In-season Microcycle Quantification of Professional Women Soccer Players – External, Internal and Wellness Measures

Renato Fernandes [1,2,3,*], Halil İbrahim Ceylan [5], Filipe Manuel Clemente [7,8,9], João Paulo Brito [1,2,4], Alexandre Duarte Martins [1,2,6], Hadi Nobari [10,11,12,13], Victor Machado Reis [3,4] and Rafael Oliveira [1,2,4,*]

1 1 Sports Science School of Rio Maior–Polytechnic Institute of Santarém, 2040-413 Rio Maior, Portugal
2 Life Quality Research Centre, 2040-413 Rio Maior, Portugal
3 University of Trás-os-Montes e Alto Douro, 5001-801 Vila Real, Portugal
4 Research Centre in Sport Sciences, Health Sciences and Human Development, 5001-801 Vila Real, Portugal
5 Ataturk University, Faculty of Kazim Karabekir Education, Physical Education and Sports Teaching Department, 25240 Erzurum, Turkey
6 Comprehensive Health Research Centre (CHRC), Departamento de Desporto e Saúde, Escola de Saúde e Desenvolvimento Humano, Universidade de Évora, Largo dos Colegiais, 7000 Évora, Portugal
7 Escola Superior Desporto e Lazer, Instituto Politécnico de Viana do Castelo, Rua Escola Industrial e Comercial de Nun'Álvares, 4900-347 Viana do Castelo, Portugal
8 Instituto de Telecomunicações, Delegação da Covilhã, 1049-001 Lisboa, Portugal
9 Research Center in Sports Performance, Recreation, Innovation and Technology (SPRINT), 4960-320 Melgaço, Portugal
10 Department of Physical Education and Sports, University of Granada, 18010 Granada, Spain
11 HEME Research Group, Faculty of Sport Sciences, University of Extremadura, 10003 Cáceres, Spain
12 Department of Exercise Physiology, Faculty of Educational Sciences and Psychology, University of Mo-haghegh Ardabili, 5619911367 Ardabil, Iran
13 Sports Scientist, Sepahan Football Club, 81887-78473 Isfahan, Iran

INTRODUCTION

The soccer intra-week variation is well-established for men in the last decade where it was observed a tapering on the physiological and locomotor activity demands in last two days before match. In the case of women, more research is needed to provide possibilities for comparisons between scenarios and contexts. This may help to characterize the reality of training process in professional women soccer players.

Therefore, the aim of this study was to quantify external (locomotor activity) and internal (psychophysiological) intensities, as well as the wellness profile of the typical microcycle from professional female soccer players during the 2019/20 in-season.

METHODS

- **10 elite women soccer players** (professional experience: 4.9 ± 2.1 years; age: 24.6 ± 2.3 years; height: 165 ± 6.0 cm; body mass: 58.5 ± 9.3 kg; body mass index: 22.3 ± 3.8 kg/m^2.
- The observational period: seven months, from September to March (early-to-mid-season) due to the **COVID-19** pandemic, which provoked the disruption of training sessions and matches and the suspension of the season in March.
- **87 training session and 15 matches** for analysis from the 2019–2020 in-season.
- The players belong to a team that participated in the **BPI League, the women's first League in Portugal**. A typical microcycle had three training session and one match per week. For better clarity, the training session occurred in MD-5, MD-4 and MD-2. During MD-3, MD-1 and in the day after the match, the athletes rested.
- **Internal Training Load Quantification** - The CR10-point scale. Then, each training/match session value was multiplied by the, respectively, session duration to produce the s-RPE.
- **Wellness quantification** - Hooper Index (HI) that includes four categories: fatigue, stress, muscle soreness (scale of 1–7, in which 1 is very, very low and 7 is very, very high), and quality of sleep of the night that preceded the evaluation (scale of 1–7, in which 1 is very, very bad and 7 is very, very good).
- **External Intensity Quantification** - A 10 Hz GPS device was used to collect external data (PlayerTek, Catapult Innovations, Melbourne, Australia). The measures used for analysis were total distance, high-speed running distance (≥ 15 km/h), number of accelerations (ACC, >1–2 m.s^{-2} [ACC1]; >2–3 m.s^{-2} [ACC2]; >3–4 m.s^{-2} [ACC3]; >4 m.s^{-2} [ACC4]) and decelerations (DEC, <−1–2 m.s^{-2} [DEC1]; <−2–3 m.s^{-2} [DEC2]; <−3–4 m.s^{-2} [DEC3]; <−4 m.s^{-2} [DEC4]) maximal speed, average speed and player load.

RESULTS

Table 1 shows the MD- differences for duration and running distance variables between training and match days. With the exception for duration, where MD-4 displayed the highest value, all running-based variables showed to be significantly higher in MD with very large effect sizes.

Table 1: External Intensity by running-based variables during training and matches for squad average (mean ± SD).

Day	Duration (min)	Total Distance (m)	Average Speed (m/min)	Maximal Speed (km/h)	HSR (m)
MD-5	85.1 ± 2.8	5121.6 ± 82.2 [a,b,c,*]	60.6 ± 1.7 [a,b,c,*]	23.3 ± 0.5 [c,*]	306.5 ± 33.9 [c,*]
MD-4	90.9 ± 2.5 [b,*]	4638.6 ± 73.0 [b,c,*]	53.5 ± 1.8 [b,c,*]	23.5 ± 0.7 [c,*]	312.8 ± 38.2 [c,*]
MD-2	78.3 ± 2.1	3857.5 ± 73.0 [c,*]	47.8 ± 1.2 [c,*]	22.9 ± 0.5 [c,*]	311.3 ± 22.2 [c,*]
MD	87.2 ± 2.0	7616.1 ± 395.2	89.9 ± 5.4	26.7 ± 1.2	879.7 ± 102.2

MD, match-day; MD-, matchday minus (5, 4, 2); min, minutes; m, meters; HSR; high-speed running; [a] denotes difference from MD-4; [b] denotes difference from MD-2; [c] denotes difference from MD; all $p \leq 0.05$; * means a very large effect size for all differences (>2.0).

Table 2 shows the MD- differences for accelerometer-based variables, namely, ACC, DEC and player load between training and match days. With the exceptions of player load in MD-5 and ACC4, all variables showed to be significantly higher in MD with very large effect sizes.

Table 2. External Intensity by accelerometry-based variables during training and matches for squad average (mean ± SD).

MD	Player Load (AU)	ACC1	ACC2	ACC3	ACC4	DEC1	DEC2	DEC3	DEC4
MD-5	284.4 ± 11.7 [a,b,*]	138.6 ± 7.6 [b,c,*]	80.9 ± 4.3 [b,c,*]	29.9 ± 2.7 [a,b,*]	9.6 ± 1.4	126.3 ± 6.8 [b,c,*]	77.8 ± 4.6 [b,c,*]	28.0 ± 2.4 [b,c,*]	11.8 ± 1.6 [c,*]
MD-4	263.4 ± 10.5 [b,c,*]	134.8 ± 6.7 [b,c,*]	79.8 ± 3.5 [b,c,*]	26.7 ± 2.5 [b,c,*]	7.5 ± 1.2	121.9 ± 5.6 [b,c,*]	77.6 ± 3.6 [b,c,*]	27.9 ± 2.2 [b,c,*]	11.2 ± 1.4 [c,*]
MD-2	222.6 ± 7.2 [c,*]	100.7 ± 4.1 [c,*]	52.9 ± 1.7 [c,*]	21.3 ± 1.3 [c,*]	9.8 ± 1.0	89.6 ± 4.1 [c,*]	56.0 ± 2.3 [c,*]	21.2 ± 1.3 [c,*]	9.7 ± 1.1 [c,*]
MD	324.4 ± 14.0	177.3 ± 8.2	106.8 ± 6.4	34.9 ± 3.4	10.3 ± 1.8	169.0 ± 4.8	98.8 ± 5.9	39.0 ± 4.1	18.9 ± 2.9

MD, match-day; MD- = matchday minus (5, 4, 2); AU, Arbitrary Units; ACC, acceleration; DEC, deceleration. Both ACC and DEC were measured in number (counts); [a] denotes difference from MD-4; [b] denotes difference from MD-2; [c] denotes difference from MD; all $p \leq 0.05$; * means a very large effect size for all differences (>2.0).

Table 3 shows the MD- differences for internal intensity and wellness profile. While variables from HI did not show any significant difference, both RPE and s-RPE showed to be significantly higher in MD with very large effect sizes. There was an exception regarding MD-5 versus MD for s-RPE that showed a large effect size instead of a very large.

Table 3. Internal Intensity and Wellness Profile during training and matches for squad average (mean ± SD).

MD	RPE (AU)	s-RPE (AU)	Fatigue (AU)	Stress (AU)	DOMS (AU)	Sleep Quality (AU)	HI (AU)
MD-5	5.9 ± 0.3 [b,c,*]	508.3 ± 29.0 [b,#]	3.3 ± 0.2	3.6 ± 0.4	2.9 ± 0.3	3.6 ± 0.3	13.4 ± 0.8
MD-4	5.4 ± 0.2 [b,c,*]	473.7 ± 20.5 [b,c,*]	3.4 ± 0.2	3.1 ± 0.3	3.0 ± 0.3	3.4 ± 0.2	13.0 ± 0.7
MD-2	4.4 ± 0.3 [c,*]	353.5 ± 21.9 [c,*]	3.3 ± 0.2	3.2 ± 0.4	2.7 ± 0.2	3.3 ± 0.2	12.5 ± 0.7
MD	7.9 ± 0.3	604.7 ± 36.5	3.1 ± 0.1	3.0 ± 0.2	3.0 ± 0.2	3.3 ± 0.3	11.6 ± 0.8

MD, match-day; MD-, matchday minus (5, 4, 2); AU, Arbitrary Units; RPE, rated perceived exertion; s-RPE, session-RPE; DOMS, delayed onset muscle soreness; HI, Total Hooper Index; [a] denotes difference from MD-4. [b] denotes difference from MD-2. [c] denotes difference from MD; all $p \leq 0.05$; [#] means a large effect size (>1.2–2.0); * means a very large effect size for all differences (>2.0).

DISCUSSION AND CONCLUSIONS

- ✓ The present study revealed that the internal (RPE, s-RPE) and external measures (total distance, average speed, maximal speed, high-speed running distance, almost ACC and DEC) were higher on the match day than during the weekday training sessions (MD-5, MD-4, MD-2) throughout the in-season in elite female soccer players.
- ✓ In addition, it was observed that HI values did not differ significantly between training sessions and matches during the week.
- ✓ Finally, the present study showed that players generally reached the highest internal and external intensity in MD-5 and after that, intensity decreased until the MD.
- ✓ **This study confirmed the hypothesis regarding internal and external intensity but not regarding wellness. It is recommended to consider the results of the current study in the weekly intensity distribution in female soccer players and accordingly in the optimal adjustment of the relationship between intensity and rest.**

References

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* (✉ rfernandes@esdrm.ipsantarem.pt)

SPORT SCIENCE SCHOOL OF RIO MAIOR,
POLYTECHNIC INSTITUTE OF SANTARÉM,
RIO MAIOR, PORTUGAL

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