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The influence of menstrual cycle phases on athlete's performance

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Abstract

The study aimed to analyse and compare the psychological changes during the four different phases of the menstrual cycle; Menstrual, Follicular, Ovulatory, and Luteal. Fifteen athletes were selected ages ranging between 18 to 25, who were involved in sports chosen with experience of 5-8 years. Their average age was 21, 5 ± 2 years, and the selected athletes were (5 amateur tennis players, 5 amateur football players, and 5 amateur field hockey players). Reaction time and Determination time were measured in each phase and analysed with the help of the Vienna test system (VTS allows digital psychological tests to be administered while also providing automatic and comprehensive scoring). The data in the study were analysed by using Repeated Measure ANOVA and the level of significance was at $p < 0.05$.

Keywords: Menstrual cycle, reaction time, Vienna test system, repeated measure ANOVA

Introduction

Menstruation has become less of a barrier to achieving sports goals for women in recent times. Menstruation has historically been a taboo subject in sports science and in the coach-female athlete relationship, with embarrassment and lack of empathy from male coaches being .Despite abundant research addressing the effects of exercise on menstruation, including menstrual irregularities resulting from training, less is known about how menstruation affects women's athletic training and competition. These cyclic hormonal fluctuations may affect physiological, physical and psychological potential and ultimately impact on sports performance.

Physical fitness is considered as one of the most valuable and important health markers in childhood (Ortega *et al.*, 2008) [7]. Accordingly, in the past decades numerous countries have been promoting physical fitness improvement among young people in diverse ways. It is known that planning long-term fitness programs is the best way to improve these components (Donnelly *et al.*, 2009) [8]. It has been an issue of debate since long time about the effect of menstrual cycle upon sports performance.

Material and Methods

Selection of Subjects

The current study was performed on 10 young female athletes taken from LNIPE Gwalior. Their age was ranged from 18- 23 years old with a regular menstrual cycle of 28-30 days. Those female athletes with irregular menstrual cycle or those using any supplements or medications were not allowed to participate in the study.

Data Collection

Subjects were given instructions to visit the psychological laboratory during each phase of menstrual cycle i.e., 1-2nd day of Menstrual phase, 8th -10th day of Follicular phase (PP), 14th-16 of Ovulation phase and 21th-24nd day of Luteal Phase. The subjects' Reaction time and Determination time was assessed by the Vienna Test System and analysed for various psychological parameters such as (Reaction time and Determination time).

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Statistical Analysis

Reaction time and determination time were analyzed and measured during the menstrual cycle phase. Repeated measure Anova was used with the help of SPSS.

Table 1: Mean and Standard deviation of psychological variable in different phases of menstrual cycle

Variable	Menstrual	Follicular	Ovulation	Luteal
Reaction Time	4.32±0.76	4.14±0.79	4.28±0.78	4.13±0.76
Determination Time	8.42±1.21	8.75±1.51	8.22±1.43	8.33±1.38

Table 2: Pairwise Comparison of Reaction time in Different Phases of Menstrual Cycle

Factor I	Factor J	Mean Difference (I-J)	Std Error	Sig.	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
1	2	-1.23	.12	.00	-1.65	-.81
	3	-7.10	.50	.00	-10.00	-6.77
2	4	-26.30	1.32	.00	-31.23	-23.27
	3	-7.16	.33	.00	-8.47	-5.56
3	4	-25.96	1.32	.00	-30.00	-21.7
	4	-18.80	1.34	1.00	-22.69	-14.50

As per the results shown in Table - 2, there is significant difference in the Reaction time between Menstrual and Follicular Phases (p-value=0.000); likewise Significant difference was found in Menstrual phase and Luteal phase (p-

value=0.000); While there is no significant difference in the Reaction Time performance of athletes between any other menstrual phases

Table 3: Pair-Wise Comparison of Marginal Means of Determination Time during all four phases of the menstrual cycle.

Factor I	Factor J	Mean Difference (I-J)	Std Error	Sig.	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
1	2	-2.30	.48	.00	-4.38	-1.31
	3	-8.70	.74	.00	-13.00	-7.19
2	4	-23.70	1.49	.00	-29.23	-21.27
	3	-7.05	.48	.00	-8.65	-5.24
3	4	-21.96	1.58	.00	-26.44	-18.7
	4	-15.80	1.67	.00	-18.69	-10.50

As per the results shown in Table - 3, there was a significant difference in the Determination Time performance of athletes between menstrual and follicular, menstrual and ovulation, and menstrual and luteal phases. While there is no significant difference in the Determination Time performance of athletes between any other menstrual phases.

Discussion

This study aimed to investigate the changes in psychological parameters across different phases of the menstrual cycle in female athletes. The findings indicated that the mean values for reaction time and determination time varied significantly across the menstrual cycle phases. Specifically, the reaction time showed a significant difference between the menstrual phase and the follicular, ovulation, and luteal phases. During the menstrual phase, athletes exhibited slower mean reaction times compared to the other phases. However, when comparing the luteal and follicular phases, no significant difference in mean reaction time was observed, suggesting similar performance in both phases. Similarly, no significant difference was found between the luteal and follicular phases in terms of reaction time. When examining determination time, significant differences were found between the menstrual phase and the follicular, ovulation, and luteal phases, with athletes performing differently during the menstrual phase. In contrast, no significant differences were observed between the other phases (follicular, ovulation, and luteal) in determination time performance

Conclusion

The study aimed to compare reaction times and determination times across different phases of the menstrual cycle: menstrual, follicular, ovulation, and luteal phases. It found significant differences in response times between these

phases, with the follicular phase showing the fastest reaction times, followed by the ovulation, luteal, and menstrual phases. Reaction times were longest during the menstrual phase, possibly due to fluid and salt retention affecting neural conduction.

Additionally, auditory and visual reaction times (ART and VRT) were found to be longer in the menstrual phase and shorter in the luteal phase compared to the follicular phase. Previous studies suggest that cognitive function can be impaired during the para-menstrual phase (around menstruation), possibly due to hormonal fluctuations. For instance, research indicated elevated reaction times during the premenstrual phase, linked to fluid retention and reduced central nervous system processing capacity.

In terms of performance, female athletes tend to perform better during the follicular phase due to higher energy levels, reduced anxiety, and a more focused mood. Conversely, performance during the menstrual and luteal phases may be hindered by slower reaction times, attributed to hormonal and physiological changes, such as increased fluid and electrolyte levels.

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