

Research Paper

The Impact of Menstrual Cycle Phases on Psychological Changes and Their Influence on The Performance of Athletes

Tanu Shree Yadav^{1*}, Gayatri Pandey², Sanjay Kumar Prajapati³, Lisa Higgins⁴,
Zsolt Németh⁵

ABSTRACT

The study aimed to analyze 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 analyzed 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 analyzed by using Repeated Measure ANOVA and the level of significance was at $p < 0.05$. The study results showed variations in Reaction time in the Follicular phase, Luteal phase, and Menstrual phase of the menstrual cycle. For the athletes, the mean values of RT in the menstrual phase had a slower mean reaction time. While Determination time showed the mean value was higher in the Follicular phase. Results revealed that athletes have better reaction time in the Follicular phase and Ovulation phase when compared to the menstrual phase and luteal phase. Similarly, in the Determination time test athletes had better results in the follicular phase. The study concluded that variations in psychological parameters are observed during the different phases of the menstrual cycle.

Keywords: Menstrual Phase, Follicular Phase, Ovulation Phase, Luteal Phase, Psychological Effects, Sport Performance

The menstrual cycle, accompanying hormonal variations, and many aspects/markers of health, well-being, and athletic performance all have complex interactions.^[1,2,3,4] It has long been documented in the general population that the menstrual cycle and its associated physical and physiological symptomology can frequently have a detrimental influence on everyday life and activities.^[5,6,7,8] Furthermore, Bruinvels et al discovered that

¹Sports Authority of India, Lakshmibai National College of Physical Education, India

²Lakshmibai National Institute of Physical Education, India

³Sports Authority of India, Lakshmibai National College of Physical Education, India

⁴Menstrual Cycle Coach, The Red Rebel Collective, United Kingdom

⁵University of Pécs, Institute of Sport Science and Physical Education, Hungary

*Corresponding Author

Received: December 01, 2023; Revision Received: February 02, 2024; Accepted: February 06, 2024

The Impact of Menstrual Cycle Phases on Psychological Changes and Their Influence on The Performance of Athletes

half of top British female runners and rowers (n=90) believed their menstrual cycle had an influence on their training and athletic performance.^[9] From the time an adult female reaches sexual maturity (10 to 12 years of age) until menopause, when she loses blood for 1 to 7 days per month (45 to 50 years of age), menstruation is a normal phenomenon.^[10] Every woman menstruates on average, which indicates that she is capable of having children. Since the physiology, pathology, and psychology of menstruation have been connected to women's health and happiness, it is a crucial component of female morbidity and mortality.^[11]

Every female athlete is aware that her period affects how she feels, and that how she feels affects how she performs.^[12,13] A woman who is unpleasant during her period may find it enticing to skip a few cycles or go without a period, but a missing period or an irregular cycle is a significant red signal that should not be ignored.^[15,18]

Olympic hopeful, three-time national champion, and sports trainer Ayesha Billimoria claims that "most women have a terrible time exercising during their periods."^[14,16] " But when I was a young adolescent and even into my 20s, I used it to my advantage (mentally) and convinced myself that it motivates me to run more quickly.^[17,19] I wasn't very affected by it. But by the time I was thirty, the situation had completely changed. It was a sign that my body was telling me to relax, breathe, and make moderate movements throughout the first three days.^[19,21]

For around 40 years of her reproductive life, a woman's menstrual cycle is an integral part of her natural lifestyle.^[20,21,22] The clinical image of the cycle has benefited from the understandable emphasis on the premenstrual days, but the continuous, typically healthy physiological and psychological processes have received considerably less attention.^[23,24] Psychology of the reproductive process changes Such knowledge is essential for understanding menstruation more broadly as well as for managing monthly pain.^[25,29] There is little doubt that the natural structure that sustains human existence has significant psychological and behavioural concomitants. It is not unexpected for them to appear in the latter stages of pregnancy, and it is much less unexpected in the crucial initial stages of conception, consummation, and the protection of a fertilised ovum. The reproductive cycle interacts with and is affected by strong acquired psychological and social factors, just as any combination of physiological and biochemical changes.^[28]

The majority of research on psychological changes associated to the menstrual cycle do, according to a new study, show these changes.^[30,31] Even in the six studies that had results that were only partially negative, the majority found some change, but it was not statistically significant; or significant changes were found on questionnaires that were specifically related to menstruation but not on others; or the results were based on questionnaires that had been modified and thus lost their established reliability and validity; or they were simply ad hoc.^[32] In this regard, the purpose of this article was to look at the impact of menstruation cycle phases on psychological changes and their influence sportive performance of female athletes.

MATERIALS AND METHODS

Selection of Subjects

The current study was conducted on Fifteen healthy young female athletes from Lakshmibai National Institute of Physical Education, Gwalior, aged 18–25 years, with a typical menstrual cycle of 28-30 days. Women with irregular menstrual cycles, those using any

The Impact of Menstrual Cycle Phases on Psychological Changes and Their Influence on The Performance of Athletes

medications or hormonal supplements, those with any physical illnesses, and those with a history of endocrine issues, bleeding disorders, or excessive monthly bleeding (MP) were all disqualified from participating in the study. They were all given a thorough explanation of the study's objectives and methods in order to get their full cooperation, and their composure of mind was necessary for appropriate results.

Data Collection

The following protocol was used for data collection - Subjects were instructed 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. During each visit, 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).

Procedure for VTS machine Testing

The input method makes use of the response panel. The response test consists of a practise and teaching phase as well as the actual test phase. The instructions begin with a description of the assessment's goals and directions on how to respond to relevant stimuli using the black and gold keys on the response panel. After responding (that is, after pressing the black button), it's crucial for the respondent to return his finger right away to the gold-coloured key. The respondent is instructed to place his writing hand's fingertip on the gold-coloured key at the conclusion of the instructions. With this test, a tone, combinations of these stimuli, and a succession of yellow and red lights are shown. The participant is told to respond to a crucial combination that consists of two simultaneous visual stimuli (yellow and red lights). Therefore, incorrect responses are conceivable. There are at least nine practise stimuli displayed. 16 of the 48 stimuli displayed during the test stage call for a response. About nine minutes are needed for administration (including instructions).

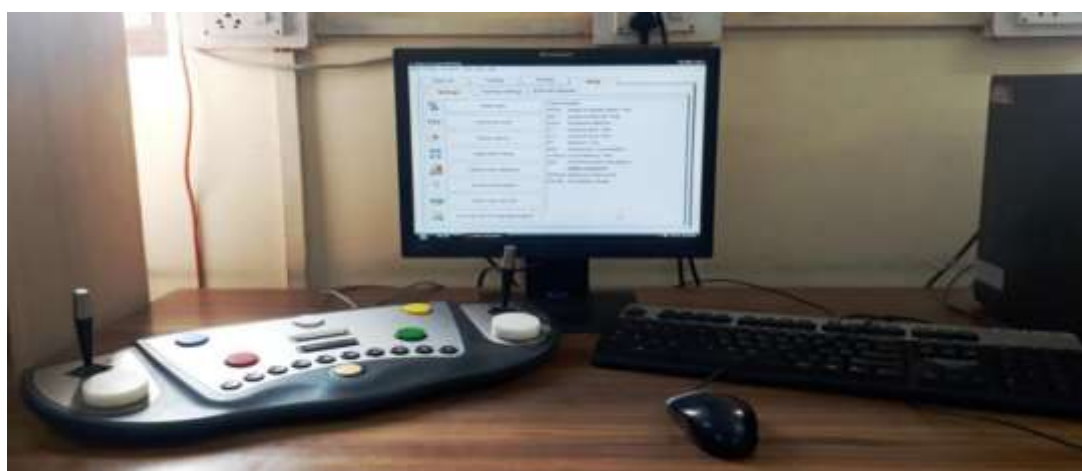


Figure 1: Set up for VTS machine for Test.

Calculating the score: Depending on the test format, the important variable is the mean response time. The Box-Cox transformation is used to compute means, which guarantees that they give the best depiction of the central tendency of the distribution of the reaction times.

The Impact of Menstrual Cycle Phases on Psychological Changes and Their Influence on The Performance of Athletes

Statistical Analysis

Reaction time and Determination time were measured during the menstrual cycle's Menstruation phase, follicular phase, ovulation phase, and luteal phase, and statistical analysis was performed using Repeated Measure ANOVA and the level of significance was at $p < 0.05$ with the help of SPSS20.

RESULT

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

(I) factor1	(J) factor1	Mean Difference (I- J)	Std. Error	Sig.	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
1	2	-1.33	.14	.00	-1.74	-.91
	3	-8.50	.53	.00	-10.02	-6.97
	4	-27.30	1.42	.00	-31.33	-23.27
2	3	-7.16	.53	.00	-8.67	-5.66
	4	-25.96	1.42	.00	-30.00	-21.9
3	4	-18.80	1.44	1.00	-22.89	-14.70

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.

(I) factor1	(J) factor1	Mean Difference (I- J)	Std. Error	Sig.	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
1	2	-2.60	.38	.00	-3.68	-1.51
	3	-9.70	.84	.00	-12.10	-7.29
	4	-24.76	1.59	.00	-29.28	-20.24
2	3	-7.10	.58	.00	-8.75	-5.44
	4	-22.16	1.58	.00	-26.64	-17.68
3	4	-15.06	1.57	.00	-19.51	-10.61

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.

The Impact of Menstrual Cycle Phases on Psychological Changes and Their Influence on The Performance of Athletes

DISCUSSION

The dynamic cyclical changes in the levels of various hormones at different phases of the menstrual cycle affect the function of different systems of the body, including the psychological aspects. This study aimed to determine changes psychological parameters in different phases of the menstrual cycle in female athletes. In the present study, results showed that the mean values of reaction time and determination time significantly changes in the various phases of menstrual cycle. According to the results of the reaction time, there was a statistically significant difference between the menstrual phase and the follicular, ovulation, and luteal phases when comparing reaction times in all four menstrual cycle phases. The menstrual phase had a slower mean reaction time than the follicular, ovulation, and luteal phases. When compared to the luteal phase and the follicular phase, which showed a comparable mean reaction time in both groups, the ovulation phase showed no statistically significant difference in mean rank. Similar to the Luteal phase to Follicular phase pair, there was no statistically significant difference in mean rank, indicating a similar mean reaction time in both groups. Similarly, when determination time was tested the result revealed that 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.

CONCLUSION

The purpose of the present study was to compare the selected psychological variable i.e. reaction time and determination time in different phases of menstrual cycle - menstrual, follicular, ovulation and luteal phase. In respect to response time, it was shown that there were substantial differences between the four groups, menstrual phase, follicular phase, ovulation phase, and luteal phase, and that follicular phase had a higher mean than ovulation phase, luteal phase, and menstrual phase. In our investigation, the ART and VRT were longer in the menstrual phase and shorter in the secretory phase as compared to the proliferative phase, despite other studies finding reduced thresholds for auditory stimuli at the beginning of the menstrual cycle^[1]. According to some, cognitive impairment is a feature of the para-menstrual stage. In research by Nene and Pazare, ART was markedly elevated throughout the premenstrual phase and on the anticipated day of ovulation.^[14] Similar to this, a research by Das et al. found that there was a substantial increase in weight and a lengthening of auditory and visual reaction times during the premenstrual phase. These alterations have been linked to fluid and salt retention at this stage, which causes a reduction in the processing power of the central nervous system. The secretory phase is most likely brought on by the elevated progesterone levels present at this time. The menstrual phase is characterized by longer reaction times, which may be attributable to a generalised shortening of neural conduction times brought on by fluid and salt retention. It has been determined that female athletes perform better during the follicular phase than they do during the menstrual and luteal phases. This is because women experience anxiety, stress, and mood swings throughout each phase, but the follicular phase is when they tend to be the most active and work-focused. The slowing of conduction times brought on by an increase in fluid and electrolyte levels during the menstrual phase is what causes the reaction times to increase.

REFERENCES

- [1] Constantini NW, Dubnov G, Lebrun. CM The menstrual cycle and sport performance. *Clin Sports Med* 2005;24: e5182. doi:10.1016/j.csm.2005.01.003

The Impact of Menstrual Cycle Phases on Psychological Changes and Their Influence on The Performance of Athletes

- [2] Mountjoy M, Sundgot-Borgen J, Burke L. The IOC consensus statement: beyond the Female Athlete Triad--Relative Energy Deficiency in Sport (RED-S). *Br J Sports Med* 2014; 48:491–7.doi:10.1136/bjsports-2014-093502
- [3] Aganoff JA, Boyle GJ. Aerobic exercise, mood states and menstrual cycle symptoms. *J Psychosom Res* 1994; 38:183–92.doi:10.1016/0022-3999(94)90114-7
- [4] Lebrun CM, Joyce SM, Constantini NW. Effects of Female Reproductive Hormones on Sports Performance. In: Constantini N, Hackney AC, eds. *Endocrinology of physical activity and sport*. 2nd ed. New York: Springer Science and Business Media, 2013: 281–322.
- [5] Banikarim C, Chacko MR, Kelder SH. Prevalence and impact of dysmenorrhea on Hispanic female adolescents. *Arch Pediatr Adolesc Med* 2000; 154:1226–9.doi:10.1001/archpedi.154.12.1226
- [6] Santer M, Wyke S, Warner P. Women's management of menstrual symptoms: findings from a postal survey and qualitative interviews. *Soc Sci Med* 2008; 66:276–88.doi:10.1016/j.socscimed.2007.08.018
- [7] Iacovides S, Avidon I, Baker FC. What we know about primary dysmenorrhea today: a critical review. *Hum Reprod Update* 2015;21: 762–78.doi:10.1093/humupd/dmv039
- [8] Martin D, Sale C, Cooper SB. Period prevalence and perceived side effects of hormonal contraceptive use and the menstrual cycle in elite athletes. *Int J Sports Physiol Perform* 2018; 13:926–32.doi:10.1123/ijsp.2017-0330
- [9] Bruinvels G, Burden R, Brown N. The prevalence and impact of heavy menstrual bleeding (menorrhagia) in elite and Non-Elite athletes. *PLoS One* 2016;11:e0149881–8 .doi:10.1371/journal.pone.0149881
- [10] Lacroix AE, Gondal H, Shumway KR, et al. Physiology, Menarche. [Updated 2023 Mar 11]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan.
- [11] Deshpande, T. N., Patil, S. S., Gharai, S. B., Patil, S. R., & Durgawale, P. M. (2018). Menstrual hygiene among adolescent girls - A study from urban slum area. *Journal of family medicine and primary care*, 7(6), 1439–1445. https://doi.org/10.4103/jfmpc.jfmpc_80_18
- [12] Lebrun C. M. (1993). Effect of the different phases of the menstrual cycle and oral contraceptives on athletic performance. *Sports medicine (Auckland, N.Z.)*, 16(6), 400–430. <https://doi.org/10.2165/00007256-199316060-00005>
- [13] Arora, D., Sandhu, P., Mehta, K., Kaur, A., & Kaur, N. (2015). Expiratory Flow Rate Changes During Menstrual Cycle. *Pakistan Journal of Physiology*, 10(3-4), 3-5. Retrieved from <https://www.pjp.pps.org.pk/index.php/PJP/article/view/509>
- [14] Lebrun, C. M., & Rumball, J. S. (2001). Relationship between athletic performance and menstrual cycle. *Current women's health reports*, 1(3), 232–240.
- [15] Jasrotia RB, Kanchan A, Harsoda JM. Effect of menstrual cycle on pulmonary Publishing.
- [16] Tsampoukos, A., Peckham, E. A., James, R., & Nevill, M. E. (2010). Effect of menstrual cycle phase on sprinting performance. *European journal of applied physiology*, 109(4), 659–667. <https://doi.org/10.1007/s00421-010-1384-z>
- [17] Ertaş, B., and Ersöz, G. (2002) Effects of Different Menstrual Periods on Selected Performance Criteria in Female Swimmers. 7th International Sports Sciences Congress, Antalya.
- [18] Kishali, N. F., Imamoglu, O., Katkat, D., Atan, T., & Akyol, P. (2006). Effects of menstrual cycle on sports performance. *The International journal of neuroscience*, 116(12), 1549–1563. <https://doi.org/10.1080/00207450600675217>
- [19] Karakaş, E. S. (1987). *Sporcu Sağlığı*. Kayseri: Erciyes Üniversitesi Yayınları.
- [20] Lebrun, C. M., and Rumball, J. S. (2001). Relationship between athletic performance and menstrual cycle. *Current Women's Health*

The Impact of Menstrual Cycle Phases on Psychological Changes and Their Influence on The Performance of Athletes

- [21] Lind, A. R., and Petrofsky, J. S. (1976). Isometric strength and endurance during the menstrual cycle.
- [22] Fomin, S. K., Pivovarova, V. I. and Voronova, V. I. (1989). Changes in the working special capacity and mental stability of well trained women skiers at various phases of the biological cycle. *Sports*
- [23] Kiesner J, Eisenlohr-Moul T, Mendle J. Evolution, the Menstrual Cycle, and Theoretical Overreach. *Perspect Psychol Sci.* 2020 Jul;15(4):1113-1130. doi: 10.1177 /1745691620906440. Epub 2020 Jun 15. PMID: 32539582; PMCID: PMC7334061.
- [24] M.L.M. Heine, G. Kwakkel, U. Dalgas, Aerobic Capacity in Persons with Multiple Sclerosis: A Systematic Review and Meta-Analysis, *Sports Medicine.* 45 (2015) 905–923, <https://doi.org/10.1007/s40279-015-0307-x>.
- [25] Hennegan J, Winkler IT, Bobel C, Keiser D, Hampton J, Larsson G, Chandra-Mouli V, Plesons M, Mahon T. Menstrual health: a definition for policy, practice, and research. *Sex Reprod Health Matters.* 2021 Dec;29(1):1911618. doi: 10.1080/26410397 .2021.1911618. PMID: 33910492; PMCID: PMC8098749.
- [26] Lebrun CM, Rumball JS. Relationship between athletic performance and menstrual cycle. *Current Women's Health Reports* 2001; 1(3): 232-240
- [27] Pratima Chatterjee, Samir Nag, Minati Kali, Chatterjee S. Study on VO₂ max of female athletes in relation to menstrual cycle. *Ind J Physiol and Allied Sci* 1988; 42(1): 11-13.
- [28] Yim, I. S., Tanner Stapleton, L. R., Guardino, C. M., Hahn-Holbrook, J., & Dunkel Schetter, C. (2015). Biological and psychosocial predictors of postpartum depression: systematic review and call for integration. *Annual review of clinical psychology*, 11, 99–137. <https://doi.org/10.1146/annurev-clinpsy-101414-020426>
- [29] Nazem TG, Ackerman KE. The female athlete triad. *Sports Health* 2012; 4:302–11. doi: 10.1177/1941738112439685 *Sciences*, 4(4): 3-9.
- [30] Prado, R. C. R., Silveira, R., Kilpatrick, M. W., Pires, F. O., & Asano, R. Y. (2021). Menstrual Cycle, Psychological Responses, and Adherence to Physical Exercise: Viewpoint of a Possible Barrier. *Frontiers in psychology*, 12, 525943. <https://doi.org/10.3389/fpsyg.2021.525943>
- [31] K.H. Cooper, A Means of Assessing Maximal Oxygen Intake, *Jama.* 203 (1968) 201, <https://doi.org/10.1001/jama.1968.03140030033008>. *Physiology*, 35: 1-10. *Journal of Applied Physiology*, 109 (4), 659–667.
- [32] Carmichael, M. A., Thomson, R. L., Moran, L. J., & Wycherley, T. P. (2021). The Impact of Menstrual Cycle Phase on Athletes' Performance: A Narrative Review. *International journal of environmental research and public health*, 18(4), 1667. <https://doi.org/10.3390/ijerph18041667>

Acknowledgment

The author(s) appreciates all those who participated in the study and helped to facilitate the research process.

Conflict of Interest

The author(s) declared no conflict of interest.

How to cite this article: Yadav, T.S., Pandey, G., Prajapati, S. Higgins, L. & Németh, Z. (2024). The Impact of Menstrual Cycle Phases on Psychological Changes and Their Influence on The Performance of Athletes. *International Journal of Indian Psychology*, 12(1), 429-435. DIP:18.01.041.20241201, DOI:10.25215/1201.041