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**DESCRIPTION OF PERCEIVED EXERTION, RECOVERY AND MENSTRUAL STATUS ACROSS A SINGLE-CONGESTED TOURNAMENT OF EUROPEAN WOMEN FUTSAL: THE CASE OF THE WINNING TEAM**

Gabriela Dal'Maz<sup>1</sup>, Marta Gimunová<sup>2</sup>, Koulla Parpa<sup>3</sup>, Mayara Maciel Batista<sup>4</sup>, Ana Carolina Paludo<sup>5</sup>

**ABSTRACT**

The aim of this study was two-fold: (i) describe the perceived exertion and recovery of female futsal players across a congested tournament and (ii) compare the players' responses according to the menstrual cycle phase. Ten Italian female professional futsal players (age: 27.7  $\pm$  4.9 years old; height: 165.3  $\pm$  4.8 cm; body mass: 60.4  $\pm$  2.3 kg) belonging to the same team were assessed during 3 matches from a 4-days European Women' Futsal tournament. Perceived recovery (TQR) was collected before and perceived exertion (RPE) after the matches. The menstrual cycle phase (early follicular, day 10-15 and after day 15) was collected after the tournament. Players presented a significant increase in RPE from matches 1 and 2 to match 3 ( $F=9.30$ ;  $p<0.001$ ); however, no significant changes in pre-match recovery were found ( $F=2.48$ ;  $p=0.102$ ). Considering the menstrual cycle phase, in the last match (match 3), players on day 10-15 of the menstrual cycle (close to ovulation), presented lower values of recovery and lower match exertion compared to those players in the early follicular phase, with a medium (0.68) and large (0.87) but unclear effect. The findings highlighted that the single-congested tournament resulted in players' perception of the high intensity of the last match, which was higher in those players in early-FP. Caution should be taken on interpretation, once the findings are representative of the winning team in this specific tournament, thus the results should not be generalized to other situations (i.e., regular competition or different congested schedules).

**Key words:** Futsal. Congested fixture. Sportswomen. Load quantification. Recovery.

1 - Marmi Chiaravalle Futsal Club, Italy.

2 - Department of Physical Activities and Health Sciences, Faculty of Sports Studies, Masaryk University, Brno, Czech Republic.

3 - Faculty of Sport and Exercise Science, UCLan University of Cyprus, Pyla, Cyprus.

**RESUMO**

Descrição do esforço percebido, da recuperação e do estado menstrual em um torneio único congestionado de futsal feminino europeu: o caso da equipe vencedora

O estudo apresenta dois objetivos principais: (i) descrever o esforço percebido e a recuperação de jogadoras de futsal durante um torneio congestionado e (ii) comparar as respostas das jogadoras de acordo com a fase do ciclo menstrual. Dez jogadoras profissionais italianas de futsal (idade: 27,7  $\pm$  4,9 anos; altura: 165,3  $\pm$  4,8 cm; massa corporal: 60,4  $\pm$  2,3 kg) pertencentes à mesma equipe foram avaliadas durante 3 partidas de um torneio europeu de futsal feminino de 4 dias. A recuperação percebida (TQR) foi coletada antes e o esforço percebido (RPE) após as partidas. A fase do ciclo menstrual (follicular precoce, dia 10-15 e após o dia 15) foi coletada após o torneio. As jogadoras apresentaram um aumento significativo na PSE das partidas 1 e 2 para a partida 3 ( $F=9,30$ ;  $p<0,001$ ), porém não foram encontradas mudanças significativas na recuperação pré-jogo ( $F=2,48$ ;  $p=0,102$ ). Considerando a fase do ciclo menstrual, na última partida (jogo 3), as jogadoras no dia 10-15 do ciclo menstrual (próximo à ovulação), apresentaram menores valores de recuperação e menor esforço de jogo em comparação com as jogadoras no início da fase folicular, com um efeito médio (0,68) e grande (0,87), mas pouco claro. Os resultados destacaram que um simples torneio congestionado resultou em uma percepção de alta intensidade na última partida, sendo esta maior naquelas jogadoras no início da fase folicular. Deve-se ter cautela na interpretação, uma vez que os resultados são representativos da equipe vencedora neste torneio específico, portanto, os resultados não devem ser generalizados para outras situações.

**Palavras-chave:** Futsal. Campeonato congestionado. Mulher no esporte. Quantificação de carga. Recuperação.

## INTRODUCTION

Congested match scheduling is characterized by accumulating matches (e.g., two-three weekly) over a short period. This fixture could result in residual fatigue due to increased physical demand and insufficient recovery time (Julian, Page and Harper, 2021; Dupont et al., 2010).

In professional soccer players, the effect of the congested schedule has been well-investigated, with some reporting no expressive impact on match performance (e.g., distance covered) (Julian, Page and Harper, 2021), and also no changes in internal load compared to regular weeks (Garcia et al., 2022).

Considering that futsal is a high-intensity intermittent modality with dynamic acceleration and deceleration (Beato, Coratella and Schena, 2016), players reach maximal physiological demands most of the playing time (Spyrou et al., 2020; Barbero-Alvarez et al., 2008).

Thus, it can be speculated that a congested match schedule could affect players' internal load and recovery due to the high intensity of consecutive matches with reduced time to recover.

The literature about congested match scheduling in futsal still needs to be explored. In professional male players, the training load and well-being changes within a congested week were investigated, demonstrating a decrease in training load a day before the match compared to previous days (days 2 and 3) (Clemente et al. 2019), but with no information about the match.

In female futsal players, the topic of congested fixtures needs to be addressed. The investigation of the female players' responses to congested scheduling is essential to understand how players tolerate the imposed stress of this fixture.

Also, the menstrual cycle should be considered a possible mediator in investigating perceptual responses. Due to the fluctuations of ovarian hormones across the cycle, it has been suggested that estrogen concentrations play a role in mitigating negative emotions (Gonda et al., 2008; Albert, et al., 2015).

It was recently summarized that some perceptual responses are affected in different phases of the menstrual cycle, with 'favorable' responses in phases with an increase of ovarian hormone concentrations (e.g., ovulation)

compared to phases with lower concentrations (Paludo et al., 2022).

Given the extension of the knowledge about female futsal players regarding the responses to congested match schedules, the primary aim of the study was to describe the perceived exertion and recovery during a one-single congested tournament of European Women' Futsal in an Italian futsal team. Secondly, the study compared players' responses to the menstrual cycle phase. Based on previous studies, we hypothesized that an increase in perceived exertion and a decrease in the perception of recovery would be found across the tournament.

Moreover, these responses will be attenuated in those players in the phases close to ovulation compared to other menstrual cycle phases.

## MATERIALS AND METHODS

### Participants

Ten Italian female professional futsal players (age:  $27.7 \pm 4.9$  years old; height:  $165.3 \pm 4.8$  cm; body mass:  $60.4 \pm 2.3$  kg) belonging to the same team were assessed during the VI European Women' Futsal (2022).

After the coach consented to contact the players, information about the aim of the study and the familiarization with the scales were performed. The inclusion criteria were to participate in the selected tournament and agree to participate in the study.

The Ethical Committee approved this international project at the hosting University in the Czech Republic. Players were instructed in their native language (Italian) about the study's objectives, and an informed consent form was completed before the beginning of the study.

### Study design

Professional futsal players from an Italian team were monitored during the VI European Women's Futsal Tournament in Falconara, Italy in December 2022.

The tournament comprehended teams from Italy, Hungary, Netherlands, Spain, Poland, and Portugal. All teams played three matches during the 4-day tournament.

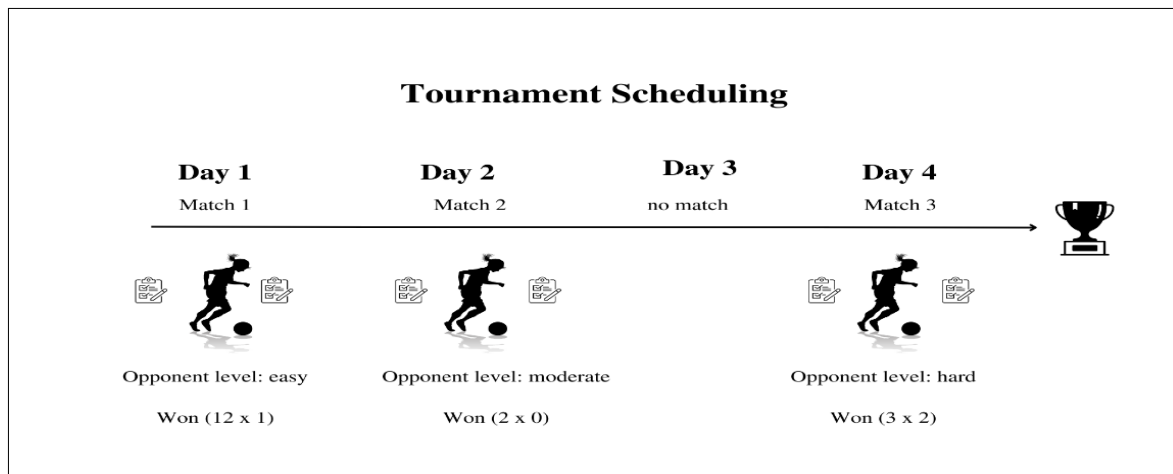
Before each match players reported their perception of recovery individually, by the

Total Quality of Recovery scale. After the match, players reported the perceived exertion from the match by the CR-10 Borg scale.

Also, they were asked about their perception of the opponent's level (e.g., easy, moderate and hard). The perceptual responses

were collected by a researcher familiar with the players.

Descriptive data (e.g., age, self-reported body mass and body height) and menstrual cycle information were collected via an online survey, by a link sent individually to each player (Figure 1).



**Figure 1** - Tournament schedule and players' response.

#### Perceptual recovery, exertion and opponent level

Before each match, players were asked about their perception of recovery and after the match, players responded to their perceived exertion and the opponent's level. Total Quality of Recovery (TQR) was used to evaluate the players' recovery. TQR, proposed by Kenttä and Hassmén (Kenttä, Hassmén, 1998), is a Likert scale ranging from 6 to 20, that represents 'not at all recovered' to 'fully recovered' respectively.

Players' perceived exertion was measured using the CR-10 Borg scale ranging from 1 to 10 which 1 meaning 'very light exertion' and 10 representing 'maximal exertion' (Borg, 1982). Also, players were asked to report their perception of the level of the opponent at the end of each match: easy, moderate or hard.

#### Menstrual cycle status

Right after the tournament, the players were asked to report their menstrual phase during the tournament. Menstrual cycle phases were separated by: the early follicular phase (early-FP); the 10-15 days after the bleeding

onset; and the luteal phase (15 days or more after the bleeding onset).

Additionally, it was asked if the current menstrual cycle status affected their performance during the tournament. Players chose one of these answers: yes, affected positively; yes, affected negatively or not affected.

#### Statistical analysis

Data normality was assessed using the Shapiro-Wilk test. Once the normality was accepted, the comparison amongst the three matches was performed by One-way ANOVA, with the post hoc of Bonferroni test to identify possible significant changes. An independent t-test performed the comparison between players in different menstrual cycle phases. Cohen's d was calculated to determine the effect size (ES) to present the magnitude of the reported effects of the menstrual cycle phase on perceptual responses. ES was interpreted as small (0.2-0.4), medium (0.5-0.7) and large (0.8-1.4) (Cohen, 1998). In addition, it was assumed that when CL does not cross the "0", a clear difference would be presented. CL crossing the "0" were classified as representing unclear differences (Batterham and Hopkins, 2006).

Statistical software JAMOV was used to perform the analysis, considering a significance of  $p < 0.05$ .

## RESULTS

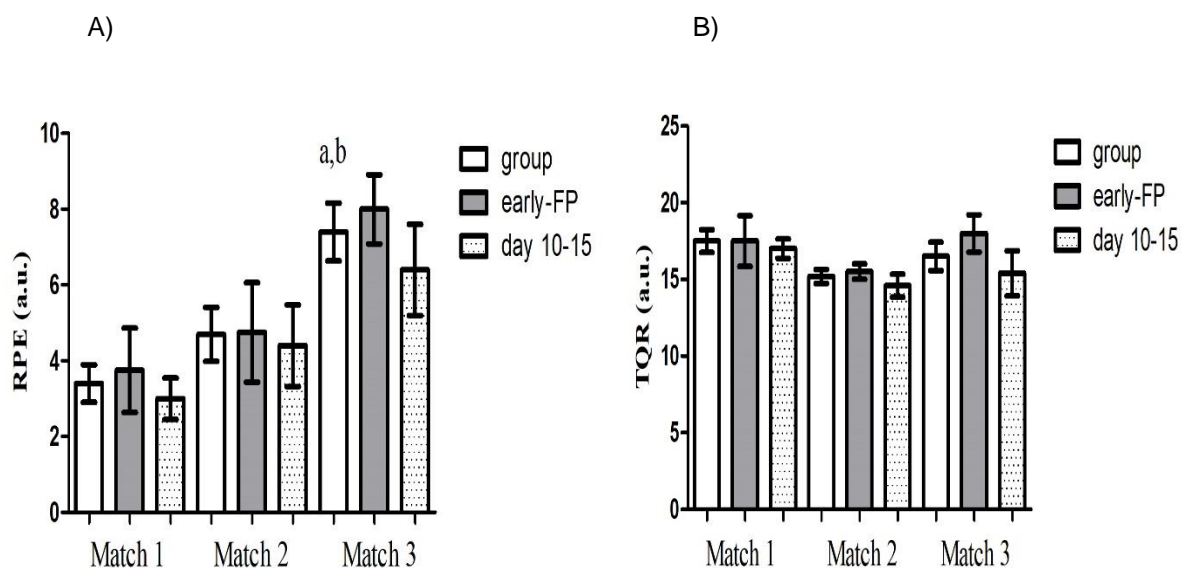
The team won the three matches, being the champion of the tournament (Figure 1). The players' perception of match exertion (RPE) and recovery (TQR) across the three matches for all players is displayed in Figure 2.

Significantly high values of RPE were found in match 3 compared to matches 1 and 2 ( $F=9.30$ ;  $p < 0.001$ ), but no difference was

found in the perception of recovery ( $F= 2.48$ ;  $p= 0.102$ ).

Players were asked about their menstrual cycle status during the tournament, one player reported menstrual irregularity; four players were in the early-FP and five were in days 10-15. A comparison was made between players from early-FP and days 10-15 of the cycle.

No significant difference between groups across the three matches for RPE and TQR, but ES reported a moderate effect in match 3 for RPE and a moderate and large effect for TQR in matches 2 and 3 respectively (Figure 2 and Table 1).



**Figure 2** - Players perceived recovery (A) and internal load (B) during the tournament. Group= data from all players ( $n=10$ ); early-FP= players classified as early follicular phase ( $n=4$ ); day 10-15: players classified as day 10 to 15 of the menstrual cycle ( $n=5$ ).

<sup>a</sup> significantly different from match 1; <sup>b</sup> significantly different from match 2.

**Table 1** - Perception of match intensity and recovery across the tournament for all players (n=11) and separated by players' menstrual cycle.

	early-LP (n=4) mean $\pm$ sd	Day 10-15 (n=5) mean $\pm$ sd	p-value	ES
<i>RPE</i>				
Match 1	3.7 $\pm$ 2.2	3.0 $\pm$ 1.2	0.537	0.41 (-0.96/1.69)
Match 2	4.7 $\pm$ 2.6	4.4 $\pm$ 2.4	0.841	0.12 (-1.21/1.42)
Match 3	8.0 $\pm$ 1.8	6.4 $\pm$ 2.7	0.347	0.68 (-0.75/1.95)
<i>TQR</i>				
Match 1	17.2 $\pm$ 2.3	17.0 $\pm$ 1.4	0.767	0.11 (-1.22/1.41)
Match 2	15.5 $\pm$ 1.0	14.6 $\pm$ 1.7	0.378	0.61 (-0.80/1.88)
Match 3	18.0 $\pm$ 2.5	15.4 $\pm$ 3.3	0.231	0.87 (-0.59/2.14)

Note: M1= match 1; M2= match 2; M3= match 3; ES= effect size; RPE= rating perception exertion; TQR= total quality of recovery.

## DISCUSSION

The primary purpose of this study was to describe the perceived exertion and recovery during a congested single-tournament in an Italian female futsal team.

As expected, the results confirmed the hypothesis of an increase in perceived exertion across the matches, revealing a significant increase in change from matches 1 and 2 to match 3.

However, the perception of recovery, pre-match, demonstrated no significant changes.

Second, it was compared the players' responses according to the menstrual cycle phase. In the last match (match 3), players that reported the day 10-15 of the menstrual cycle (close to ovulation), even presented a lower recovery from the last match, they perceived a lower match exertion compared to those players in the early-FP.

Perceived exertion (RPE) has been used as a parameter of internal load in futsal training and match-play (Milanez et al., 2006; Matzenbacher et al., 2016).

As expected, the players increased their internal load in each match during the tournament. Match 3, the final match, presented significantly higher exertion than others.

This finding is similar to previous studies that demonstrated that match

importance could affect players' perception of exertion (Moreira et al., 2013).

As the match's physical demands were not monitored (e.g., time running, speed, acceleration and deceleration) as well as the player's time in the match, we can speculate from the match outcome and players' perception about the opponent level, that the level of each match was increasing during the tournament, being more demanding at the final match.

It has been assumed that recovery is related to the load intensity; therefore higher load can generate a lower recovery in the next day or match (Kenttä and Hassmén, 1998).

However, even with the increase in internal load in each match, players reported no significant reduction in recovery. In a previous study conducted during a congested tournament (5 matches and 2-days), rugby-7 women demonstrated that perceptual recovery was impaired significantly after match day 1 and did not return to baseline values up to 2 days after the tournament.

A possible explanation for the contradictory dynamic of recovery presented in the present study can be found in a recent study in male futsal players, in which the perceptual recovery was associated with results of the previous game, with games preceded by victory presenting a lower pre-game recovery (Rinaldo et al., 2022).



In our case, the team won all matches during the tournament, maybe it could generate motivation to play the next match, mitigating the perception of fatigue and increasing the readiness to play.

In order to verify if players in different menstrual cycle phases could differ from each other regarding the perceptual responses, players in early-FP which correspond to the first day of bleeding were compared to players in days 10-15 which correspond to a later-FP and ovulation.

Our previous literature review demonstrated that athletes present significant competitiveness in ovulation, but no difference was found in the meta-analysis according to perceived exertion (Paludo et al., 2022).

Regarding the perceived exertion, in match 3 the players grouped in early-FP reported high ratings compared to those on days 10-15, and the effect size demonstrated a moderate but unclear effect. Interestingly, the perceived recovery before matches 2 and 3 was better in players of early-FP group compared to the days 10-15 group, considering an effect of moderate to large, but also unclear.

The unclear effect suggests caution in interpreting these outcomes, maybe due to the small sample size and short-term evaluation the possible effect could result from a different source.

However, from the practical point of view, it is worth considering that during a tournament, team sports can have players in different menstrual cycles phase, and it could be possible that those in early-LP (e.g., bleeding) could perceive the matches in major intensity.

Lastly, it was asked if the current menstrual phase affected the performance during the tournament.

Only one player in the early-FP reported a negative influence on performance during the tournament. The literature has described that despite the symptoms associated with the menstrual cycle, most elite athletes perceived a possible negative effect on training more than the competition (Brown, Knight and Forrest, 2021; McNamara, Harris and Minahan, 2022).

More experienced athletes can be more confident in performing around the menstrual cycle, as explored elsewhere (McNamara, Harris and Minahan, 2022).

Also, it is relevant to mention that McNamara and colleagues (2022), it was asked elite athletes the most desirable time to compete and most athletes reported 'just after their period.' It aligns with the aforementioned about a favorable emotion around ovulation (Paludo et al., 2022).

However, the players in our study on the day 10-15 did not perceive a positive effect in competing in this phase.

Despite the fact that the present study was one of the first to describe the perceptual responses of female futsal players in a congested tournament, considering the menstrual phase status, there are limitations to emphasize.

Monitoring a single-congested tournament, with no comparison to regular match scheduling, narrows the results' generalization.

The player's participation in the match was not computed; therefore it can influence the perception of exertion.

Thus, additional training load metrics and physical performance can offer information about the impact of the increased training load across the tournament.

Also, an evaluation of each player in each phase will be more appropriate to understand the menstrual cycle effect better. Finally, future studies can consider addressing these limitations.

It is essential to highlight that the study is a 'snapshot' of the players' responses to a congested-fixture tournament, for a big picture, needs to monitor the players across the entire season.

## CONCLUSION

The results cooperated to describe the dynamics of perceived exertion and recovery in futsal players during a single-congested tournament, considering the menstrual cycle status.

The data demonstrated that players perceived a significant exertion in the last match, but not chances of perceived recovery across the tournament. In addition, considering the menstrual status, players in the early-FP seem to perceive more intense match exertion compared to those in days 10-15 of the menstrual cycle, with effects from moderate to large, but unclear.

Hence, coaches and support staff should be aware of the high intensity of the last match in the tournament with congested fixtures and prepare the players for it, especially the players in early-FP, once they could be perceived the match as more intense.

It is important to highlight that the present findings represent the winning team in this specific tournament, thus the results should not be generalized to other situations (i.e., normal competition or different congested schedules).

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### COMPETING INTERESTS

The authors declare no competing interests.

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4 - Flamengo Football 7, Strength & Conditioning, Brazil.

5 - Faculty of Sports Studies, Incubator of Kinanthropology Research, Masaryk University, Brno, Czech Republic.

Authors e-mail:

[gabrieladalmaz@gmail.com](mailto:gabrieladalmaz@gmail.com)

[gimunova@fsps.muni.cz](mailto:gimunova@fsps.muni.cz)

[kparpa@uclan.ac.uk](mailto:kparpa@uclan.ac.uk)

[mayamb2@hotmail.com](mailto:mayamb2@hotmail.com)

[carolina.paludo@fsps.muni.cz](mailto:carolina.paludo@fsps.muni.cz)

Autor correspondente:

Ana Carolina Paludo.

[carolina.paludo@fsps.muni.cz](mailto:carolina.paludo@fsps.muni.cz)

Masaryk University, Faculty of Sports Studies, Kamenice 753/5, Bohunice, Brno

Phone: +420 549 49.

Orcid: 0000-0001-8771-4580.

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