vs.* Wing: 0.585 Middle *vs.* Wing: **0.029**	- - Middle *vs.* Wing: **1.48**
Backward distance (m/min)	12.22 ± 4.42	9.33 ± 4.40	14.30 ± 1.02	12.77 ± 5.31	0.314	-	-
Impacts (nr/min)	0.29 ± 0.30	0.36 ± 0.24	0.44 ± 0.38	0.14 ± 0.24	0.146	-	-
Jumps (nr/min)	0.15 ± 0.12	0.24 ± 0.08	0.13 ± 0.15	0.10 ± 0.09	0.134	-	-

*m: meters; min: minutes; m/min: meters per minute; nr/min: number per minute; m/s: meters per second; km/h: kilometre per hour. Bold denotes significant results for $p < 0.05$; *, comparisons from Kruskal-Wallis; [#], Pairwise Comparisons through Bonferroni adjustment Post Hoc.*

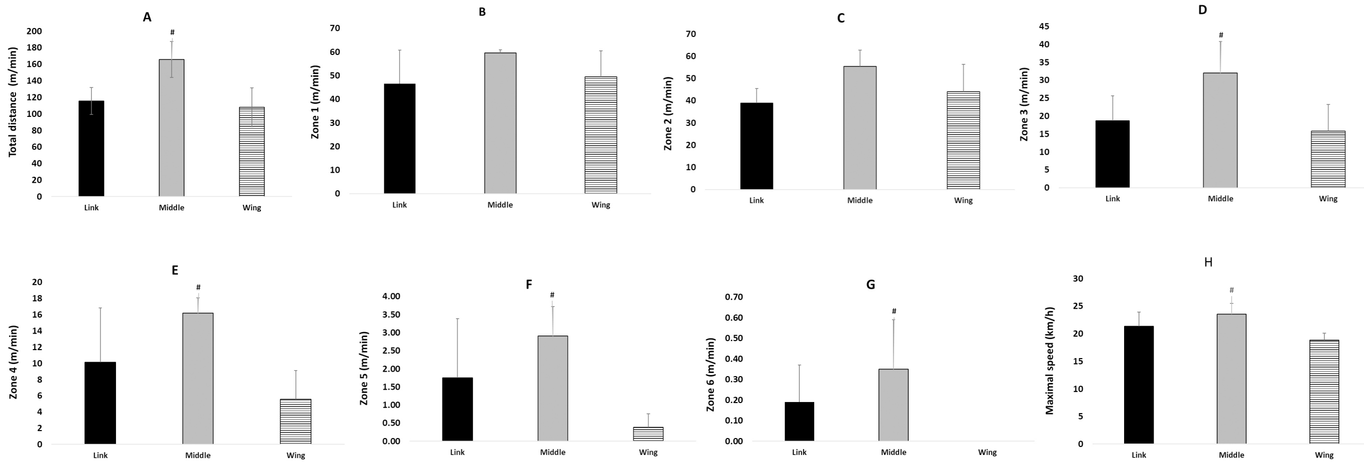

FIGURE 1. Comparisons of playing positions for total distance, zones 1 to 6 and maximal speed. (A) Total distance. (B) Zone 1. (C) Zone 2. (D) Zone 3. (E) Zone 4. (F) Zone 5. (G) Zone 6. (H) Maximal speed. $^{\#}$denotes significant difference from wing ($p < 0.05$).

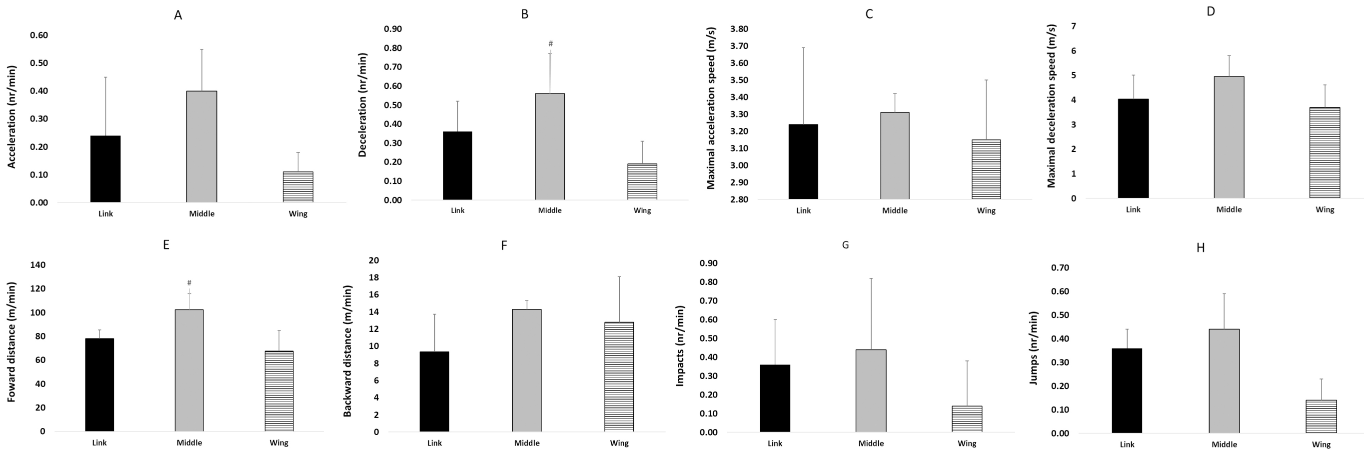

FIGURE 2. Comparisons of playing positions for acceleration, deceleration, maximal acceleration speed, maximal deceleration speed, forward distance, backward distance, impacts and jumps. (A) Acceleration. (B) Deceleration. (C) Maxima acceleration. (D) Maximal deceleration. (E) Forward distance. (F) Backward distance. (G) Impacts. (H) Jumps. $^{\#}$denotes significant difference from wing ($p < 0.05$).

Considering the relativized data used for the present study, the same approach was applied to analyse data in different contexts. For instance, research used 40-min of international and regional match-play data and showed a total distance of ~69.3 m/min which ranged from ~57 m/min in international level to ~74 m/min in regional level, respectively [10]. This was identical in an international test match series which revealed ~70 m/min [8]. Moreover, other international TR matches showed 129 m/min [11] or a range between 123 to 134 m/min [9] while the present study revealed a higher value of ~144 m/min. The present results should be emphasized considering the size of the field, since the present study used a small size when compared with the traditional (*e.g.*, 70 × 50 m). In addition, the previous authors also showed a high-speed running (>14 km/h) of 32 m/min or a range between 31 to 35 m/min [9] which contrasts with the present findings because if the values of zones 4, 5 and 5 were summed, the result would be a range between 11.22 to 19.57 m/min which is much lower. Once again, the context of the analysed players/teams is relevant and the previous authors did not reveal it [11]. Furthermore, other studies showed maximal speeds of 6.98 m/s in international test match series [8], 6.94 m/s in New Zealand elite touch players [30] and 7.25 m/s in England international touch players [10] which were higher than the valued achieved in the present study (5.80 m/s). Nonetheless, it is relevant to mention that some rules of touch changed since 2013 which consequently avoid proper comparisons with older studies. Moreover, the fact that other research used data from matches with longer durations and field size (*e.g.*, 70 × 50 m) can also influence any kind of comparison. Finally, it is relevant to mention that the current analysed players had a mean age of 39.36 ± 5.83 years and BMI associated with overweight which is not comparable with research in which athletes had between 20 to 30 years old and a BMI associated with normal weight [8–11, 30].

Despite the findings, the present study included some limitations that should be listed. The number of matches analysed (five), the fact they all belonged to the same tournament and

TABLE 2. Comparisons of among the five matches for the whole team.

Variable	Match 1 (n = 12)	Match 2 (n = 12)	Match 3 (n = 12)	Match 4 (n = 12)	Match 5 (n = 12)	*p*-value
Total distance (m/min)	163.64 ± 62.86	144.34 ± 68.32	134.77 ± 38.80	135.04 ± 29.91	107.39 ± 33.32	0.243
Zone 1 (m/min)	65.96 ± 19.78	47.08 ± 19.95	49.11 ± 12.78	51.09 ± 12.52	49.02 ± 9.86	0.180
Zone 2 (m/min)	55.72 ± 26.16	49.00 ± 24.57	47.55 ± 18.54	47.22 ± 12.65	37.64 ± 9.90	0.323
Zone 3 (m/min)	27.04 ± 14.19	29.42 ± 19.75	23.18 ± 10.19	23.75 ± 11.38	18.81 ± 10.48	0.463
Zone 4 (m/min)	11.78 ± 7.26	15.53 ± 9.56	9.87 ± 5.00	12.04 ± 8.27	9.94 ± 6.58	0.078
Zone 5 (m/min)	2.50 ± 2.45	3.60 ± 3.14	1.31 ± 2.25	0.94 ± 1.23	1.28 ± 1.38	0.176
Zone 6 (m/min)	0.65 ± 0.93	0.44 ± 1.38	0.04 ± 0.14	0.00 ± 0.00	0.00 ± 0.00	0.486
Acceleration (nr/min)	0.18 ± 0.16	0.36 ± 0.20	0.34 ± 0.38	0.21 ± 0.15	0.17 ± 0.17	0.055
Deceleration (nr/min)	0.55 ± 0.31	0.27 ± 0.18	0.45 ± 0.29	0.38 ± 0.40	0.32 ± 0.28	0.255
Maximal acceleration speed (m/s)	3.23 ± 0.45	3.40 ± 0.43	3.27 ± 0.53	3.20 ± 0.31	3.18 ± 0.33	0.368
Maximal deceleration speed (m/s)	4.69 ± 1.25	4.22 ± 1.26	4.25 ± 1.30	4.28 ± 1.23	4.00 ± 1.38	0.829
Maximal speed (km/h)	22.53 ± 3.98	21.88 ± 2.99	20.54 ± 3.50	20.40 ± 2.24	19.91 ± 3.24	0.376
Forward distance (m/min)	110.29 ± 40.73	89.69 ± 38.11	90.50 ± 24.44	84.35 ± 21.36	67.98 ± 20.65	0.294
Backward distance (m/min)	11.57 ± 6.10	13.62 ± 7.49	12.68 ± 5.80	11.40 ± 4.22	10.11 ± 3.66	0.294
Impacts (nr/min)	0.36 ± 0.36	0.51 ± 0.50	0.42 ± 0.41	0.44 ± 0.52	0.25 ± 0.19	0.308
Jumps (nr/min)	0.25 ± 0.22	0.15 ± 0.17	0.16 ± 0.12	0.16 ± 0.12	0.12 ± 0.12	0.275

m: meters; min: minutes; m/min: meters per minute; nr/min: number per minute; m/s: meters per second; km/h: kilometre per hour.

that all data came from only one Portuguese amateur team limits the generalization of results and suggest more studies with more matches and participants. Consequently, there were few players by position and maybe with larger sample sizes and/or more teams, the results could be better confirmed. However, the study findings can be an important contribution for coaches, since the results of the present study reflect the context of an amateur team where there is scarce research. Nonetheless, the mean age of the participants is quite high when compared with professional athletes, thus all findings should be cautiously interpreted, and the generalization to different contexts must be carefully considered.

Future studies can also include other contextual variables such as the ball possession which can help understanding offensive and defensive patterns. The addition of specific physical and physiological characteristics of the player would provide relevant knowledge for playing position comparisons. Finally, the approach applied in the present research can be further analyzed in different teams, contexts, and age groups.

As practical implications for coaches and practitioners, the present study highlights the importance of different positional demands which should be considered in training. For instance, middles displayed high loads for all variables (with exception of jumps) while links and wings should have additional training to cope with demands of middle players. Moreover, the study showed higher values of deceleration than acceleration during matches which should be considered for specific tactical drills in addition to small-sided games or match-simulation games. Furthermore, and considering the amateur context and the possibility of adding new players for the team, coaches can use the data of the present study to define playing position (*e.g.*, middles require higher load demands when compared with links and wings which consequently means that a new player without experience should not be placed as a middle). Finally, with the data example from the five matches analysed, coaches can better design higher intensity training sessions to cope with match demands, as well as, to prepare longer training sessions to simulate more matches in the same training session, since the same scenario happens on a tournament day.

5. Conclusions

The findings of this study provided a deeper understanding of the positional activity profile of an amateur Portuguese team, allowing practitioners to align training with the common external load experienced in tournaments. The main results showed higher values of zone 4, zone 5, zone 6, deceleration, maximal speed and forward distance for middles than other positions. In addition, this trend was also displayed for the remaining variables with only two exceptions for backward distance and jumps.

Furthermore, the analysis of match-to-match comparison revealed that no differences were observed throughout the competition day which means that fatigue was well managed considering the substitution rule and the tactics of the team.

AVAILABILITY OF DATA AND MATERIALS

Due to issues of participant consent related to the new data protection law from 25 May 2018 from the Portuguese data protection law No. 58/2019 of 08 August, in accordance with the Council and European Parliament (EU) Regulation 2016/679, 27 April 2016, on the protection of individuals regarding the processing of personal data and on the free movement of such data, data will not be shared publicly. Interested researchers may contact the corresponding author.

AUTHOR CONTRIBUTIONS

RO—conceptualization; formal analysis; writing-original draft preparation; funding. RO and MN—methodology; data collection; data curation; writing-review and editing; supervision. Both authors have read and agreed to the published version of the manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Ethics Committee of Polytechnic Institute of Santarém (No. 29-2023ESDRM). Written informed consent was obtained from all participants.

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CONFLICT OF INTEREST

The authors declare no conflict of interest. Rafael Oliveira is serving as one of the Editorial Board members of this journal. We declare that RO had no involvement in the peer review of this article and has no access to information regarding its peer review. Full responsibility for the editorial process for this article was delegated to BG.

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