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Within-Week Variation of Training Load in Turkish Elite Soccer Players by Players Positions (a GPS Technology Study)

Hakan Bayraktar [1,†], Erkan Gunay [2,*,†], Erhan Cene [3], Egemen Manci [1] and Zeki Akyildiz [4]

[1] Faculty of Sport Sciences, Dokuz Eylul University, Izmir; byrktrhkn64@gmail.com (H.B); egemenmanci@gmail.com (E.M)

[2] Faculty of Sport Sciences, Celal Bayar University, Manisa; erkanswim@gmail.com

[3] Department of Statistics, Yildiz Technical University, Istanbul, Turkey; erhancene@hotmail.com

[4] Faculty of Sport Sciences, Gazi University, Ankara; zekiakyldz@hotmail.com

[*] Correspondence: erkanswim@gmail.com

[†] The second author contributed equally to the manuscript at every stage and at the same level as the first author.

Abstract: The of this study was to analyze the variation between within-week and between-playing positions on the locomotor and mechanical demands of soccer players. 19 elite soccer players of a team competing in the Turkish First League were included in the research. 86 training sessions of this team were evaluated. The differences between training performance metrics among microcycles for each position are revealed with repeated ANOVA and the differences between training performance metrics among positions in each microcycle are revealed with ANOVA. All the number of deceleration and acceleration per minute variables show statistical differences among the cycles for the defenders and midfielders but not for the forwards. These data suggested that there is a need to plan for different position-specific training stimuli in elite soccer teams for high performance outputs. We believe that these results can be used to determine positional demands by sports scientists and data analysts.

Keywords: Soccer; TRIMP; Workload; Players; Heart Rate; GPS; Microcycles

Introduction

Monitoring the psychophysiological, locomotor and mechanical demands in soccer training context is determinant for a proper identification of the impact of exercise on the players (Halson, 2014). This importance is disclosed by studies conducted in practitioners and coaches (McGuigan et al., 2020) which emphasizes that using Global Positioning System (GPS) or subjective questionnaires as rate of perceived exertion has become prevalent in the daily practice (Weston, 2018). This importance is related with the perception of coaches and practitioners regarding the usefulness and cost-benefit of these instruments to quantify the magnitude of stimulus induced by the exercise, to adjust the training plans based on that and to prevent exposure to risk situations (Fullagar et al., 2019).

Among others, monitoring locomotor (distances covered and total distances covered at different speed zones) and mechanical demands (acceleration and deceleration) imposed in the training can help in to identify and classify the main targets of training and characterize the variation of training demands in the weekly schedule (Oliveira et al., 2021). A typical weekly schedule in soccer usually contains days dedicated to a greater metabolic stimulus, while others are more focused on the neuromuscular strain and mechanical stimulus (Laursen & Buchheit, 2019). This naturally will conduct to variations in locomotor and mechanical demands within the week. Research regarding this matter often reveals that the training sessions in the middle of the week are the most demanding regarding distances covered at

different intensities, while the day before the match is often the one with smaller intensity and volume (Anderson et al., 2016a; Clemente et al., 2018; Swallow et al., 2021a).

Although the targets defined by the coach and the proximity to the previous and the next match play a role in the demands imposed on the training, the specific exercises is also determinant to explain the variation in the demands between players. As an example, a descriptive study revealed that a vast majority of time is spent in played drills (e.g., small-sided games, positional games, 11 vs. 11) (Gonçalves et al., 2021), which exposure players to different locomotor and mechanical demands considering the positional effect. The physical demands of positional differences during competitions and training can create different locomotor and mechanical loads due to the distances covered by the players in their positions, and the different training stimuli of the game format in the positions. In fact, the contextual factor of playing position may be important, and some studies have been disclosing the significant variations of locomotor and mechanical demands between playing positions during the training sessions (Akenhead et al., 2016; Anderson et al., 2016b).

Although research conducted about the variations of locomotor and mechanical training demands between playing positions (Akenhead et al., 2016; Anderson et al., 2016b), more research should be conducted considering the interaction with the weekly schedule. The combination of analysis of variation of training demands regarding the within-week variations and between-playing positions can help coaches to identify normative values and expectable evidence to manage the training design. Therefore, the aim of this study was to analyze the variation between within-week and between-playing positions on the locomotor and mechanical demands of soccer players.

Methods

Participants

Nineteen elite soccer players (26.52±4.70 year; 180.21±5.97 cm; 73.83±7.14 kg; 22.63±7.14 kg/m²) of one team competing in the Turkish First League were evaluated for 86 training sessions. The inclusion criterion for the participants was (i) at least 3 training sessions per week. The exclusion criteria were (i) each player due to prolonged injury or a lack of participation in training for at least 2 weeks were excluded, and (ii) goalkeepers were excluded from the study due to differences in sports activity and variables used (Nobari et al., 2022). This research was conducted by the training coaches of the club after setting with the relevant authorities in the club. Prior to commencing the study, it also received the approval of the research ethics committee from the University of Dokuz Eylul (7034/GOA). The study was carried out according to regulations on human studies in the Helsinki Declaration.

Study Design

In this study aimed; (i) identification of within week loads; (ii) analyze the variation between within-week and between-playing positions on the locomotor and mechanical demands of soccer players. The external training loads of the athletes were recorded through GPS technologies during a season. During the week before the official match, the athletes were fitted with GPS devices before all training. The research was designed with the data from GPS devices.   Internal training loads were recorded via the heart rate monitor included in the GPS technology.

Monitoring External Training Load

For external training loads, total distances covered, distances covered at different speed zones, acceleration and deceleration data were recorded. 10 Hz Polar Pro Team GPS device (Polar Electro, Kempele, Finland) was used to record the external training load of the athletes in all training sessions. GPS technology, in which external training loads are recorded, has been proven to provide valid and reliable data in previous studies (Akyildiz et al., 2020). The speed zones, acceleration and deceleration

zones were designed with reference to the   used in previous studies (Huggins et al., 2020; Praça et al., 2021).

Monitoring Internal Training Load

Edwards training impulse (TRIMP) value, minimum heart rate (HR), maximum HR and average HR was used to calculate the internal training loads of the athletes. TRIMP was calculated by multiplying the time spent in five HR zones by a corresponding coefficient (50–60% HRmax = 1; 60–70% HRmax = 2; 70–80% HRmax = 3; 80–90% HRmax = 4; and 90–100% HRmax = 5), the results of which were then summed (Edwards, 1993). All heart rate zones were previously determined during maximum testing. All heart rate values were recorded via the heart rate monitor integrated into the Polar Pro Team GPS unit.

Statistical Analysis

TRIMP, number of acceleration and number of deceleration variables are normalized by dividing the value of the performance metric to the training duration to eliminate the effect of training time, before conducting statistical analysis. The other variables are not normalized due to normalizing wouldn't be beneficial due to their definitions.

The averages of training performance metrics for each player in each microcycle (each week) are calculated for eliminating the effect of the different number of games that players are involved and the Shapiro-Wilks normality test is conducted with p>0.05 for all the variables indicate the data is distributed normally. The differences between training performance metrics among microcycles for each position are revealed with repeated ANOVA (Tables 2–5) and the differences between training performance metrics among positions in each microcycle are revealed with ANOVA (Table 6). If any significant result is detected after the ANOVA or repeated ANOVA then Bonferroni posthoc tests are conducted for multiple comparisons for microcycles and positions. η^2 values are also reported for the effect sizes. η^2 values in the range 0-0.009 is considered as insignificant effect sizes, 0.01-0.0588 as small effect sizes, 0.0589-0.1379 as medium effect sizes, and values are greater than 0.1379 as large effect sizes (Tomczak & Tomczak, 2014). To understand the differences among microcycles and among positions data visualization techniques are employed. All the data processing and analysis are conducted with the R programming language. p values lower than 0.05 are considered significant.

Results

The data contains training data for 19 elite players from a Turkish soccer team. Data is obtained from 86 different training sessions between 17.08.2021 to 20.01.2022. The dataset consists of 8 defenders (DF), 8 midfielders (MF), and 3 forwards (FW) who attended at the training at least 5 days before the matches.

The data contains training performance metrics of players which are given in Table 1. Data also contains a variable called microcycle which indicates the distance to the next game with possible values 5 days before the match day (MD-5) (n=147), 4 days before the match day (MD-4) (n=180), 3 days before the match day (MD-3) (n=277), 2 days before the match day (MD-2) (n=324), 1 day before the match day (MD-1) (n=299), and the next day of the match (MD+1) (n=68). Data also has another variable called position with possible values defenders, midfielders and forwards.

Table 1. Training Performance Metrics and Brief Descriptions.

Training Performance Metrics	Description
Min HR (BPM)	Min Heart Rate during training
Mean Heart Rate BPM	Mean Heart Rate during training
Max Heart Rate BPM	Max Heart Rate during training

Total Distance (m)	Total in the training
Distance per minute (m/min)	Total Distance during training / Duration of training
Max Speed (km/h)	Max Speed in the training
Average Speed (km/h)	Average Speed in the training
Training Impulse per min	Multiplying the time spent in five HR zones
Distance in Speed Area 1 (m)	Distance covered at speed (0.00 - 5.99 km/h)
Distance in Speed Area 2 (m)	Distance covered at speed (6.00 - 14.39 km/h)
Distance in Speed Area 3 (m)	Distance covered at speed (14.40 - 19.99 km/h)
Distance in Speed Area 4 (m)	Distance covered at speed (20.00 - 24.99 km/h)
Distance in Speed Area 5 (m)	Distance covered at speed (>=25 km/h)
Number of Dec. 1 per min	Number of Dec between -50.00 and -3.00 m/s2
Number of Dec. 2 per min	Number of Dec between -2.99 and -2.00 m/s2
Number of Dec. 3 per min	Number of Dec between -1.99 and -1.00 m/s2
Number of Dec. 4 per min	Number of Dec between -0.99 and -0.50 m/s2
Number of Acc. 1 per min	Number of Acc between 0.50 and 0.99 m/s2
Number of Acc. 2 per min	Number of Acc between 1.00 and 1.99 m/s2
Number of Acc. 3 per min	Number of Acc between 2.00 and 2.99 m/s2
Number of Acc. 4 per min	Number of Acc between 3.00 and 50.00 m/s2

Tables 2–5 give mean and standard deviation for training performance metrics among each microcycle for all the data and for each position separately. Repeated ANOVA with Bonferroni multiple comparison results and η^2 effect sizes are also reported in these tables.

For minimum heart rate, there is no difference for all the data, midfielders and forwards. The only statistical difference takes place for the defenders (p < 0.001). MD-1 statistically significantly higher minimum heart rate than all the other cycles for the defenders. Also, MD-5 has a significantly higher heart rate than MD-2 and MD-3 cycles.

Table 2. Mean and standard deviation, repeated ANOVA, Bonferroni test results and effect sizes for training performance metrics among microcycles for all data.

	Cycle For All Players													F	p	Source of Difference	Effect Size
	MD-5		MD-4		MD-3		MD-2		MD-1		MD+1						
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD				
Min HR (BPM)	64.224	8.980	67.426	13.683	64.003	9.071	66.607	9.083	67.946	9.263	62.737	13.749	2.469	0.068	-----	0.032 (Small)
Mean Heart Rate (BPM)	131.739	11.998	138.770	11.935	134.054	8.999	135.314	9.584	125.009	10.852	131.317	18.119	10.841	<0.001	MD-1 - MD-2, MD-3, MD-4, MD-5; MD-3 - MD-4	0.111 (Medium)
Max Heart Rate (BPM)	192.811	14.319	194.843	13.836	194.172	10.818	193.388	12.163	182.687	15.199	187.004	28.116	3.895	0.032	MD-1 - MD-2, MD-3, MD-4	0.069 (Medium)
Total Distance (m)	4514.591	786.696	4803.911	524.278	4930.951	319.517	4287.314	236.855	2783.812	314.599	3430.211	978.156	59.865	<0.001	MD-1 - MD-2, MD-3, MD-4, MD-5, MD+1; MD-2 - MD-3, MD-4; MD+1 - MD-2, MD-3, MD-4, MD-5	0.641 (Large)
Distance per minute (m/min)	52.982	8.011	59.586	7.666	62.380	4.436	66.824	4.892	47.806	4.109	47.024	12.980	31.365	<0.001	MD-1 - MD-2, MD-3, MD-4; MD-3 - MD-5, MD+1; MD-2 - MD-3, MD-4, MD-5, MD+1; MD-4 - MD+1	0.496 (Large)
Max Speed (km/h)	23.804	4.316	25.203	2.324	26.350	1.398	25.968	1.178	23.607	1.113	19.803	5.249	14.585	<0.001	MD-1 - MD-2, MD-3; MD+1 - MD-2, MD-3, MD-4	0.349 (Large)
Average Speed (km/h)	4.005	0.376	4.252	0.551	4.387	0.298	4.325	0.309	3.158	0.273	4.337	0.863	22.094	<0.001	MD-1 - MD-2, MD-3, MD-4, MD-5, MD+1; MD-5 - MD-2, MD-3	0.446 (Large)
Training Impulse per min	2.169	0.729	2.541	0.736	2.338	0.516	2.513	0.542	2.003	0.573	1.860	1.008	8.158	<0.001	MD-1 - MD-2, MD-3, MD-4; MD+1 - MD-2, MD-4	0.119 (Medium)
Distance in Speed Area 1 (m)	21.537	4.580	23.768	3.939	24.204	2.460	27.431	2.118	27.565	2.103	19.547	9.019	10.258	<0.001	MD-1, MD-2 - MD-3, MD-4, MD-5, MD+1	0.286 (Large)
Distance in Speed Area 2 (m)	25.120	3.532	27.556	4.834	28.753	3.037	30.436	3.388	16.082	2.210	22.980	6.556	62.602	<0.001	MD-1, MD-2 - MD-3, MD-4, MD-5, MD+1; MD-1 - MD-2; MD-3, MD-4 - MD+1; MD-3 - MD-5	0.575 (Large)
Distance in Speed Area 3 (m)	4.705	1.693	5.888	1.337	6.548	1.452	6.807	1.466	3.196	0.616	3.451	2.233	32.278	<0.001	MD-1 - MD-2, MD-3, MD-4, MD-5; MD-2, MD-3; MD-5, MD+1; MD-4 - MD+1	0.473 (Large)
Distance in Speed Area 4 (m)	1.409	0.773	2.119	0.792	2.482	0.754	1.743	0.486	0.843	0.418	0.944	0.676	26.598	<0.001	MD-1 - MD-2, MD-3, MD-4, MD-5; MD-3, MD-4; MD-5, MD+1; MD-2 - MD-3, MD+1	0.455 (Large)
Distance in Speed Area 5 (m)	0.176	0.131	0.237	0.129	0.361	0.196	0.422	0.213	0.109	0.088	0.103	0.090	32.697	<0.001	MD-1- MD-2, MD-3, MD-4; MD-2 - MD-3; MD-4, MD-5, MD+1; MD-4 - MD+1	0.409 (Large)
Number of Dec. 1 per min	0.142	0.064	0.199	0.073	0.195	0.059	0.198	0.068	0.110	0.044	0.126	0.086	12.944	<0.001	MD-1 - MD-2, MD-3, MD-4; MD+1 - MD-2, MD-3, MD-4	0.245 (Large)
Number of Dec. 2 per min	0.470	0.187	0.666	0.190	0.605	0.150	0.612	0.140	0.423	0.073	0.407	0.252	12.675	<0.001	MD-1 - MD-2, MD-3, MD-4; MD+1 - MD-2, MD-3, MD-4; MD-4 - MD-5	0.261 (Large)
Number of Dec. 3 per min	0.009	0.005	0.012	0.005	0.011	0.003	0.011	0.003	0.007	0.005	0.006	0.007	4.785	<0.01	MD-1 - MD-4	0.158 (Large)
Number of Dec. 4 per min	5.816	1.482	6.468	1.222	6.112	0.728	7.121	0.632	7.968	1.042	4.618	2.767	14.434	<0.001	MD-1 - MD-2, MD-3, MD-4, MD-5, MD+1; MD-2 - MD-3, MD+1; MD-4 - MD+1	0.342 (Large)

	MD-5 Mean	MD-5 SD	MD-4 Mean	MD-4 SD	MD-3 Mean	MD-3 SD	MD-2 Mean	MD-2 SD	MD-1 Mean	MD-1 SD	MD+1 Mean	MD+1 SD	F	p	Source of Difference	Effect Size
Number of Acc. 1 per min	3.089	0.791	3.443	0.733	3.307	0.455	3.841	0.530	4.560	0.831	2.443	1.469	18.600	<0.001	MD-1 - MD-2, MD-3, MD-4, MD-5, MD+1; MD-2 - MD-3, MD+1; MD-4 - MD+1	0.374 (Large)
Number of Acc. 2 per min	1.866	0.512	2.188	0.479	2.047	0.320	2.191	0.240	1.801	0.298	1.472	0.899	7.994	<0.001	MD-1 - MD-2, MD-4; MD+1 - MD-2, MD-4	0.205 (Large)
Number of Acc. 3 per min	0.551	0.196	0.744	0.181	0.672	0.140	0.755	0.128	0.510	0.086	0.490	0.304	11.875	<0.001	MD-1 - MD-2, MD-3, MD-4; MD-2 - MD-3, MD-5, MD+1; MD-4 - MD-5, MD+1	0.263 (Large)
Number of Acc. 4 per min	0.135	0.063	0.207	0.076	0.198	0.056	0.199	0.057	0.203	0.051	0.140	0.082	7.252	<0.001	MD-5 - MD-1, MD-3; MD-4 - MD+1	0.186 (Large)

Distance in Speed Area 1 (m) : Distance covered at speed (0.00 - 5.99 km/h), Distance in Speed Area 2 (m) : Distance covered at speed (6.00 - 14.39 km/h), Distance in Speed Area 3 (m): Distance covered at speed (14.40 - 19.99 km/h), Distance in Speed Area 4 (m) : Distance covered at speed (20.00 - 24.99 km/h) Distance in Speed Area 5 (m) : Distance covered at speed (>=25 km/h), Number of Dec. 1 per min : Number of Dec between -50.00 and -3.00 m/s2, Number of Dec. 2 per min : Number of Dec between -2.99 and -2.00 m/s2, Number of Dec. 3 per min : Number of Dec between -1.99 and -1.00 m/s2, Number of Dec. 4 per min : Number of Dec between -0.99 and -0.50 m/s2, Number of Acc. 1 per min : Number of Acc between 0.50 and 0.99 m/s2, Number of Acc. 2 per min : Number of Acc between 1.00 and 1.99 m/s2, Number of Acc. 3 per min : Number of Acc between 2.00 and 2.99 m/s2, Number of Acc. 4 per min : Number of Acc between 3.00 and 50.00 m/s2, SD: Standard Deviation, Source of Difference: Multiple Comparison test results according to Bonferroni test MD-5: Training 5 days before match, MD-4: Training 4 days before match, MD-3: Training 3 days before match, MD-2: Training 2 days before match, MD-1: Training 1 day before match, MD+1: Training 1 day after match, Examples for Source of difference column: (A) – (B) denotes significant differences between A and B; (A)-(B)-(C) denotes significant differences for all possible pairwise combinations for A, B and C. (A)-(B),(C) denotes significant differences between A and B, and also between A and C, (A),(B) – (C) denotes significant differences between A and C, and also between B and C.

Table 3. Mean and standard deviation, repeated ANOVA, Bonferroni test results and effect sizes for training performance metrics among microcycles for the defenders.

	Cycle for Defenders												F	p	Source of Difference	Effect Size
	MD-5		MD-4		MD-3		MD-2		MD-1		MD+1					
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD				
Min HR (BPM)	67.110	10.700	66.523	17.287	66.699	10.590	66.865	12.105	69.048	13.251	67.158	13.719	17.621	<0.001	MD-1 - MD-2, MD-3, MD-4, MD-5, MD+1; MD-5 - MD-2, MD-3	0.524 (Large)
Mean Heart Rate (BPM)	135.115	10.020	139.017	9.650	133.502	6.288	134.670	7.257	125.832	9.052	126.835	21.267	2.766	0.126	----	0.211 (Large)
Max Heart Rate (BPM)	195.133	13.208	195.047	15.015	194.124	14.197	193.762	12.106	185.628	14.234	176.404	35.129	24.459	<0.001	MD-1, MD-2 - MD-4, MD-5, MD+1; MD-1 - MD-2; MD-3 - MD-5, MD+1; MD-4 - MD+1	0.599 (Large)
Total Distance (m)	4618.339	470.466	4839.406	486.795	4757.572	365.924	4233.559	252.431	2839.141	242.073	3228.715	852.330	15.277	<0.001	MD-1 - MD-2, MD-3, MD-4, MD-5; MD-2, MD-3 - MD-5, MD+1; MD-4 - MD+1	0.476 (Large)
Distance per minute (m/min)	54.703	6.193	60.140	6.927	60.113	5.241	65.308	4.573	47.885	3.915	45.590	12.485	11.836	0.002	MD-1 - MD-2, MD-3, MD-4, MD-5; MD-2 - MD-3, MD+1; MD-3, MD-4 - MD-5, MD+1	0.522 (Large)
Max Speed (km/h)	24.852	3.363	25.603	2.464	26.638	0.873	26.165	1.159	23.511	1.095	18.097	6.347	22.568	<0.001	MD-1 - MD-2, MD-3, MD-4; MD-4 - MD+1; MD-2, MD-3 - MD-4, MD-5, MD+1	0.545 (Large)
Average Speed (km/h)	3.961	0.301	4.474	0.638	4.344	0.368	4.283	0.323	3.147	0.268	4.584	0.794	13.981	0.002	MD-1 - MD-2, MD-3 MD-4; MD-4 - MD+1; MD-2 - MD-3, MD-4, MD-5, MD+1; MD-3 - MD-5, MD+1	0.525 (Large)

	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	F	p	Source of Difference	η^2
Training Impulse per min	2.425	0.605	2.591	0.692	2.339	0.428	2.527	0.405	2.135	0.516	1.594	1.091	3.092	0.105	----	0.131 (Medium)
Distance in Speed Area 1 (m)	23.583	3.379	24.384	4.943	24.746	2.094	28.050	1.871	28.625	2.174	20.440	12.103	0.194	0.849	----	0.005 (Insig.)
Distance in Speed Area 2 (m)	24.721	3.443	27.490	4.895	26.950	2.481	29.181	2.970	15.507	1.629	21.656	6.514	4.664	0.047	MD-1 - MD-2, MD-3, MD-4, MD-5; MD-3 - MD-4	0.155 (Large)
Distance in Speed Area 3 (m)	4.836	1.465	5.722	1.534	5.688	1.422	5.923	1.466	2.930	0.457	2.777	2.031	10.789	0.006	MD-1 - MD-2, MD-3; MD+1 - MD-2, MD-3, MD-4	0.483 (Large)
Distance in Speed Area 4 (m)	1.338	0.757	2.198	0.861	2.291	0.891	1.699	0.458	0.672	0.268	0.682	0.507	13.969	0.003	MD-1 - MD-2, MD-3, MD-4, MD-5, MD+1; MD+1 - MD-2, MD-4; MD-2 - MD-3	0.522 (Large)
Distance in Speed Area 5 (m)	0.217	0.158	0.281	0.138	0.422	0.185	0.465	0.191	0.096	0.067	0.078	0.071	6.499	0.018	MD-1, MD+1 - MD-2, MD-4	0.346 (Large)
Number of Dec. 1 per min	0.161	0.052	0.189	0.069	0.183	0.041	0.183	0.063	0.109	0.031	0.096	0.075	7.724	<0.001	MD-1 - MD-2, MD-3, MD-4; MD-2 - MD-3, MD-4, MD+1; MD-4 - MD-5, MD+1	0.346 (Large)
Number of Dec. 2 per min	0.496	0.168	0.588	0.160	0.528	0.120	0.548	0.104	0.408	0.030	0.308	0.231	4.725	0.002	MD-5 - MD-1, MD-3; MD-4 - MD+1	0.287 (Large)
Number of Dec. 3 per min	0.010	0.005	0.011	0.005	0.011	0.003	0.010	0.002	0.005	0.002	0.004	0.007	11.003	0.006	MD-1 - MD-2, MD-3, MD-4, MD-5, MD+1; MD-2 - MD-3, MD+1; MD-4 - MD+1	0.486 (Large)
Number of Dec. 4 per min	6.138	1.017	6.245	1.285	6.030	0.851	7.113	0.335	7.988	0.519	3.853	2.790	5.534	<0.001	MD-1 - MD-4	0.326 (Large)
Number of Acc. 1 per min	3.289	0.519	3.313	0.748	3.305	0.520	3.838	0.301	4.578	0.475	2.079	1.446	5.925	<0.001	MD-1, MD+1 - MD-2, MD-3, MD-4; MD-4 - MD-5	0.315 (Large)
Number of Acc. 2 per min	1.959	0.395	2.022	0.407	1.912	0.327	2.105	0.156	1.772	0.217	1.165	0.870	7.913	<0.001	MD-1, MD+1 - MD-2, MD-3, MD-4;	0.326 (Large)
Number of Acc. 3 per min	0.579	0.178	0.697	0.172	0.617	0.142	0.704	0.116	0.487	0.063	0.373	0.279	40.483	<0.001	MD-1 - MD-2, MD-3, MD-4, MD-5, MD+1; MD-2 - MD-3, MD-4; MD+1 - MD-2, MD-3, MD-4, MD-5	0.741 (Large)
Number of Acc. 4 per min	0.143	0.062	0.179	0.056	0.181	0.044	0.191	0.058	0.217	0.044	0.107	0.085	7.734	0.012	MD-1 - MD-2, MD-3, MD-4; MD+1 - MD-2, MD-4	0.225 (Large)

Distance in Speed Area 1 (m) : Distance covered at speed (0.00 - 5.99 km/h), Distance in Speed Area 2 (m) : Distance covered at speed (6.00 - 14.39 km/h), Distance in Speed Area 3 (m): Distance covered at speed (14.40 - 19.99 km/h), Distance in Speed Area 4 (m) : Distance covered at speed (20.00 - 24.99 km/h) Distance in Speed Area 5 (m) : Distance covered at speed (>=25 km/h), Number of Dec. 1 per min : Number of Dec between -50.00 and -3.00 m/s2, Number of Dec. 2 per min : Number of Dec between -2.99 and -2.00 m/s2, Number of Dec. 3 per min : Number of Dec between -1.99 and -1.00 m/s2, Number of Dec. 4 per min : Number of Dec between -0.99 and -0.50 m/s2, Number of Acc. 1 per min : Number of Acc between 0.50 and 0.99 m/s2, Number of Acc. 2 per min : Number of Acc between 1.00 and 1.99 m/s2, Number of Acc. 3 per min : Number of Acc between 2.00 and 2.99 m/s2, Number of Acc. 4 per min : Number of Acc between 3.00 and 50.00 m/s2, SD: Standard Deviation, Source of Difference: Multiple Comparison test results according to Bonferroni test MD-5: Training 5 days before match, MD-4: Training 4 days before match, MD-3: Training 3 days before match, MD-2: Training 2 days before match, MD-1: Training 1 day before match, MD+1: Training 1 day after match, Examples for Source of difference column: (A) – (B) denotes significant differences between A and B; (A)-(B)-(C) denotes significant differences for all possible pairwise combinations for A, B and C. (A)-(B),(C) denotes significant differences between A and B, and also between A and C, (A),(B) – (C) denotes significant differences between A and C, and also between B and C.

Table 4. Mean and standard deviation, repeated ANOVA, Bonferroni test results and effect sizes for training performance metrics among microcycles for midfielders.

	MD-5 Mean	SD	MD-4 Mean	SD	MD-3 Mean	SD	MD-2 Mean	SD	MD-1 Mean	SD	MD+1 Mean	SD	F	p	Source of Difference	Effect Size
Min HR (BPM)	61.515	7.976	64.165	7.491	59.610	7.637	64.466	6.263	65.518	5.352	56.379	13.118	3.195	0.068	----	0.142 (Large)
Mean Heart Rate (BPM)	127.592	9.797	133.787	10.848	130.729	8.672	131.710	8.889	120.874	10.188	129.967	14.239	10.148	<0.001	MD-1 - MD-2, MD-3, MD-4, MD-5; MD-3 - MD-4	0.148 (Large)
Max Heart Rate (BPM)	185.821	14.548	194.653	15.491	192.228	8.905	192.013	13.706	180.195	15.849	193.444	22.481	4.128	0.005	MD-1 - MD-2, MD-3, MD-4	0.108 (Medium)
Total Distance (m)	4598.732	442.170	4707.888	571.107	5010.200	243.073	4314.452	243.155	2768.898	184.279	3557.923	1057.164	30.965	<0.001	MD-1 - MD-2, MD-3, MD-4, MD-5, MD+1; MD-2 - MD-3, MD-4; MD+1 - MD-2, MD-3, MD-4, MD-5	0.693 (Large)
Distance per minute (m/min)	53.262	4.341	57.404	7.697	62.854	2.119	66.762	3.916	46.658	3.591	45.942	13.485	19.698	<0.001	MD-1 - MD-2, MD-3, MD-4; MD-3 - MD-5, MD+1; MD-2 - MD-3, MD-4, MD-5, MD+1; MD-4 - MD+1	0.584 (Large)
Max Speed (km/h)	23.951	2.292	24.161	2.140	25.607	1.689	25.603	1.389	23.754	1.177	20.773	4.485	6.160	0.017	MD-1 - MD-2, MD-3; MD+1 - MD-2, MD-3, MD-4	0.331 (Large)
Average Speed (km/h)	3.901	0.180	4.058	0.453	4.468	0.257	4.299	0.260	3.086	0.239	4.197	1.008	8.189	0.015	MD-1 - MD-2, MD-3, MD-4, MD-5, MD+1; MD-5 - MD-2, MD-3	0.486 (Large)
Training Impulse per min	2.097	0.553	2.323	0.593	2.215	0.514	2.414	0.597	1.828	0.562	1.823	0.792	6.823	0.008	MD-1 - MD-2, MD-3, MD-4; MD+1 - MD-2, MD-4	0.138 (Medium)
Distance in Speed Area 1 (m)	21.071	2.306	22.209	2.749	22.821	2.543	26.648	1.850	26.481	1.492	17.596	5.596	11.742	0.005	MD-1, MD-2 - MD-3, MD-4, MD-5, MD+1	0.544 (Large)
Distance in Speed Area 2 (m)	25.564	3.541	27.114	5.129	30.278	3.130	30.994	3.418	15.765	2.209	23.122	6.741	34.706	<0.001	MD-1 , MD-2 - MD-3, MD-4, MD-5, MD+1; MD-1 - MD-2; MD-3 - MD-5; MD+1 - MD-3, MD-5	0.617 (Large)
Distance in Speed Area 3 (m)	4.870	0.902	5.803	1.251	7.011	1.143	7.221	1.062	3.382	0.324	3.965	2.322	21.607	<0.001	MD-1 - MD-2, MD-3, MD-4, MD-5; MD-2, MD-3 - MD-5, MD+1; MD-4 - MD+1	0.581 (Large)
Distance in Speed Area 4 (m)	1.586	0.721	2.097	0.546	2.416	0.434	1.582	0.417	0.922	0.419	1.122	0.743	11.229	<0.001	MD-1 - MD-2, MD-3, MD-4, MD-5; MD-2 - MD-3, MD+1; MD-3, MD-4 - MD-5, MD+1	0.489 (Large)
Distance in Speed Area 5 (m)	0.145	0.094	0.184	0.120	0.293	0.221	0.328	0.242	0.123	0.100	0.111	0.096	7.625	<0.001	MD-1 - MD-2, MD-3, MD-4; MD-2, MD-3 - MD-4, MD-5, MD+1; MD-4 - MD+1	0.244 (Large)
Number of Dec. 1 per min	0.129	0.035	0.180	0.052	0.187	0.052	0.185	0.039	0.105	0.030	0.141	0.076	8.054	<0.001	MD-1, MD+1 - MD-2, MD-3, MD-4;	0.313 (Large)
Number of Dec. 2 per min	0.466	0.088	0.661	0.131	0.616	0.100	0.616	0.068	0.414	0.044	0.450	0.243	9.372	0.007	MD-1, MD+1 - MD-2, MD-3, MD-4; MD-4 - MD-5	0.387 (Large)
Number of Dec. 3 per min	0.008	0.002	0.011	0.003	0.011	0.002	0.011	0.003	0.007	0.003	0.009	0.006	2.277	0.068	----	0.197 (Large)
Number of Dec. 4 per min	5.999	0.787	6.196	0.940	5.922	0.445	7.025	0.588	7.569	0.763	4.396	1.761	18.595	<0.001	MD-1 - MD-2, MD-3, MD-4, MD-5, MD+1; MD-2 - MD-3; MD+1 - MD-2, MD-4	0.542 (Large)
Number of Acc. 1 per min	3.191	0.450	3.280	0.615	3.188	0.356	3.716	0.425	4.224	0.555	2.225	0.874	26.705	<0.001	MD-1 - MD-2, MD-3, MD-4, MD-5, MD+1; MD-2 - MD-3, MD+1; MD-4 - MD+1	0.563 (Large)

	MD-5 Mean	SD	MD-4 Mean	SD	MD-3 Mean	SD	MD-2 Mean	SD	MD-1 Mean	SD	MD+1 Mean	SD	F	p	Source of Difference	Effect Size
Number of Acc. 2 per min	1.896	0.221	2.131	0.383	2.059	0.099	2.217	0.191	1.755	0.264	1.480	0.663	8.649	0.005	MD-1, MD+1 - MD-2, MD-4	0.362 (Large)
Number of Acc. 3 per min	0.556	0.090	0.719	0.127	0.674	0.094	0.763	0.079	0.510	0.048	0.532	0.278	6.393	0.017	MD-1 - MD-2, MD-3, MD-4; MD-2 - MD-3; MD-2, MD-4 - MD-5, MD+1	0.354 (Large)
Number of Acc. 4 per min	0.131	0.047	0.202	0.052	0.193	0.060	0.187	0.030	0.182	0.052	0.150	0.076	4.161	0.034	MD-5 - MD-1, MD-3; MD-4 - MD+1	0.196 (Large)

Distance in Speed Area 1 (m) : Distance covered at speed (0.00 - 5.99 km/h), Distance in Speed Area 2 (m) : Distance covered at speed (6.00 - 14.39 km/h), Distance in Speed Area 3 (m): Distance covered at speed (14.40 - 19.99 km/h), Distance in Speed Area 4 (m) : Distance covered at speed (20.00 - 24.99 km/h) Distance in Speed Area 5 (m) : Distance covered at speed (>=25 km/h), Number of Dec. 1 per min : Number of Dec between -50.00 and -3.00 m/s2, Number of Dec. 2 per min : Number of Dec between -2.99 and -2.00 m/s2, Number of Dec. 3 per min : Number of Dec between -1.99 and -1.00 m/s2, Number of Dec. 4 per min : Number of Dec between -0.99 and -0.50 m/s2, Number of Acc. 1 per min : Number of Acc between 0.50 and 0.99 m/s2, Number of Acc. 2 per min : Number of Acc between 1.00 and 1.99 m/s2, Number of Acc. 3 per min : Number of Acc between 2.00 and 2.99 m/s2, Number of Acc. 4 per min : Number of Acc between 3.00 and 50.00 m/s2, SD: Standard Deviation, Source of Difference: Multiple Comparison test results according to Bonferroni test MD-5: Training 5 days before match,   MD-4: Training 4 days before match,   MD-3: Training 3 days before match,   MD-2: Training 2 days before match,   MD-1: Training 1 day before match,   MD+1: Training 1 day after match, Examples for Source of difference column: (A) – (B) denotes significant differences between A and B; (A)-(B)-(C) denotes significant differences for all possible pairwise combinations for A, B and C. (A)-(B),(C)   denotes significant differences between A and B, and also between A and C, (A),(B) – (C) denotes significant differences between A and C, and also between B and C.

Table 5. Mean and standard deviation, repeated ANOVA, Bonferroni test results and effect sizes for training performance metrics among microcycles for forwards.

	Cycle for Forwards												F	p	Source of Difference	Effect Size
	MD-5		MD-4		MD-3		MD-2		MD-1		MD+1					
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD				
Min HR (BPM)	63.751	6.278	78.528	14.559	68.527	2.624	71.628	5.988	71.485	3.197	67.900	12.662	2.051	0.156	-----	0.284 (Large)
Mean Heart Rate (BPM)	133.799	22.078	151.403	14.324	144.394	11.018	146.640	10.946	133.838	14.892	146.867	14.555	2.629	0.091	-----	0.228 (Large)
Max Heart Rate (BPM)	205.264	6.664	194.806	9.678	199.481	3.581	196.058	11.922	181.489	20.715	198.100	15.044	2.136	0.144	-----	0.332 (Large)
Total Distance (m)	4013.556	1913.923	4965.319	649.495	5181.962	59.168	4358.289	229.962	2676.041	732.284	3626.967	1367.909	3.674	0.038	MD-1 - MD-2, MD-3, MD-4, MD-5, MD+1; MD-2 - MD-3, MD-4; MD+1 - MD-2, MD-3, MD-4, MD-5	0.493 (Large)
Distance per minute (m/min)	47.645	17.960	63.931	10.248	67.159	3.095	71.028	7.268	50.657	5.972	53.733	15.932	2.877	0.073	-----	0.471 (Large)
Max Speed (km/h)	20.620	9.486	26.912	1.406	27.564	0.439	26.412	0.230	23.473	1.397	21.768	3.921	1.599	0.246	-----	0.367 (Large)
Average Speed (km/h)	4.397	0.748	4.175	0.487	4.286	0.209	4.509	0.444	3.377	0.359	4.051	0.707	2.001	0.164	-----	0.423 (Large)
Training Impulse per min	1.681	1.337	2.994	1.207	2.663	0.779	2.739	0.839	2.120	0.840	2.665	1.238	1.590	0.249	-----	0.205 (Large)
Distance in Speed Area 1 (m)	17.320	9.269	26.283	2.631	26.448	0.304	27.867	3.448	27.631	2.507	22.366	8.917	1.446	0.289	-----	0.398 (Large)

Variable	MD-5 Mean	SD	MD-4 Mean	SD	MD-3 Mean	SD	MD-2 Mean	SD	MD-1 Mean	SD	MD+1 Mean	SD	F	p	Source of Difference	Effect Size
Distance in Speed Area 2 (m)	24.997	5.044	28.910	5.547	29.492	2.016	32.292	4.337	18.458	2.721	26.135	7.567	5.202	0.013	MD-1, MD-2 - MD-3, MD-4, MD-5, MD+1; MD-1 - MD-2; MD-3 - MD-5, MD+1; MD-4 - MD+1	0.546 (Large)
Distance in Speed Area 3 (m)	3.915	3.783	6.557	1.254	7.606	1.349	8.059	1.308	3.408	1.350	3.880	2.898	3.134	0.059	-----	0.522 (Large)
Distance in Speed Area 4 (m)	1.126	1.137	1.964	1.397	3.167	0.901	2.289	0.475	1.091	0.688	1.164	0.898	5.768	0.009	MD-1 - MD-2, MD-3, MD-4, MD-5; MD-2 - MD-3, MD+1; MD-3, MD-4 - MD-5, MD+1	0.485 (Large)
Distance in Speed Area 5 (m)	0.150	0.155	0.260	0.117	0.377	0.139	0.556	0.082	0.105	0.135	0.149	0.129	8.002	0.003	MD-1 - MD-2, MD-3, MD-4; MD-2, MD-3 - MD-4, MD-5, MD+1; MD-4 - MD+1	0.694 (Large)
Number of Dec. 1 per min	0.124	0.144	0.277	0.103	0.249	0.102	0.275	0.108	0.124	0.101	0.165	0.140	2.009	0.163	-----	0.324 (Large)
Number of Dec. 2 per min	0.410	0.425	0.891	0.276	0.780	0.218	0.770	0.262	0.488	0.174	0.557	0.314	1.981	0.167	-----	0.352 (Large)
Number of Dec. 3 per min	0.007	0.009	0.016	0.006	0.011	0.004	0.010	0.002	0.013	0.011	0.008	0.007	0.789	0.581	-----	0.228 (Large)
Number of Dec. 4 per min	4.471	3.276	7.789	1.206	6.839	0.755	7.398	1.356	8.980	2.149	7.249	4.228	1.175	0.386	-----	0.31 (Large)
Number of Acc. 1 per min	2.288	1.679	4.225	0.683	3.630	0.515	4.183	1.159	5.411	1.676	3.995	2.257	1.769	0.207	-----	0.376 (Large)
Number of Acc. 2 per min	1.540	1.203	2.783	0.562	2.372	0.533	2.349	0.489	2.002	0.566	2.269	1.325	0.912	0.511	-----	0.23 (Large)
Number of Acc. 3 per min	0.464	0.439	0.934	0.263	0.813	0.183	0.871	0.218	0.571	0.193	0.690	0.412	1.529	0.265	-----	0.311 (Large)
Number of Acc. 4 per min	0.126	0.118	0.293	0.132	0.257	0.050	0.254	0.095	0.224	0.061	0.207	0.055	1.210	0.371	-----	0.333 (Large)

Distance in Speed Area 1 (m) : Distance covered at speed (0.00 - 5.99 km/h), Distance in Speed Area 2 (m) : Distance covered at speed (6.00 - 14.39 km/h), Distance in Speed Area 3 (m): Distance covered at speed (14.40 - 19.99 km/h), Distance in Speed Area 4 (m) : Distance covered at speed (20.00 - 24.99 km/h) Distance in Speed Area 5 (m) : Distance covered at speed (>=25 km/h), Number of Dec. 1 per min : Number of Dec between -50.00 and -3.00 m/s2, Number of Dec. 2 per min : Number of Dec between -2.99 and -2.00 m/s2, Number of Dec. 3 per min : Number of Dec between -1.99 and -1.00 m/s2, Number of Dec. 4 per min : Number of Dec between -0.99 and -0.50 m/s2, Number of Acc. 1 per min : Number of Acc between 0.50 and 0.99 m/s2, Number of Acc. 2 per min : Number of Acc between 1.00 and 1.99 m/s2, Number of Acc. 3 per min : Number of Acc between 2.00 and 2.99 m/s2, Number of Acc. 4 per min : Number of Acc between 3.00 and 50.00 m/s2, SD: Standard Deviation, Source of Difference: Multiple Comparison test results according to Bonferroni test MD-5: Training 5 days before match, MD-4: Training 4 days before match, MD-3: Training 3 days before match, MD-2: Training 2 days before match, MD-1: Training 1 day before match, MD+1: Training 1 day after match, Examples for Source of difference column: (A) – (B) denotes significant differences between A and B; (A)-(B)-(C) denotes significant differences for all possible pairwise combinations for A, B and C. (A)-(B),(C) denotes significant differences between A and B, and also between A and C, (A),(B) – (C) denotes significant differences between A and C, and also between B and C.

For mean heart rate, there are no statistically significant differences for the defenders and forwards. For both the defenders and for all the data, MD-1 statistically differs from MD2, MD-3, MD-4, and MD-5, also MD-3 is statistically different than MD-4 ($p < 0.001$).   MD-1 has the lowest mean heart rate compared to all other cycles and cycle MD-4 has a higher mean heart rate than MD-3.

For maximum heart rate, MD-1 cycle has significantly lower averages than MD-2, MD-3 and MD-4 cycles for all the data ($p < 0.05$) and for the midfielders ($p < 0.01$). No statistically significant result is found for the forwards. Defenders showed a complex relationship among the cycles ($p < 0.001$). Both MD-1 and MD-2 have significantly lower maximum heart rate than MD-3, MD-4 and MD-5 and also they have significantly higher maximum heart rate than MD+1. Also cycle MD-1 differs from MD-2, MD-3 differs from both MD-5 and MD+1 and MD-4 differs from MD+1.

In total distance, defenders show a different pattern than all the other positions. For both the midfielders and forwards cycle MD-1 and cycle MD+1 have significantly lower total distance than all other cycles. Also MD-2 is significantly different than MD-3 and MD-4. For the defenders, MD-1 has significantly lower total distance than all other cycles except MD+1. Also MD-2 and MD-3 differ from both MD-5 and MD+1 cycles and MD-4 differs from MD+1.

In distance per minute, MD-1 has significantly lower values compared to all other cycles except MD+1 for the defenders. Also for the defenders MD-2 differs from cycles MD+1 and MD-3 and also MD-3 and MD-4 differs from both MD-5 and MD+1. For midfielders, MD-1 has lower distance per minute values compared to MD-2, MD-3 and MD-4 whereas MD-2 has higher distance per minute values compared to all other microcycles. MD-3 differs from both MD-5 and MD+1 and MD-4 differs from MD+1. Forward position doesn't show any significant differences among cycles for the distance per minute.

For the defenders, MD-1 has lower means than MD-2, MD-3 and MD-4 and MD-4 differs from MD+1 in max speed. Also cycles MD-2 and MD-3 show significant differences compared to MD-4, MD-5 and MD+1 cycles for the defenders. For the midfielders MD-1 differs from MD-2 and MD-3 while MD+1 differs from MD-2, MD-3 and MD-4. Forward position doesn't show any significant differences among cycles for the max speed.

In average speed, no significant differences is located for the forwards. For the defenders, MD-1 is significantly lower than MD-2, MD-3 and MD-4 and MD-2 is significantly higher than all other microcycles. MD-3 and MD-4 differ from MD+1 and MD-3 differs from MD-5 for the defenders. For the midfielders, MD-1 has the lowest mean compared to all the other cycles and MD-5 differs from MD-2 and MD-3.

Midfielders is the only position that show statistically significant differences for the TRIMP per minute. MD-1 and MD+1 cycles significantly lower than MD-2 and MD-4 cycles for the midfielders. Also MD-1 also differs from MD-3 cycle.

Distance covered at speed between 0 – 5.99 km/h only showed significant differences for the midfielders where both MD-1 and MD-2 have higher values than all other cycles.

Distance covered at speed between 6 – 14.39 km/h showed differences in cycles for all the positions. For defenders, MD-1 cycle is significantly lower than all cycles except MD+1 and cycle MD-4 is higher than cycle MD-3. For midfielders, both MD-1 and MD+1 cycles are significantly lower than all other cycles. Also MD-1 is lower than MD+1 and MD-3 differs than MD-5 whereas MD+1 cycle differs both from MD-3 and MD-5. For forwards, MD-1 and MD-2 significantly differs from all other cycles where MD-1 has the lowest mean and MD-2 has the highest mean. Also significant differences are located between MD-1 and MD-2; MD-4 and MD+1 and also between MD-3 and both MD-5 and MD+1.

Distance covered at speed between 14.40 – 19.99 km/h showed differences in cycles for the defenders and midfielders but not for the forwards. For defenders, both MD-1 and MD+1 differ from MD-2 and MD-3 and also MD+1 differs from MD-4. For midfielders, cycle MD-1 is significantly lower than all other cycles except MD+1. Also both MD-2 and MD-3 differ from MD-5 and MD+1 and MD-4 differs from MD+1 only.

Distance covered at speed between 20 – 24.99 km/h showed differences in cycles for all the positions. For defenders, MD-1 has significantly lower values compared to all other cycles. MD+1 differs from MD-2 and MD-4 and MD-2 also differs from MD-3. Both for the midfielders and forwards MD-1 show differences except MD+1 cycle. MD-2 is significantly different than both MD-3 and MD+1 and also MD-3 and MD-4 are significantly different than MD-5 and MD+1.

For defenders, MD-1 and MD-2 cycles are separated from cycles MD-2 and MD-4 where lower values are detected in the former cycles in distance covered at speed over 25 km/h. For midfielders and forwards same results are achieved. For both of these positions, MD-1 is separated from MD-2, MD-3 and MD-4; MD-2 and MD-3 are distinguished from MD-4, MD-5 and MD+1; and MD-4 differs from MD+1.

All the number of deceleration and acceleration per minute variables show statistical differences among the cycles for the defenders and midfielders but not for the forwards.

Number of deceleration per minute between -50 and -3.00 m/s^2 showed difference at cycles MD-1 and MD-2, MD-3 and MD-4 for the defenders as well as between MD-2 and MD-3, MD-4 and MD+1. Also MD-4 differs from both MD-5 and MD+1 for the defenders. For the midfielders MD-1 and MD+1 differ from MD-2, MD-3 and MD-4.

MD-5 shows significant differences with cycles MD-1 and MD-3 and MD-4 differs from MD+1 for defenders in number of deceleration per minute between -2.99 and -2.00 m/s^2. For midfielders, both MD-1 and MD+1 differ from MD-2, MD-3 and MD-4 whereas MD-4 also differs from MD-5.

MD-1 significantly differs from all the other cycles and MD-2 differs from MD-3 and MD+1 for the defenders in number of deceleration per minute between -1.99 and -1.00 m/s^2. Also MD-4 differs from MD+1 in the defenders. No significant differences is detected both for midfielders and forwards.

MD-1 significantly differs from MD-4 for the defenders and MD-1 significantly differs from all the other cycles for the midfielders in number of deceleration per minute between -0.99 and -0.50 m/s^2. For midfielders, also MD-2 differs from MD-3 and MD+1 differs from both MD-2 and MD-4.

Both MD-1 and MD+1 differ from MD-2, MD-3 and MD-4 for the defenders in number of acceleration per minute between 0.50 and 0.99 m/s^2. Also for the defenders MD-4 and MD-5 differs from each other. For midfielders, MD-1 significantly differs from all the other cycles, MD-2 differs from MD-3 and MD+1; and MD-4 differs from MD+1.

Both MD-1 and MD+1 differ from MD-2, MD-3 and MD-4 for the defenders and both MD-1 and MD+1 differ from MD-2 and MD-4 for the midfielders in number of acceleration per minute between 1 and 1.99 m/s^2.

Both MD-1 and MD+1 significantly differs from all the other cycles and MD-2 differs from both MD-3 and MD-4 for defenders in number of acceleration per minute between 2 and 2.99 m/s^2. For midfielders, MD-1 differs from MD-2, MD-3 and MD-4; MD-2 differs from MD-3; and both MD-2 and MD-3 differ from MD-5 and MD+1.

Both MD-1 and MD+1 differ from MD-2 and MD-4; and MD-1 differs from MD-3 for the defenders in number of acceleration per minute between 3 and 50 m/s^2. For midfielders MD-5 differs from both MD-1 and MD-3; and MD-4 differs from MD+1.

Another think to mention from the tables is about the effect sizes. Most of the effect sizes are consistent with the differences among the cycles except for the forwards (Table-5). High effect sizes for the training performance metrics didn't reflect to the cycle differences for the forward.

A second analysis is conducted on training performance indicators to detect differences among positions in each microcycle with ANOVA test followed by Bonferroni multiple comparison test when a difference is found (Table 6). The results also visualized with bar chart for an easier and deeper understanding on how training performance metrics change for each position and microcycle and is indicated in Figure 1.
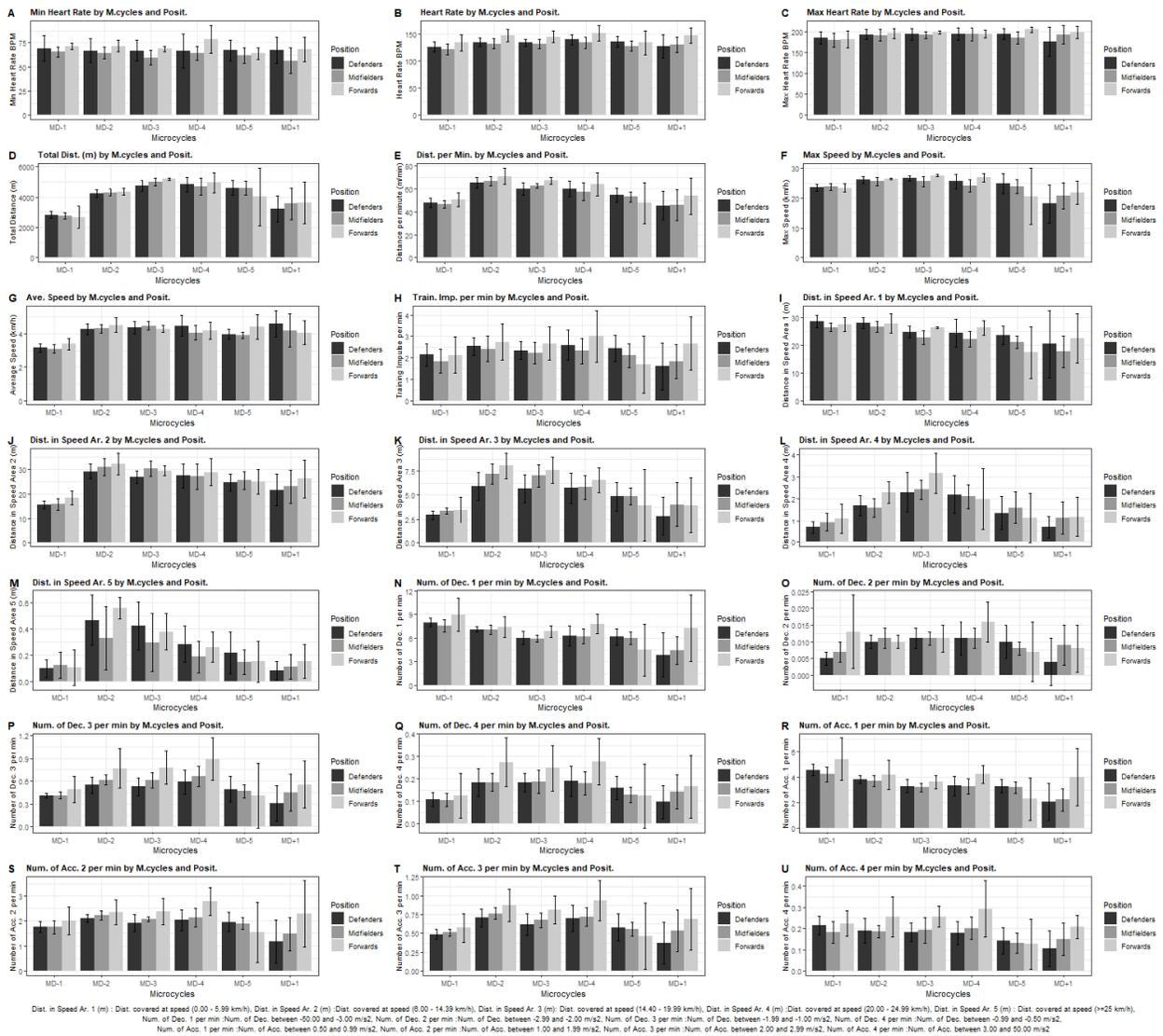
Figure 1. Bar charts for training performance metrics among microcycles and positions.

Table 6. Mean and standard deviation, ANOVA, Bonferroni test results and effect sizes for training performance metrics among positions for all data and all microcycles.

	ALL						F	p	SOD	Effect Size	MD-5						F	p	SOD	Effect Size
	DF		MF		FW						DF		MF		FW					
	Mean	SD	Mean	SD	Mean	SD					Mean	SD	Mean	SD	Mean	SD				
Min Heart Rate BPM	67.234	12.450	61.942	8.520	70.303	8.736	5.401	0.006	MF - DF, FW	0.089	67.110	10.700	61.515	7.976	63.751	6.278	0.761	0.484	---	0.087
Mean Heart Rate BPM	132.495	12.021	129.110	10.855	142.823	14.435	8.621	<0.001	FW - DF, MF	0.134	135.115	10.020	127.592	9.797	133.799	22.078	0.822	0.457	---	0.093
Max Heart Rate BPM	190.016	19.345	189.726	15.692	195.866	12.924	0.948	0.390	---	0.017	195.133	13.208	185.821	14.548	205.264	6.664	2.577	0.107	---	0.244
Total Distance (m)	4086.122	910.857	4159.682	932.125	4137.022	1232.117	0.070	0.933	---	0.001	4618.339	470.466	4598.732	442.170	4013.556	1913.923	0.700	0.511	---	0.080
Distance per minute (m/min)	55.623	9.793	55.480	10.233	59.026	13.161	0.823	0.442	---	0.015	54.703	6.193	53.262	4.341	47.645	17.960	0.840	0.450	---	0.095
Max Speed (km/h)	24.144	4.192	23.975	2.836	24.458	4.514	0.111	0.895	---	0.002	24.852	3.363	23.951	2.292	20.620	9.486	1.064	0.368	---	0.117
Average Speed (km/h)	4.132	0.671	4.001	0.647	4.132	0.583	0.566	0.569	---	0.010	3.961	0.301	3.901	0.180	4.397	0.748	2.271	0.136	---	0.221
Training Impulse per min	2.268	0.713	2.116	0.619	2.477	1.002	1.675	0.192	---	0.029	2.425	0.605	2.097	0.553	1.681	1.337	1.236	0.317	---	0.134
Distance in Speed Area 1 (m)	24.971	6.067	22.804	4.288	24.653	6.104	2.090	0.129	---	0.036	23.583	3.379	21.071	2.306	17.320	9.269	2.452	0.118	---	0.235
Distance in Speed Area 2 (m)	24.251	5.970	25.473	6.561	26.714	6.101	1.126	0.328	---	0.020	24.721	3.443	25.564	3.541	24.997	5.044	0.104	0.901	---	0.013
Distance in Speed Area 3 (m)	4.646	1.923	5.375	1.913	5.571	2.701	2.070	0.131	---	0.036	4.836	1.465	4.870	0.902	3.915	3.783	0.361	0.702	---	0.043
Distance in Speed Area 4 (m)	1.480	0.908	1.621	0.746	1.800	1.127	0.911	0.405	---	0.016	1.338	0.757	1.586	0.721	1.126	1.137	0.415	0.667	---	0.049
Distance in Speed Area 5 (m)	0.260	0.202	0.197	0.172	0.266	0.195	1.617	0.203	---	0.028	0.217	0.158	0.145	0.094	0.150	0.155	0.653	0.534	---	0.075
Number of Dec. 1 per min	0.153	0.066	0.155	0.057	0.202	0.120	3.284	0.041	FW - DF, MF	0.056	0.161	0.052	0.129	0.035	0.124	0.144	0.625	0.548	---	0.073
Number of Dec. 2 per min	0.479	0.170	0.537	0.156	0.649	0.302	5.224	0.007	DF - FW	0.086	0.496	0.168	0.466	0.088	0.410	0.425	0.213	0.810	---	0.026
Number of Dec. 3 per min	0.008	0.005	0.009	0.004	0.011	0.007	1.545	0.218	---	0.027	0.010	0.005	0.008	0.002	0.007	0.009	0.431	0.657	---	0.051
Number of Dec. 4 per min	6.228	1.831	6.184	1.365	7.121	2.514	2.005	0.140	---	0.035	6.138	1.017	5.999	0.787	4.471	3.276	1.579	0.237	---	0.165
Number of Acc. 1 per min	3.400	1.045	3.304	0.817	3.955	1.553	2.573	0.081	---	0.044	3.289	0.519	3.191	0.450	2.288	1.679	2.081	0.157	---	0.206
Number of Acc. 2 per min	1.823	0.535	1.923	0.419	2.219	0.816	3.462	0.035	DF - FW	0.059	1.959	0.395	1.896	0.221	1.540	1.203	0.732	0.497	---	0.084
Number of Acc. 3 per min	0.576	0.201	0.626	0.166	0.724	0.307	3.343	0.039	DF - FW	0.057	0.579	0.178	0.556	0.090	0.464	0.439	0.350	0.710	---	0.042
Number of Acc. 4 per min	0.169	0.067	0.174	0.058	0.227	0.094	4.974	0.009	FW - DF, MF	0.082	0.143	0.062	0.131	0.047	0.126	0.118	0.095	0.910	---	0.012

MD-4	MD-4						F	p	SOD	Effect Size	MD-3						F	p	SOD	Effect Size
	DF		MF		FW						DF		MF		FW					
	Mean	SD	Mean	SD	Mean	SD					Mean	SD	Mean	SD	Mean	SD				
Min Heart Rate BPM	66.523	17.287	64.165	7.491	78.528	14.559	1.269	0.308	---	0.137	66.699	10.590	59.610	7.637	68.527	2.624	1.815	0.195	---	0.185
Mean Heart Rate BPM	139.017	9.650	133.787	10.848	151.403	14.324	2.876	0.086	---	0.264	133.502	6.288	130.729	8.672	144.394	11.018	3.148	0.070	---	0.282
Max Heart Rate BPM	195.047	15.015	194.653	15.491	194.806	9.678	0.001	0.999	---	0.000	194.124	14.197	192.228	8.905	199.481	3.581	0.461	0.639	---	0.054
Total Distance (m)	4839.406	486.795	4707.888	571.107	4965.319	649.495	0.271	0.766	---	0.033	4757.572	365.924	5010.200	243.073	5181.962	59.168	2.826	0.089	---	0.261
Distance per minute (m/min)	60.140	6.927	57.404	7.697	63.931	10.248	0.809	0.463	---	0.092	60.113	5.241	62.854	2.119	67.159	3.095	3.671	0.049	DF - FW	0.315
Max Speed (km/h)	25.603	2.464	24.161	2.140	26.912	1.406	1.907	0.181	---	0.192	26.638	0.873	25.607	1.689	27.564	0.439	2.959	0.081	---	0.270
Average Speed (km/h)	4.474	0.638	4.058	0.453	4.175	0.487	1.199	0.327	---	0.130	4.344	0.368	4.468	0.257	4.286	0.209	0.521	0.604	---	0.061
Training Impulse per min	2.591	0.692	2.323	0.593	2.994	1.207	0.932	0.414	---	0.104	2.339	0.428	2.215	0.514	2.663	0.779	0.809	0.463	---	0.092
Distance in Speed Area 1 (m)	24.384	4.943	22.209	2.749	26.283	2.631	1.395	0.276	---	0.149	24.746	2.094	22.821	2.543	26.448	0.304	3.442	0.057	---	0.301
Distance in Speed Area 2 (m)	27.490	4.895	27.114	5.129	28.910	5.547	0.137	0.873	---	0.017	26.950	2.481	30.278	3.130	29.492	2.016	3.088	0.073	---	0.278
Distance in Speed Area 3 (m)	5.722	1.534	5.803	1.251	6.557	1.254	0.425	0.661	---	0.050	5.688	1.422	7.011	1.143	7.606	1.349	3.261	0.065	---	0.290
Distance in Speed Area 4 (m)	2.198	0.861	2.097	0.546	1.964	1.397	0.090	0.914	---	0.011	2.291	0.891	2.416	0.434	3.167	0.901	1.629	0.227	---	0.169
Distance in Speed Area 5 (m)	0.281	0.138	0.184	0.120	0.260	0.117	1.213	0.323	---	0.132	0.422	0.185	0.293	0.221	0.377	0.139	0.863	0.441	---	0.097
Number of Dec. 1 per min	0.189	0.069	0.180	0.052	0.277	0.103	2.368	0.126	---	0.228	0.183	0.041	0.187	0.052	0.249	0.102	1.624	0.228	---	0.169
Number of Dec. 2 per min	0.588	0.160	0.661	0.131	0.891	0.276	3.561	0.053	---	0.308	0.528	0.120	0.616	0.100	0.780	0.218	4.257	0.033	DF - FW	0.347
Number of Dec. 3 per min	0.011	0.005	0.011	0.003	0.016	0.006	2.048	0.161	---	0.204	0.011	0.003	0.011	0.002	0.011	0.004	0.101	0.904	---	0.013
Number of Dec. 4 per min	6.245	1.285	6.196	0.940	7.789	1.206	2.410	0.122	---	0.232	6.030	0.851	5.922	0.445	6.839	0.755	2.032	0.164	---	0.203
Number of Acc. 1 per min	3.313	0.748	3.280	0.615	4.225	0.683	2.329	0.129	---	0.226	3.305	0.520	3.188	0.356	3.630	0.515	1.028	0.380	---	0.114
Number of Acc. 2 per min	2.022	0.407	2.131	0.383	2.783	0.562	3.712	0.047	DF-FW	0.317	1.912	0.327	2.059	0.099	2.372	0.533	2.687	0.099	---	0.251

	DF Mean	DF SD	MF Mean	MF SD	FW Mean	FW SD	F	p	SOD	Effect Size	DF Mean	DF SD	MF Mean	MF SD	FW Mean	FW SD	F	p	SOD	Effect Size
Number of Acc. 3 per min	0.697	0.172	0.719	0.127	0.934	0.263	2.283	0.134	---	0.222	0.617	0.142	0.674	0.094	0.813	0.183	2.457	0.117	---	0.235
Number of Acc. 4 per min	0.179	0.056	0.202	0.052	0.293	0.132	3.005	0.078	---	0.273	0.181	0.044	0.193	0.060	0.257	0.050	2.369	0.126	---	0.228

	MD-2										MD-1									
	DF		MF		FW		F	p	SOD	Effect Size	DF		MF		FW		F	p	SOD	Effect Size
	Mean	SD	Mean	SD	Mean	SD					Mean	SD	Mean	SD	Mean	SD				
Min Heart Rate BPM	66.865	12.105	64.466	6.263	71.628	5.988	0.658	0.531	---	0.076	69.048	13.251	65.518	5.352	71.485	3.197	0.521	0.604	----	0.061
Mean Heart Rate BPM	134.670	7.257	131.710	8.889	146.640	10.946	3.390	0.059	---	0.298	125.832	9.052	120.874	10.188	133.838	14.892	1.725	0.210	----	0.177
Max Heart Rate BPM	193.762	12.106	192.013	13.706	196.058	11.922	0.115	0.892	---	0.014	185.628	14.234	180.195	15.849	181.489	20.715	0.244	0.786	----	0.030
Total Distance (m)	4233.559	252.431	4314.452	243.155	4358.289	229.962	0.366	0.699	---	0.044	2839.141	242.073	2768.898	184.279	2676.041	732.284	0.284	0.756	----	0.034
Distance per minute (m/min)	65.308	4.573	66.762	3.916	71.028	7.268	1.590	0.234	---	0.166	47.885	3.915	46.658	3.591	50.657	5.972	1.041	0.376	----	0.115
Max Speed (km/h)	26.165	1.159	25.603	1.389	26.412	0.230	0.683	0.519	---	0.079	23.511	1.095	23.754	1.177	23.473	1.397	0.109	0.897	----	0.013
Average Speed (km/h)	4.283	0.323	4.299	0.260	4.509	0.444	0.606	0.558	---	0.070	3.147	0.268	3.086	0.239	3.377	0.359	1.283	0.304	----	0.138
Training Impulse per min	2.527	0.405	2.414	0.597	2.739	0.839	0.370	0.697	---	0.044	2.135	0.516	1.828	0.562	2.120	0.840	0.621	0.550	----	0.072
Distance in Speed Area 1 (m)	28.050	1.871	26.648	1.850	27.867	3.448	0.945	0.409	---	0.106	28.625	2.174	26.481	1.492	27.631	2.507	2.403	0.122	----	0.231
Distance in Speed Area 2 (m)	29.181	2.970	30.994	3.418	32.292	4.337	1.123	0.350	---	0.123	15.507	1.629	15.765	2.209	18.458	2.721	2.413	0.121	----	0.232
Distance in Speed Area 3 (m)	5.923	1.466	7.221	1.062	8.059	1.308	3.740	0.046	DF - FW	0.319	2.930	0.457	3.382	0.324	3.408	1.350	1.339	0.290	----	0.143
Distance in Speed Area 4 (m)	1.699	0.458	1.582	0.417	2.289	0.475	2.845	0.088	---	0.262	0.672	0.268	0.922	0.419	1.091	0.688	1.402	0.275	----	0.149
Distance in Speed Area 5 (m)	0.465	0.191	0.328	0.242	0.556	0.082	1.637	0.226	---	0.170	0.096	0.067	0.123	0.100	0.105	0.135	0.174	0.842	----	0.021
Number of Dec. 1 per min	0.183	0.063	0.185	0.039	0.275	0.108	2.691	0.098	---	0.252	0.109	0.031	0.105	0.030	0.124	0.101	0.193	0.826	----	0.024
Number of Dec. 2 per min	0.548	0.104	0.616	0.068	0.770	0.262	3.485	0.055	---	0.303	0.408	0.030	0.414	0.044	0.488	0.174	1.501	0.253	----	0.158
Number of Dec. 3 per min	0.010	0.002	0.011	0.003	0.010	0.002	0.609	0.556	---	0.071	0.005	0.002	0.007	0.003	0.013	0.011	3.815	0.044	DF - FW	0.323
Number of Dec. 4 per min	7.113	0.335	7.025	0.588	7.398	1.356	0.354	0.707	---	0.042	7.988	0.519	7.569	0.763	8.980	2.149	2.291	0.133	----	0.223
Number of Acc. 1 per min	3.838	0.301	3.716	0.425	4.183	1.159	0.830	0.454	---	0.094	4.578	0.475	4.224	0.555	5.411	1.676	2.634	0.103	----	0.248
Number of Acc. 2 per min	2.105	0.156	2.217	0.191	2.349	0.489	1.233	0.318	---	0.134	1.772	0.217	1.755	0.264	2.002	0.566	0.796	0.468	----	0.091
Number of Acc. 3 per min	0.704	0.116	0.763	0.079	0.871	0.218	2.115	0.153	---	0.209	0.487	0.063	0.510	0.048	0.571	0.193	1.037	0.377	----	0.115
Number of Acc. 4 per min	0.191	0.058	0.187	0.030	0.254	0.095	1.763	0.203	---	0.181	0.217	0.044	0.182	0.052	0.224	0.061	1.297	0.301	----	0.139

MD+1	MD+1 DF		MF		FW		F	p	SOD	Effect Size
	Mean	SD	Mean	SD	Mean	SD				
Min Heart Rate BPM	67.158	13.719	56.379	13.118	67.900	12.662	1.575	0.237	----	0.165
Mean Heart Rate BPM	126.835	21.267	129.967	14.239	146.867	14.555	1.438	0.266	----	0.152
Max Heart Rate BPM	176.404	35.129	193.444	22.481	198.100	15.044	1.014	0.385	----	0.112
Total Distance (m)	3228.715	852.330	3557.923	1057.164	3626.967	1367.909	0.275	0.763	----	0.033
Distance per minute (m/min)	45.590	12.485	45.942	13.485	53.733	15.932	0.448	0.647	----	0.053
Max Speed (km/h)	18.097	6.347	20.773	4.485	21.768	3.921	0.748	0.489	----	0.085
Average Speed (km/h)	4.584	0.794	4.197	1.008	4.051	0.707	0.569	0.577	----	0.066
Training Impulse per min	1.594	1.091	1.823	0.792	2.665	1.238	1.278	0.306	----	0.138
Distance in Speed Area 1 (m)	20.440	12.103	17.596	5.596	22.366	8.917	0.346	0.713	----	0.041

	DF mean	DF SD	MF mean	MF SD	FW mean	FW SD	F	p	SOD	
Distance in Speed Area 2 (m)	21.656	6.514	23.122	6.741	26.135	7.567	0.483	0.626	----	0.057
Distance in Speed Area 3 (m)	2.777	2.031	3.965	2.322	3.880	2.898	0.605	0.558	----	0.070
Distance in Speed Area 4 (m)	0.682	0.507	1.122	0.743	1.164	0.898	1.043	0.375	----	0.115
Distance in Speed Area 5 (m)	0.078	0.071	0.111	0.096	0.149	0.129	0.706	0.508	----	0.081
Number of Dec. 1 per min	0.096	0.075	0.141	0.076	0.165	0.140	0.935	0.413	----	0.105
Number of Dec. 2 per min	0.308	0.231	0.450	0.243	0.557	0.314	1.302	0.299	----	0.140
Number of Dec. 3 per min	0.004	0.007	0.009	0.006	0.008	0.007	0.997	0.391	----	0.111
Number of Dec. 4 per min	3.853	2.790	4.396	1.761	7.249	4.228	1.847	0.190	----	0.188
Number of Acc. 1 per min	2.079	1.446	2.225	0.874	3.995	2.257	2.296	0.133	----	0.223
Number of Acc. 2 per min	1.165	0.870	1.480	0.663	2.269	1.325	1.791	0.199	----	0.183
Number of Acc. 3 per min	0.373	0.279	0.532	0.278	0.690	0.412	1.368	0.283	----	0.146
Number of Acc. 4 per min	0.107	0.085	0.150	0.076	0.207	0.055	1.898	0.182	----	0.192

DF: Defenders, MF: Midfielders, FW: Forwards, SOD: Source of Difference according to Bonferroni test results. Examples for Source of difference column: (A) – (B) denotes significant differences between A and B; (A)-(B)-(C) denotes significant differences for all possible pairwise combinations for A, B and C. (A)-(B),(C) denotes significant differences between A and B, and also between A and C, (A),(B) – (C) denotes significant differences between A and C, and also between B and C.

For all the data, few training performance indicators show statistically significant differences among positions. Midfielders separated from defenders and forwards in min heart rate and forwards separated from defenders and midfielders from mean heart rate. Forwards has a higher number of deceleration per minute between -50 and -3.00 m/s^2 compared to the other positions and also they have a higher number of deceleration per minute between -2.99 and -2.00 m/s^2 compared to defenders. Forwards have significantly higher averages in the number of acceleration per minute between 1 and 1.99 m/s^2 and in the number of acceleration per minute between 2 and 2.99 m/s^2 compared to defenders and also forwards have significantly higher averages in the number of acceleration per minute greater than 3.00 m/s^2 compared to both defenders and midfielders. For microcycles MD-5 and MD+1, no significant difference is detected among positions for any of the training performance indicators. For microcycle MD-4, the only training performance indicator that shows the difference among positions is the number of acceleration per minute between 1 and 1.99 m/s^2 where forwards have higher averages than defenders. For microcycle MD-3, the only two training performance indicators that show differences among positions are distance per min and the number of deceleration between -2.99 and -2 m/s^2 where forwards have higher average values compared to defenders in both. For MD-2, the only training performance indicator that shows the difference among positions is the distance covered at speed 20.00 - 24.99 km/h interval where forwards have a higher average compared to the defenders. For MD-1, the only training performance indicator that shows the difference among positions is the number of deceleration between -1.99 and -1 m/s^2 where forwards have higher average values compared to defenders where forwards have a higher average compared to the defenders.

Discussion

The main aim of this study are; (i) identification of within week loads; (ii) analyze the variation between within-week and between-playing positions on the locomotor and mechanical demands of soccer players. The main finding of this study was that while lower differences were observed between internal loads within the weekly training cycle, higher differences were observed between external load values. While the training volumes increase on the days farthest from the match, the parameters affecting the training intensities increase on the days closest to the match.

There are studies examining the weekly variations of internal and external training loads according to players positions (Martín-García et al., 2018; Owen, Djaoui, et al., 2017; Owen, Lago-Peñas, et al., 2017). A research conducted on professional soccer players, findings are presented similar to the findings of our study (Martín-García et al., 2018). The findings of this research (Martín-García et al., 2018) show that the external training loads show wider variation during the week than the internal training load. The reason why the external training loads have wider differences in the weekly training cycle compared to the internal training loads is thought to be since the external training load measurements have more sensitive measurements in accordance with the nature of soccer. In another studies (Owen, Djaoui, et al., 2017; Owen, Lago-Peñas, et al., 2017), which supports our findings, the days with the highest intensity during the week were reported as MD-4 and MD-3.The preferred period is the middle of the week days in order to maintain the training gains in the microcycles during the competition period and to provide the new training gains needed. In particular, it is important for sustainable performance in soccer to avoid repeated high physiological stress exposure both away from the match day and after the match. On the other hand, surprisingly It is thought that heart rate-based evaluations especially in high-speed running may create confusion and should be interpreted by supporting an external training load monitoring. It is known that metabolic conditions become suitable for increasing running speed, although the heart rate reaches the maximum level during the increased running speed due to the regeneration of the energy resources needed especially in low-intensity running tempos and in high-speed running (Alexandre et al., 2012). Depending on this situation, higher running speeds can be observed in response to a constant heart rate at high heart rate values. Physiological differences occur more easily between high-speed runs, especially since the repetition frequency of high-intensity running speeds is lower during training (Alexandre et al., 2012). When we look at the results according to the positions, the

fact that the forwards covered more distance in the high-speed running fields on MD-3, MD-2, MD -1 days and accordingly the differences in the TRIMP values on with-in weeks support our findings.

In studies (Anderson et al., 2016b; Martín-García et al., 2018; Owen, Djaoui, et al., 2017; Owen, Lago-Peñas, et al., 2017; Praça et al., 2021; Swallow et al., 2021b) comparing internal and external training loads during the week according to player positions, it is reported that forward players reach higher internal and external training load values compared to other player positions, similar to our findings. The highest running speeds achieved in gradual accelerations, repetitive high running speeds achieved with intermittent loads, and reaching high running speeds due to sudden needs create similar heart rate responses while creating different external loads. Since high-speed running creates great physiological stresses, in addition, cold, hot environment, altitude, humidity and clothing can have altering effects on the magnitude of this stress (Coyne et al., 2018). Different running speed responses at similar heart rates in the anaerobic sprint reserve domain remain confusing. Different approaches are needed for this domain (Alexandre et al., 2012; Calbet et al., 2015; Kairiukstiene et al., 2021).

Interestingly, midfielders had lower average heart rate values than other positions during all micro-cycles. Although no difference was observed in all other parameters, the difference in this parameter may be associated with lower heart rate values in midfielders and higher aerobic capacity depending on the needs of the region. In line with these data, it also reveals the needs of midfielders for different speed-based training manipulations for this group. It is seen that the player group with the highest average heart rate is the players playing in the forward position. The biggest reason affecting this situation is thought to be the highest in total distances covered per minute, as well as the average heart rate of forwards, and the distances covered are in parallel with their heart rates. When the mechanical workloads between the positions are compared, it is forward position players are exposed to higher loads and accordingly, their internal response is higher. Heart rate values (min, max, and average) are valid. No significant difference was found in the comparison of all load values of the distance to match day parameters of the analyzed team between positions. The limitation of this study is the low number of participants between positions due to the use of data from a team in examining positional differences.

Conclusion

It is thought that the GPS technology, which is the most widely used among the athlete tracking systems, practically provides the users with the distance covered, the acceleration-deceleration parameters covered at different speeds, more appropriately for the monitoring needs of the soccer. Through these data, careful examination of the reflections of chronic physiological adaptations between micro-cycles according to positions can provide critical information during training load planning.

In this study, the internal and external responses to training stimuli during the weekly microcycle show that; It was observed that the volume increases as it gets closer to the match day, when the intensity is high on the day away from the match day. These data also suggested that there is a need to plan for different position-specific training stimuli in elite soccer teams for high performance outputs. We believe that these results can be used to determine positional demands by sports scientists and data analysts, especially in elite teams.

Conflicts of interest/Competing interests: All authors declare that they have no conflicts of interest relevant to the content of this review.

Ethics approval and consent to participate: The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the University of Dokuz Eylul (7034/GOA). Written informed consent was obtained from the participants to publish this paper.

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