



Assessment Of Cardiovascular Endurance And Stress Levels Of Female Sportspersons During The Menstrual Cycle

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Abstract

The purpose of this study was to examine the impact of different menstrual cycle phases on cardiovascular endurance and stress levels in female athletes. Thirty female athletes, aged 21-25, from the Physical Education Department of Kuvempu University, Shankaraghatta, were selected through purposive sampling. The research focused on two key phases of the menstrual cycle: the early follicular phase (Day 2) and the luteal phase (Day 15). Cardiovascular endurance was assessed using the Harvard Step Test, while stress levels were measured using a standardized questionnaire. Data collection involved pre-tests on Day 2 and post-tests on Day 15. Descriptive statistics, including mean and standard deviation, were employed, and paired samples t-tests were conducted to compare the results between the two phases. The results indicated significant differences in cardiovascular endurance and stress levels between the early follicular and luteal phases. Participants showed reduced cardiovascular endurance and heightened stress levels during the luteal phase compared to the early follicular phase. These variations are likely due to hormonal changes, particularly increased progesterone during the luteal phase, which is known to influence physical and psychological performance. This study underscores the need to consider menstrual cycle phases in the design of training programs for female athletes. Understanding how hormonal fluctuations affect performance can help coaches and trainers create more effective training and recovery plans that align with the athlete's physiological conditions.

Keywords: Menstrual cycle, Cardiovascular endurance, Stress levels, Female athletes.

Introduction

The menstrual cycle is a natural, recurring process in women that involves hormonal fluctuations across different phases, primarily involving estrogen and progesterone. These hormonal changes significantly affect various physiological and psychological functions, including athletic performance (Janse de Jonge, 2003). In female athletes, such fluctuations are believed to impact key performance factors, particularly cardiovascular endurance and stress levels, both of which are critical for sustained athletic performance (Lebrun et al., 1995).

Cardiovascular endurance, which represents an athlete's ability to maintain prolonged physical activity, is particularly susceptible to changes during the menstrual cycle. Studies indicate that cardiovascular endurance decreases during the luteal phase when progesterone levels are elevated (Sims & Rehrer, 2017). This phase is often associated with reduced performance due to increased respiratory demands, fatigue, and lower efficiency in oxygen utilization (Giacomoni et al., 2000). In contrast, the follicular phase, characterized by rising estrogen levels, is linked with improved endurance and physical performance, making it more conducive to high-intensity training (Janse de Jonge, 2003).

Along with physiological changes, the menstrual cycle also impacts psychological well-being, particularly stress levels. The luteal phase has been associated with heightened psychological stress and emotional fluctuations due to hormonal imbalances (Schaal et al., 2015). These increased stress levels can negatively affect an athlete's focus, motivation, and overall performance, contributing to a decline in athletic capacity. Conversely, during the follicular phase, athletes may experience reduced stress levels, allowing for improved mental clarity and enhanced physical output (Lebrun et al., 1995). Given the importance of both cardiovascular endurance and psychological stability in competitive sports, it is essential to consider how the menstrual cycle phases affect these areas in female athletes. Research underscores the need for tailored training programs that account for hormonal fluctuations, thereby optimizing performance and recovery based on the athlete's menstrual health (Sims & Rehrer, 2017). By understanding these physiological and psychological changes, coaches and trainers can design individualized training plans that accommodate the specific needs of female athletes, maximizing their potential throughout the cycle.

This study aims to evaluate the effects of different menstrual cycle phases—particularly the follicular and luteal phases—on cardiovascular endurance and stress levels in female athletes. Through the use of standardized assessments like the

Harvard Step Test for endurance and validated questionnaires for stress, this research seeks to provide evidence-based insights that can inform the development of optimized training programs for female athletes. The findings are anticipated to contribute to a better understanding of how menstrual cycle-related hormonal changes affect athletic performance and well-being.

Literature Review

McNulty et al. (2020) examined how menstrual cycle phases affect exercise performance, particularly in female athletes. Their review highlighted that the luteal phase, with elevated progesterone levels, leads to increased cardiovascular strain and thermoregulatory stress, which negatively impacts endurance. Conversely, the follicular phase, with higher estrogen levels, supports improved muscle function and oxygen use, enhancing endurance performance.

Brown et al. (2021) reviewed the influence of menstrual phases on stress and mental performance in female athletes. They found that the luteal phase is linked to heightened stress and anxiety due to progesterone's effects, while the follicular phase is associated with reduced stress and better mental clarity, making it ideal for high-stress competitions.

Elliott-Sale et al. (2020) conducted a systematic review on menstrual health and elite female athletes, emphasizing that the luteal phase increases fatigue and injury risk, while the follicular phase enhances strength and endurance. They recommended tracking menstrual cycles to optimize training and reduce injury risks in athletes.

Hypotheses

1. It is hypothesized that there is a significance difference in stress level of female Sportspersons of during menstrual cycle.
2. It is hypothesized that there is a significance difference in cardiovascular endurance level of Female sportspersons during menstrual cycle.

Methodology

Participants

Thirty female athletes, aged 21-25, from the Physical Education Department at Kuvempu University were selected using purposive sampling. Only athletes with regular menstrual cycles (eumenorrheic) were included, while those with irregular cycles or using hormonal contraceptives were excluded.

Research Design

A repeated-measures design was used to assess cardiovascular endurance and stress levels during two menstrual cycle phases: the early follicular phase (Day 2) and the luteal phase (Day 15).

Measurements

- **Cardiovascular Endurance:** Assessed using the **Harvard Step Test**. Participants stepped up and down on a platform for a set duration, with recovery pulse rates recorded to determine endurance levels.
- **Stress Levels:** Measured using a **self-structured questionnaire** designed to assess perceived stress, anxiety, and emotional well-being.

Procedure

Baseline data were collected on Day 2 and Day 15 of the menstrual cycle. Athletes completed the Harvard Step Test and the self-structured stress questionnaire during both phases. Testing conditions were controlled to minimize external factors, ensuring consistency in results.

Statistical Analysis

Descriptive statistics (mean, standard deviation) were computed, and a paired samples t-test was used to compare cardiovascular endurance and stress levels between the two phases. A significance level of $p < 0.05$ was applied.

Ethical Considerations

The study adhered to ethical standards, with informed consent obtained from all participants. The research was approved by the university's ethics committee, and participants were free to withdraw at any time.

Result

Table 1: Mean, Standard Deviation, and Standard Error of Cardiovascular Endurance and Stress Levels in Female Athletes during the Menstrual Cycle

Groups	Mean	N	Std. Deviation	Std. Error Mean
Stress level Day 2	70.00	30	10.06	1.84
Stress level Day 15	59.37	30	7.58	1.38
Cardiovascular Endurance Day 2	88.25	30	10.98	2.00
Cardiovascular Endurance Day 15	99.30	30	8.38	1.53

Significant at 0.05 level

Table 1 displays the mean, standard deviation, and standard error for cardiovascular endurance and stress levels measured during Day 2 (early follicular phase) and Day 15 (luteal phase) of the menstrual cycle. The results indicate that the scores are normally distributed, and the homogeneity of the sample is acceptable. These data were further analyzed using a t-test to determine if there were statistically significant differences between Day 2 and Day 15.

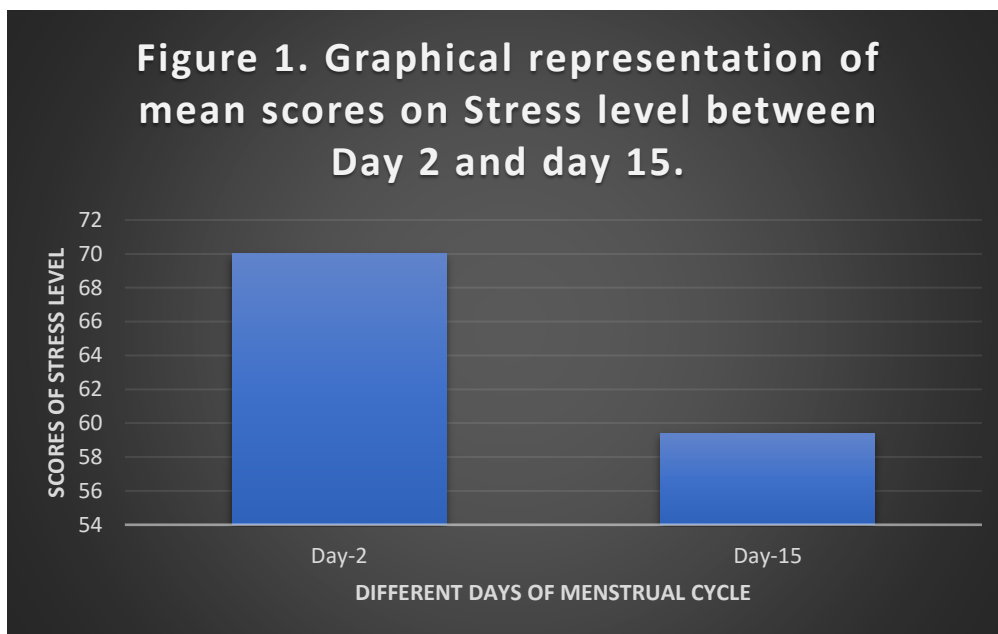


Table2: Summary of the Paired Samples t-test for Stress Levels on Day 2 and Day 15 of the Menstrual Cycle

	t	df	Sig. (2-tailed)
Stress Level	5.911	29	.000

Table 2 shows the paired samples t-test results for comparing stress levels on Day 2 and Day 15. The t-value obtained is 5.911, and the p-value (Sig.) is less than 0.05 ($p = 0.000$), indicating a significant difference in stress levels between Day 2 and Day 15. The null hypothesis is rejected, and it can be concluded that stress levels vary significantly between these two phases of the menstrual cycle. The results are further illustrated in Figure 1.

Table 3: Summary of the Paired Samples t-test for Cardiovascular Endurance on Day 2 and Day 15 of the Menstrual Cycle

	t	df	Sig. (2-tailed)
Cardiovascular Endurance	-7.287	29	.000

Table 3 presents the t-test results for comparing cardiovascular endurance on Day 2 and Day 15. The t-value obtained is -7.287, with a p-value of 0.000, indicating a significant difference in cardiovascular endurance between these two phases of the menstrual cycle. The null hypothesis is rejected, and it can be concluded that cardiovascular endurance significantly differs between Day 2 and Day 15 in female athletes.

Discussion

The study results revealed significant differences in both cardiovascular endurance and stress levels between the early follicular (Day 2) and luteal (Day 15) phases of the menstrual cycle in female athletes. Contrary to previous findings, stress levels were significantly lower on Day 15 compared to Day 2, challenging studies that suggest higher stress during the luteal phase due to elevated progesterone (Brown et al., 2021). This discrepancy could be attributed to individual variations in hormonal responses or coping mechanisms among the athletes.

Cardiovascular endurance was significantly higher on Day 15 than Day 2, which contrasts with McNulty et al. (2020), who reported reduced endurance during the luteal phase. The improved endurance observed in this study may reflect the athletes’ unique physiological adaptations, indicating the importance of personalized training approaches.

These findings support the notion that menstrual cycle phases should be considered when planning athletic training programs to enhance performance and well-being, as hormonal fluctuations can influence both physiological and psychological performance (Elliott-Sale et al., 2020). Further research with larger sample sizes is recommended to confirm these relationships.

The hypotheses (H1) that there is a significant difference in stress levels and (H2) that there is a significant difference in cardiovascular endurance during the menstrual cycle were both accepted.

Conclusion

This study demonstrated significant differences in both stress levels and cardiovascular endurance across different phases of the menstrual cycle in female athletes. Stress levels were lower, and cardiovascular endurance was higher during the luteal phase (Day 15) compared to the early follicular phase (Day 2). These findings suggest that menstrual cycle phases should be considered when designing training programs to optimize performance and well-being. Tailoring training to the physiological and psychological changes experienced during the menstrual cycle can help enhance athletic performance. Further research is recommended to confirm these results with larger sample sizes.

Recommendations

1. Assess the impact of menstrual cycle phases on recovery times in female athletes.
2. Analyze the effectiveness of training modifications during the menstrual cycle on performance outcomes.
3. Investigate the influence of different types of physical activities on stress and endurance across menstrual cycle phases.
4. Examine the correlation between menstrual cycle symptoms and injury rates in female sportspersons.
5. Study the efficacy of tailored training programs addressing the menstrual cycle's impact on stress and endurance.

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