IMPACT OF MENSTRUAL CYCLE PHASES ON PERCEIVED EXERTION AND MOOD STATE IN FEMALE GYM ENTHUSIASTS

Eeraj Omer Farooq

The University Of Lahore

Abstract
Background
In order to maximize the workout experiences of female gym aficionados, it is imperative to comprehend the impact of menstrual cycle stages on perceived exertion and mood state.
Investigating how menstrual cycle phases may affect these parameters is essential for customizing exercise programming and support methods to better meet the needs of female gym aficionados, given the substantial impact that mood and perceived exertion play in exercise performance and adherence.

Aims
The primary aim of this research is to investigate the impact of different phases of the menstrual cycle on perceived exertion and mood state in female gym enthusiasts.
By understanding these effects, the study aims to provide insights that can help in customizing exercise programming and support methods to better accommodate the unique physiological and psychological needs of female gym-goers, thereby enhancing their workout experiences, performance, and adherence to fitness routines.

Methedology
Following approval from 104 females, data was collected from the female gym enthusiasts. The corresponding Performa is appended below. Convenient sampling was used to collect information from females through a variety of questionnaires in order to gain permission to use that information in future research.
The purpose of this study was to assess the present impact of menstrual cycle phases on perceived exertion and mood state in female gym enthusiasts, look into probable perceived exertion distinctions among females, and examine the likelihood mood state in women.
This research was a cross-sectional analysis. Physical exertion is measured by Rating of perceived exertion (RPE) Borgs, mood state is checked by Hoopers questionnaire and Menstruation cycle phases are checked by self-modified questionnaire.

Results
A sample of 104 females were surveyed online, and assessed. The research was cross-sectional in nature.
Data was collected through Hooper's Mackinnon Index and Rate of perceived exertion through selected samples. SPSS Version 25 was used to analyze the data.
The mean age of 27.67 with a standard deviation of 4.40. 25.0% in menstruation and follicular.26.0% of ovulation phase and 24.0% of luteal phase.
14.4% of the enthusiasts reported having Low exertion, 41.3% of the enthusiasts reported having Moderate Exertion, 24.0% of the enthusiasts reported having High Exertion and 20.2% indicated that they were experiencing "Very high Exertion" perceived stress levels.
This study showed the statistical significant association between menstrual cycle phases and mood state as p value is 0.00. Statistical significant association between menstrual cycle phases and exertion categories as p value is 0.00.

Conclusion
This study concluded that in the luteal phase of menstrual cycle showed a higher prevalence of very high exertion while the menstruation and follicular phases have a higher proportion of individuals fell into the severe and very severe categories of psychological distress compared to the ovulation and luteal phases.

Index Terms- Exercise, exertion, menstrual cycle, mood, performance

INTRODUCTION

For young women, the menstrual cycle is a regular monthly occurrence regulated by the hypothalamic-pituitary-ovarian axis, influenced by physiological and pathological changes throughout a woman's life. The cycle is divided into two primary phases separated by ovulation: the follicular phase (FP) and the luteal phase (LP). During FP, levels of key hormones like progesterone (P4) and luteinizing

hormone (LH) are low, whereas, in LP, these hormones are significantly elevated. Exercise performance and perception are affected by these hormonal changes, which influence factors such as body hydration, electrolyte balance, thermoregulation, and energy metabolism.

The onset of menarche typically occurs between the ages of 10 and 16 and continues until menopause, around the age of 51, barring interruptions from pregnancy, hormonal contraception, or menstrual disorders. Premenstrual and menstrual symptoms can significantly impact athletes' daily lives, training, and competition. Conditions like menorrhagia can lead to iron deficiency anemia, affecting physical performance and causing symptoms such as weakness, fatigue, dizziness, and shortness of breath. Menstrual irregularities (e.g., amenorrhea, oligomenorrhea) are more common among elite athletes and can affect their overall well-being.

A standard menstrual cycle lasts 28 ± 2.4 days and includes four phases controlled by hormonal fluctuations. Menstruation marks the cycle's beginning, with low progesterone and estrogen levels. The FP encompasses early FP (menstruation) and late FP, where estrogen levels surge. Mid-cycle ovulation occurs about 36 hours after the LH peak, followed by a rapid decline in estrogen. The LP is characterized by rising progesterone levels, which prepare the uterine endometrium for potential implantation. Variations in hormone levels during these phases are regulated by the gonadotropic axis (hypothalamus-pituitary), influencing the final stages of follicular growth and ovulation.

Premenstrual symptoms, such as back pain, fatigue, depression, abdominal bloating, and irritability, affect over 70% of women, impacting cognitive and spatial performance due to fluctuations in aldosterone, testosterone, and estrogen levels. These symptoms can also affect athletic performance, with 59% of athletes reporting worsened performance during the late luteal phase (LLP). Menstrual stigma remains a global issue, affecting education and socioeconomics, with many young girls feeling ashamed of their periods. Research has shown that hormonal variations throughout the menstrual cycle influence several aspects of the physiological response to exercise, including thermoregulation, ventilation, and cardiovascular strain. These variations also affect psychological responses to physical activity, such as perceived pain and exertion.

Understanding how the menstrual cycle affects exercise habits is crucial for women's health. Hormonal fluctuations influence the body's reaction to exercise, impacting ventilation, thermoregulation, and cardiovascular responses. These physiological changes can alter psychological responses to exercise, potentially affecting motivation and adherence. While some studies have reported higher ratings of perceived exertion (RPE) during certain phases of the cycle, findings are inconsistent. For instance, some studies indicate higher RPE during the ovulatory phase, while others report higher RPE during the luteal phase.

There is evidence that inactive and low-fit individuals report higher exertion levels than what is indicated by heart rate (HR) measurements. Most studies on exercise metabolism in women have focused on the early menstrual cycle phase (FP), leaving the impact of hormonal changes on other physiological aspects less understood. These aspects include the autonomic nervous system, cardiovascular response, thermic stress responses, energy metabolism, and immune function. For example, estrogen can enhance endothelium-dependent vasodilatation, while low estrogen levels may increase cardiovascular stress response. Progesterone's thermogenic effects are regulated by the preoptic/anterior hypothalamus.

Despite the potential impact of the menstrual cycle on performance, women's training often does not account for individual hormonal variations. Recent research has begun to explore how the menstrual cycle affects training adaptations in female athletes, emphasizing the importance of tailoring exercise programs to hormonal changes.

This research aims to examine the effects of menstrual cycle phases on mood state and perceived exertion in female gym enthusiasts. By understanding these effects, exercise programs can be customized to better meet the needs of female gym-goers, enhancing their workout experiences and adherence.

Tailoring training plans to accommodate hormonal fluctuations can improve women's exercise performance and overall experience, promoting inclusivity and fairness in fitness environments. Additionally, this understanding can advance knowledge of women's health and well-being in relation to exercise, fostering a more supportive and effective approach to fitness for women.

METHODOLOGY

The study utilized a cross-sectional design to investigate the impact of menstrual cycle phases on perceived exertion and mood state among female gym enthusiasts. Data collection involved convenient sampling of 106 female participants who were recruited based on their availability and willingness to participate.

Participants completed a series of questionnaires to assess perceived exertion using Borg's Rating of Perceived Exertion (RPE), mood state using the Hooper's questionnaire, and menstrual cycle phases through a self-modified questionnaire.

The study aimed to evaluate current differences in perceived exertion among females across different menstrual cycle phases, as well as to explore potential associations with mood state. Data analysis was conducted using descriptive statistics to summarize participant characteristics and key variables related to perceived exertion and mood state.

Statistical methods, likely including correlation analysis, were employed to investigate relationships between menstrual cycle phases, perceived exertion levels, and mood states among the participants.

This approach allowed for a comprehensive examination of how menstrual cycle phases impact exercise perception and mood in female gym enthusiasts, providing insights that could inform tailored exercise programming and support strategies.

Inclusion Criteria

- Between the 20 and 50 years of age
- women who workout regularly for 4-5 days a week
- With regular menstrual cycles
- Not currently using hormone based contraceptives such as contraceptive tablets, injections or an intrauterine device

Exclusion Criteria

- Past or current reproductive health problems, including infertility
- With no or irregular cycles
- Diagnosed with psychiatric problems
- Pregnant or breastfeeding women

FIGURES AND TABLES

AGE OF THE PARTICIPANTS

FIGURE 1 AND TABLE 1

Age of participants

N	Valid	104
	Missing	0
Std. Deviation		4.40804
Minimum		20.00
Maximum		37.00

Age of participants

Mean = 27.88
Std. Dev. = 4.408
N = 104
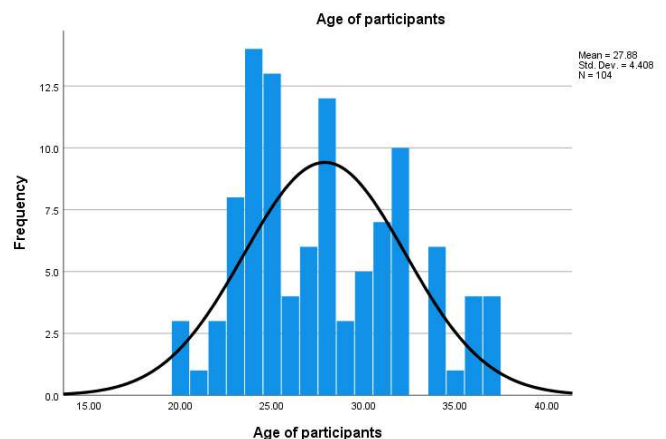
In the presented table the mean age of participants was found to be 27.6750 with a standard deviation of 4.40804, The minimum age of female enthusiasts participating in the study was 20, while the maximum age of participants enrolled in the course of the study was 37.

HEIGHT OF THE PARTICIPANTS

TABLE 2 AND FIGURE 2

Height of participants

N	Valid	104
	Missing	0
Mean		175.4856
Std. Deviation		14.58410
Minimum		151.09
Maximum		199.25

Height of participants

Mean = 175.49
Std. Dev. = 14.584
N = 104
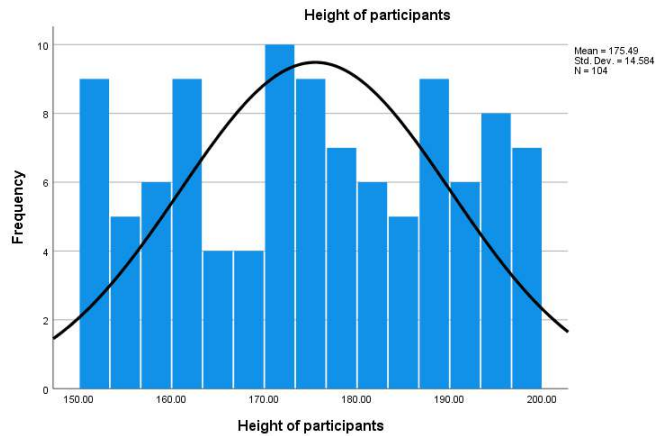
The above statistics showed the descriptive statistics of height. The mean height of 175.4856 with a standard deviation of 14.58410, minimum height is 151.09 and maximum height of participant is 199.25.

WEIGHT OF THE PARTICIPANTS

TABLE AND FIGURE 3

Weight of participants

N	Valid	104
	Missing	0
Mean		74.8577
Std. Deviation		14.30336
Minimum		50.00
Maximum		99.00

Weight of participants

Mean = 75.25
Std. Dev. = 14.326
N = 104
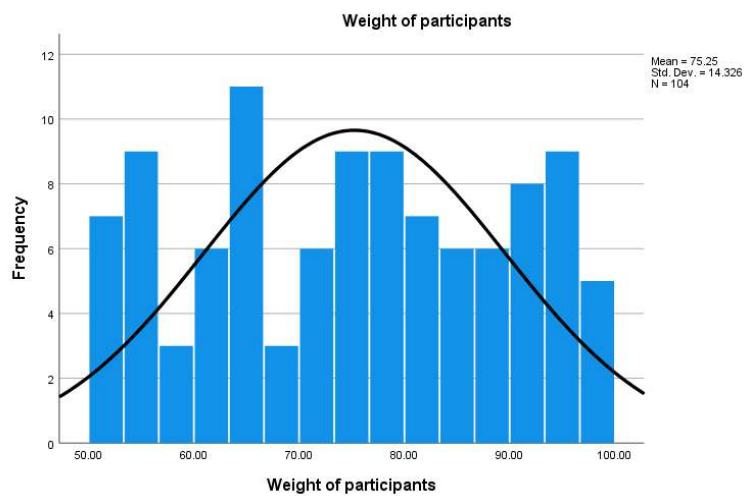
The above statistics showed the descriptive statistics of weight. The mean weight of 75.2470 with a standard deviation of 14.32591, minimum weight is 50.02 and maximum weight of participant is 99.77.

BMI OF THE PARTICIPANTS

TABLE AND FIGURE 4

BMI of Participants

N	Valid	104
	Missing	0
Mean		24.8840
Std. Deviation		5.98768
Minimum		12.84
Maximum		37.27

BMI of Participants

Mean = 24.88
Std. Dev. = 5.988
N = 104
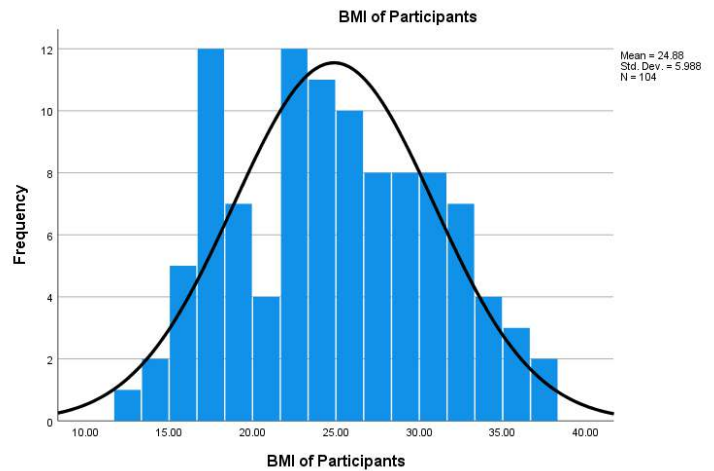
The above statistics showed the descriptive statistics of BMI. The mean BMI of 34.8840 with a standard deviation of 5.98768, minimum BMI is 12.84 and maximum BMI of participants is 37.27.
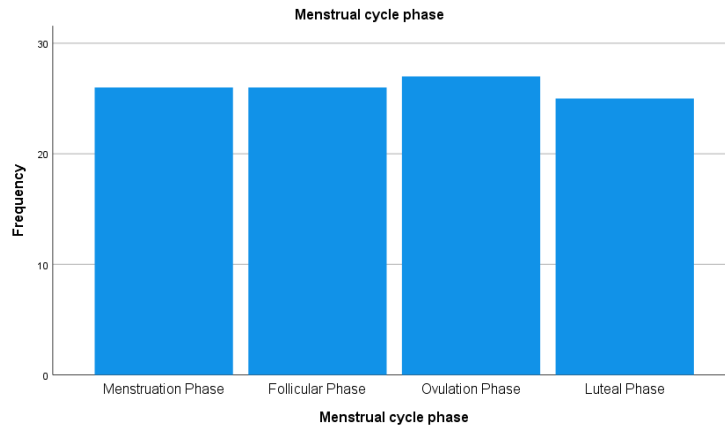
TABLE AND FIGURE 5

MENSTRUAL CYCLE PHASES IN FEMALE PARTICIPANTS

Menstrual cycle phase

		Frequency	Percent	Valid Percent
Valid	Menstruation Phase	26	25.0	25.0
	Follicular Phase	26	25.0	25.0
	Ovulation Phase	27	26.0	26.0
	Luteal Phase	25	24.0	24.0
	Total	104	100.0	100.0

This table showed the descriptive statistics of menstrual cycle phases of 25.0% in menstruation and follicular.26.0% of ovulation phase. And 24.0% of luteal phase

Menstrual cycle phase

TABLE AND

HOOPER QUESSIONAIRE

FIGURE 6

MACKINNON INDEX

QUESTION 1 : HOW FATIGUED ARE YOU ?

TABLE 6

How fatigued are?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No fatigue	2	1.9	1.9	1.9
	Minimal fatigue	9	8.7	8.7	10.6
	Better than normal	19	18.3	18.3	28.8
	Normal	20	19.2	19.2	48.1
	Worse than normal	28	26.9	26.9	75.0
	Very fatigued	16	15.4	15.4	90.4
	Exhausted - major fatigue	10	9.6	9.6	100.0
	Total	104	100.0	100.0	

FIGURE 6

How fatigued are?

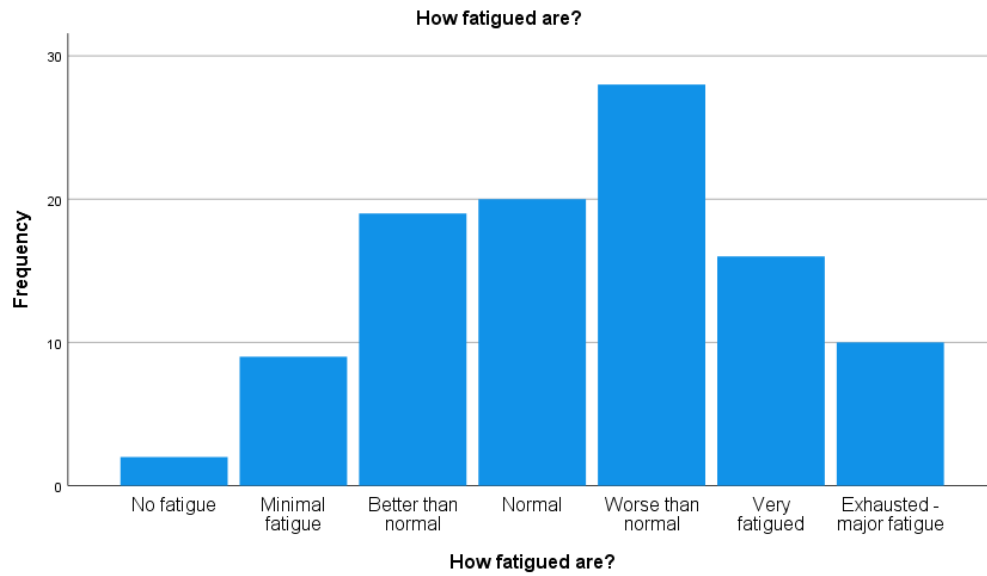

How fatigued are?

TABLE AND FIGURE 7

QUESTION 2 : HOW WAS YOUR SLEEP LAST NIGHT?

TABLE 7

How was your sleep last night?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Outstanding	3	2.9	2.9	2.9
	Very good	8	7.7	7.7	10.6
	Better than normal	18	17.3	17.3	27.9
	Worse than normal	5	4.8	4.8	32.7
	Disrupted	46	44.2	44.2	76.9
	Horrible no sleep	24	23.1	23.1	100.0
	Total	104	100.0	100.0	

This table showed the descriptive statistics of sleep quality individually. 2.9% of the total, reported having outstanding sleep. 7.7% of the sample reported having very good sleep. 17.3% of the sample reported having better than normal. Out of the sample, 4.8% consisted worse than sleep. 46 people reported having disrupted sleep, making up the biggest percentage at 44.2%. And 23.1% consisted of Horrible to no sleep.
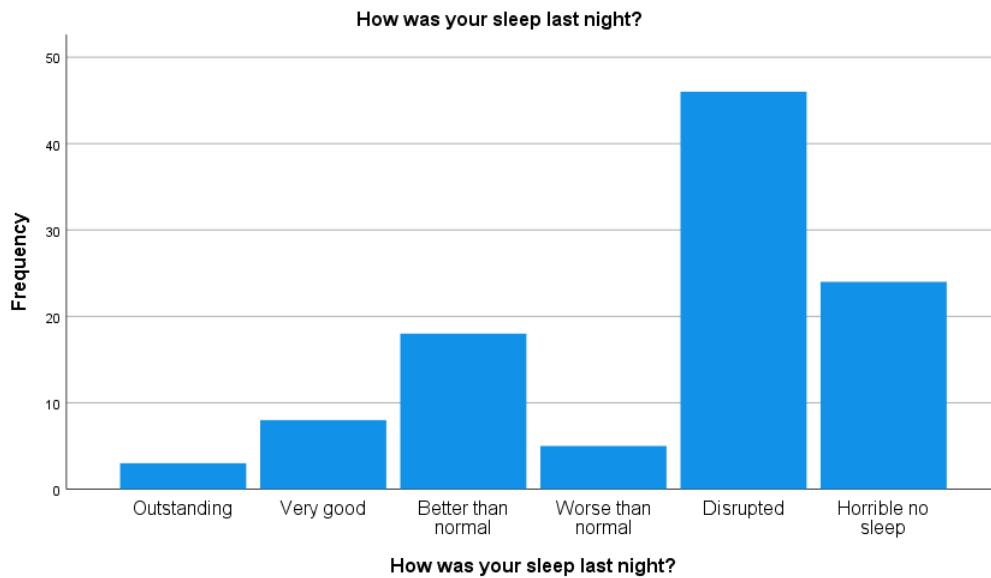
FIGURE 7

TABLE AND FIGURE 8
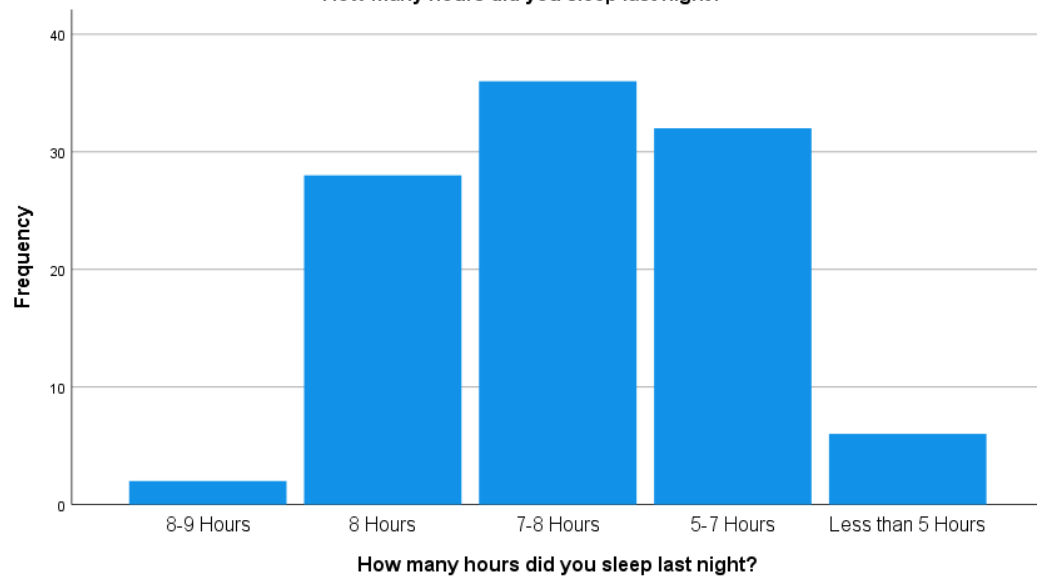
QUESTION 3 : HOW MANY HOURS DID YOU SLEEP LAST NIGHT ?

TABLE 8

How many hours did you sleep last night?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	8-9 Hours	2	1.9	1.9	1.9
	8 Hours	28	26.9	26.9	28.8
	7-8 Hours	36	34.6	34.6	63.5
	5-7 Hours	32	30.8	30.8	94.2
	Less than 5 Hours	6	5.8	5.8	100.0
	Total	104	100.0	100.0	

FIGURE 8

How many hours did you sleep last night?

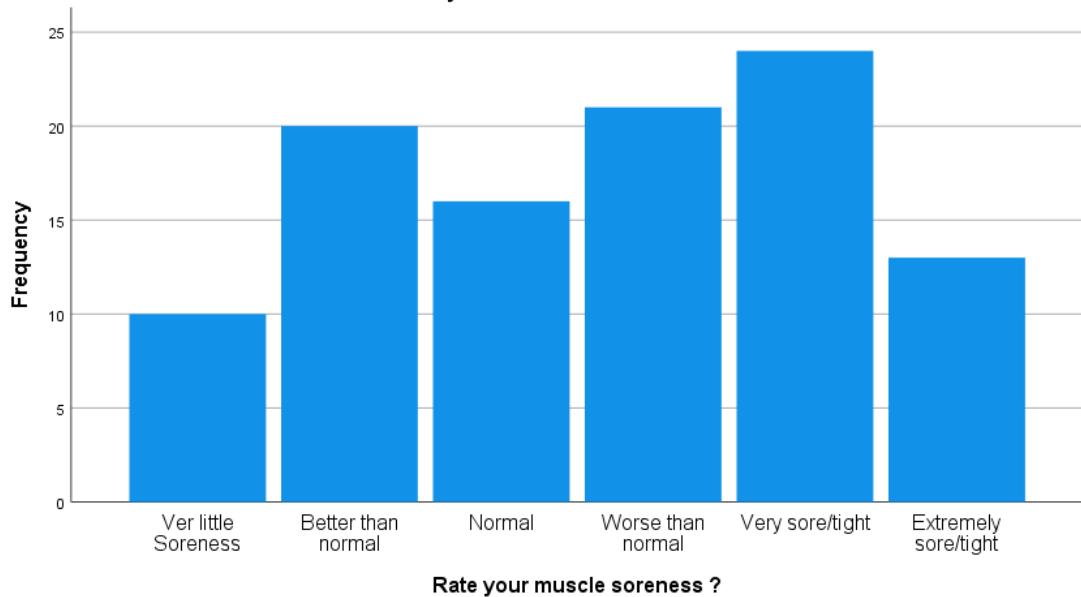**TABLES AND FIGURE 9**

QUESTION 4 : RATE YOUR MUSCLE SORENESS ?

TABLE 9

Rate your muscle soreness ?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Ver little Soreness	10	9.6	9.6	9.6
	Better than normal	20	19.2	19.2	28.8
	Normal	16	15.4	15.4	44.2
	Worse than normal	21	20.2	20.2	64.4
	Very sore/tight	24	23.1	23.1	87.5
	Extremely sore/tight	13	12.5	12.5	100.0
	Total	104	100.0	100.0	

FIGURE 9

Rate your muscle soreness ?
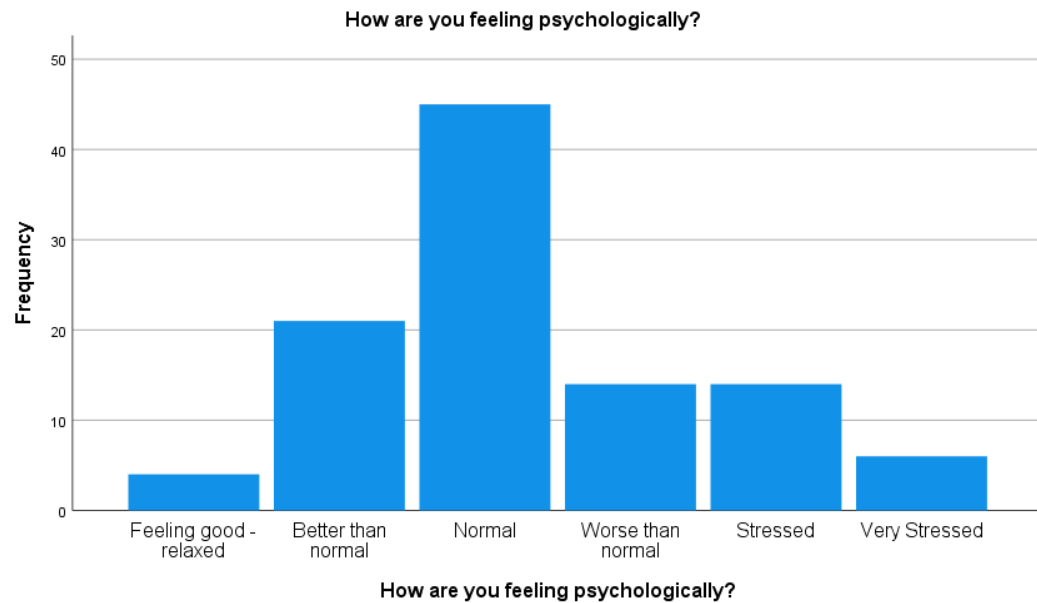
TABLES AND FIGURE 10

QUESTION 5 : HOW ARE YOU FEELING PSYCHOLOGICALLY ?

TABLE 10

How are you feeling psychologically?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Feeling good - relaxed	4	3.8	3.8	3.8
	Better than normal	21	20.2	20.2	24.0
	Normal	45	43.3	43.3	67.3
	Worse than normal	14	13.5	13.5	80.8
	Stressed	14	13.5	13.5	94.2
	Very Stressed	6	5.8	5.8	100.0
	Total	104	100.0	100.0	

FIGURE 10

How are you feeling psychologically?

TABLES AND FIGURES 11

RPE VALUES

TABLE 11

RPE Categories

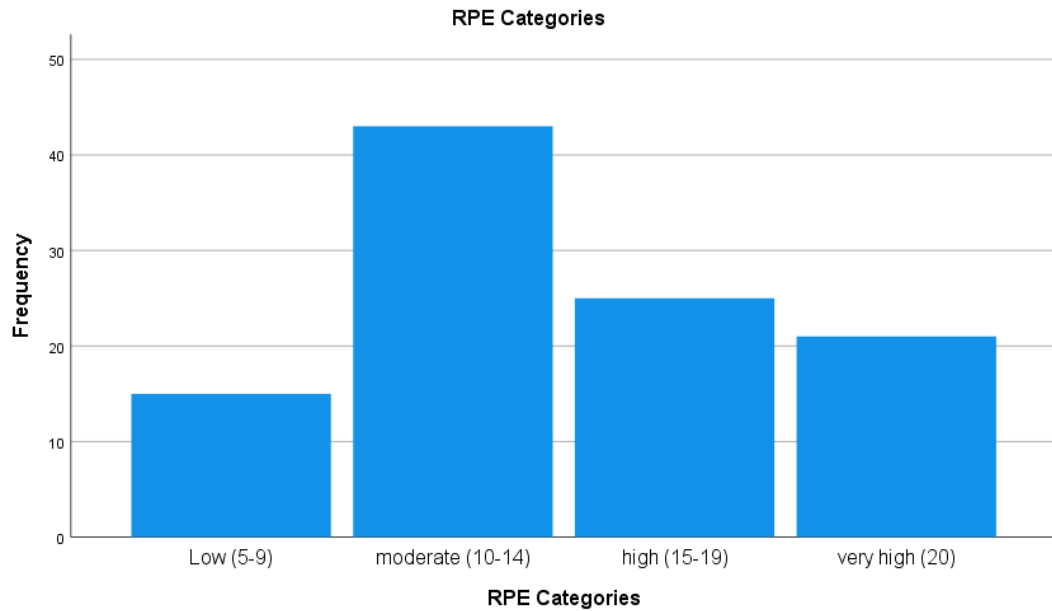|		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Low (5-9)	15	14.4	14.4	14.4
	moderate (10-14)	43	41.3	41.3	55.8
	high (15-19)	25	24.0	24.0	79.8
	very high (20)	21	20.2	20.2	100.0
	Total	104	100.0	100.0	

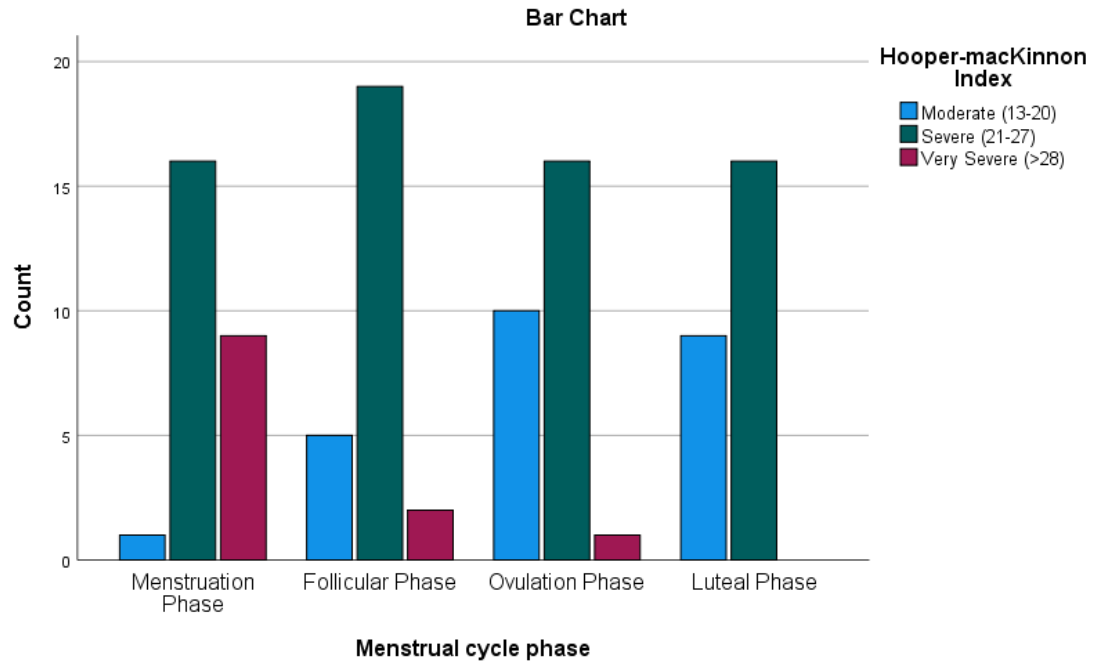FIGURE 11

TABLE AND FIGURE 12

MENSTRUAL CYCLE PHASE AND HOOPER-MACKINNON INDEX CROSSTABULATION

TABLE 12

Menstrual cycle phase * Hooper-macKinnon Index Crosstabulation

Count

		Hooper-macKinnon Index			
		Moderate (13-20)	Severe (21-27)	Very Severe (>28)	Total
Menstrual cycle phase	Menstruation Phase	1	16	9	26
	Follicular Phase	5	19	2	26
	Ovulation Phase	10	16	1	27
	Luteal Phase	9	16	0	25
Total		25	67	12	104

FIGURE 12

Bar Chart

Hooper-macKinnon Index
- Moderate (13-20)
- Severe (21-27)
- Very Severe (>28)

TABLES AND FIGURES 13

MENSTRUAL CYCLE PHASE AND RPE CATEGORIES CROSSTABULATION

TABLE 13

Menstrual cycle phase * RPE Categories Crosstabulation

Count

		RPE Categories				Total
		Low (5-9)	moderate (10-14)	high (15-19)	very high (20)	
Menstrual cycle phase	Menstruation Phase	0	6	16	4	26
	Follicular Phase	0	24	2	0	26
	Ovulation Phase	14	8	2	3	27
	Luteal Phase	1	5	5	14	25
Total		15	43	25	21	104

FIGURE 13

Bar Chart
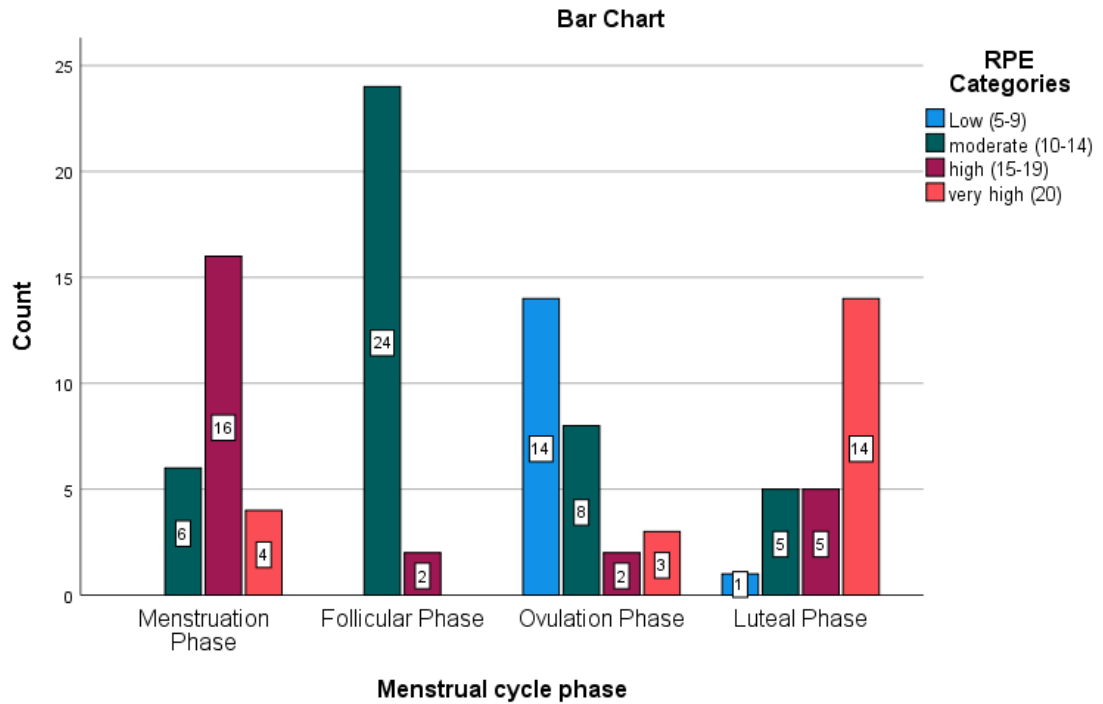
RESULTS

104 female enthusiasts from different gyms and fitness arenas of Lahore participated in this research. The mean age of 27.67 with a standard deviation of 4.40. 25.0% in menstruation and follicular.26.0% of ovulation phase and 24.0% of luteal phase.

14.4% of the enthusiasts reported having Low exertion, 41.3% of the enthusiasts reported having Moderate Exertion, 24.0% of the enthusiasts reported having High Exertion and 20.2% indicated that they were experiencing "Very high Exertion" perceived stress levels.This study showed the statistical significant association between menstrual cycle phases and mood state as p value is 0.00. Statistical significant association between menstrual cycle phases and exertion categories as p value is 0.00

CONCLUSION

In conclusion, our study on the "Impact of Menstrual Cycle Phases on Perceived Exertion and Mood States in Female Gym Enthusiasts" revealed significant findings regarding the association between menstrual cycle phases, perceived exertion levels, and mood states among participants. Specifically, we observed that during the luteal phase of the menstrual cycle, there was a higher prevalence of very high perceived exertion levels. In contrast, individuals in the menstruation and follicular phases exhibited a higher proportion reporting severe and very severe categories of psychological distress compared to those in the ovulation and luteal phases.

These findings underscore the dynamic interplay between hormonal fluctuations and exercise perception among female gym enthusiasts. They highlight the importance of considering menstrual cycle phases when designing exercise programs and support strategies tailored to women's physiological and psychological needs. By recognizing these variations, fitness professionals and healthcare providers can optimize exercise experiences and potentially improve adherence among female gym-goers.

Moving forward, future research could delve deeper into the mechanisms underlying these associations, explore additional factors influencing exercise perception across menstrual cycle phases, and evaluate the effectiveness of targeted interventions aimed at enhancing women's exercise outcomes and overall well-being.

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AUTHORS

First Author – Eeraj Omer Farooq, The University Of Lahore, eerajomerfarooq@gmail.com

Correspondence Author – Eeraj Omer Farooq, eerajomerfarooq@gmail.com, eerajomer32@gmail.com, 03324793199