



EFFECT OF PRE-MENSTRUAL AND POST-MENSTRUAL STRESS ON AUDIO-VISUAL REACTION TIME

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Abstract:

Background: Pre-menstrual stress is a psycho-neuro-endocrine disorder with biological, psychological components whereas Post-menstrual stress defines the symptoms that the women experience just after their cycle ends. Reaction time is a simple non invasive test for peripheral as well as central neural structures and has physiological significance.

Objectives: This study aims to compare pre-menstrual stress and post-menstrual stress by using Reaction time.

Methods: The study was done on 50 healthy medical and paramedical female students aged 18 to 25 years. Audio visual reaction time (AVRT) was taken with the help of reaction time apparatus during pre-menstrual and post-menstrual stress.

Results: Auditory reaction time (ART) and Visual reaction time (VRT) both was found increased in Pre-menstrual stress (P value < 0.05) as compared to Post-menstrual stress by using paired t test data.

Conclusion: Pre-menstrual stress changes the level of ovarian steroid hormone, causes the retention of salt and fluid, reduced velocity of nerve impulse, impair sensory motor coordination and processing speed of central nervous system (CNS). Thus prolonging the Audio Visual Reaction Time (AVRT).

Keywords: Pre-menstrual Stress, Post-menstrual stress, Premenstrual Syndrome, Reaction Time, Auditory Reaction Time (ART), Visual Reaction Time (VRT).

Introduction:

Menstrual cycle is a physiological process in which there is cyclical bleeding per vaginum in females during reproductive age ⁽¹⁾. Premenstrual syndrome is a psycho-neuro-endocrine disorder with biological and psychological components⁽²⁾. Premenstrual syndrome encompasses wide variety of cyclic, recurrent, physical and behavioral symptoms. More than 160 behavioral or emotional and neurological symptoms are reported during pre-menstrual phase ⁽³⁾ that some women experience monthly, generally 7 to 14 days before the onset of menses⁽⁴⁾. Commonly which are nervous irritability, emotional instability, anxiety, depression, outburst of anger, indecision, poor concentration, nervousness, tension, fatigue, insomnia, malaise etc. physical symptoms include headache, backache, nausea, ankle oedma, painful enlargement of breasts, weight gain, abdominal

cramps, changes in habits, abdominal bloating, mood swings, acne flare, food cravings, decreased tolerance to sensory stimuli i.e. light and noise⁽⁵⁾. Increased blood pressure have been reported during pre-menstrual phase. These symptoms can be associated with salt and water retention⁽⁶⁾. The most common amongst these changes are “cognitive alterations” like irritability, low memory, decreased focus and indecisiveness⁽⁷⁾.

Post-menstrual stress is also called Post-menstrual syndrome. It does come with a similar set of symptoms as its pre-menstrual relative and its symptoms always occur after menstruation⁽⁸⁾. The symptoms of post-menstrual syndrome can be split into two: physical and psychological. Psychological symptoms- anxiety (sometimes severe), low mood, moodiness or severe mood swings (sometimes actually feeling depressed), snappiness, impatience or irritability, anger and sometimes rage, teary or crying very easily, feeling like meltdowns are a regular occurrence, having trouble sleeping and concentrating, or noticing issues with coordination. Physical symptoms- pain is one of the physical symptoms this can include abdominal pain, joint pain, back and neck pain, vaginal discomfort including dryness, itching or burning, feeling cold (sometimes feeling extremely cold and not being able to warm up), headaches (sometimes migraines), digestive problems (particularly diarrhea), cramps^(8,9). In post-menstrual condition psychological symptoms tend to be reported more often than physical ones⁽⁸⁾.

Reaction time has a physiological significance and is a simple and non invasive test for peripheral as well as central neural structures⁽¹⁰⁾. Audio-Visual reaction time (AVRT) is the speed, with which a person can respond to an auditory stimulus and visual stimulus respectively⁽¹⁰⁾. Reaction time can be divided into three parts:-

1. **Perception Time** - the time for the application and perception of stimulus.
2. **Decision Time** – which signifies time for giving a suitable response to the stimulus.
3. **Motor Time** – which is the time for compliance to the order received⁽¹⁰⁾.

In the present study we studied, how the state of premenstrual tension affects the sensory function or sensory motor association and processing capability of central nervous system⁽¹¹⁾. This is done by measuring Visual reaction time (VRT) and Auditory reaction time (ART). The following parameters are studied here: Body Mass Index (BMI) (weight, height), Auditory reaction time (ART), Visual reaction time (VRT).

Aim:

To study the effect of pre-menstrual stress and post-menstrual stress on audio visual reaction time (AVRT) in Medical and Paramedical female students of Mahatma Gandhi Medical College & Hospital, Jaipur.

Objectives:

1. To evaluate the AVRT (Audio Visual Reaction Time) in medical and paramedical female students in Pre Menstrual period.
2. To evaluate the AVRT (Audio Visual Reaction Time) in medical and paramedical female students in Post Menstrual period.
3. To compare the AVRT (Audio Visual Reaction Time) during Pre Menstrual period and Post Menstrual period.

Material & Method:

This observational study was carried out in Dept. of Physiology of MGMCH on 50 healthy female subjects in medical and paramedical stream. The approval of medical ethics committee and informed consent from subject was obtained to conduct the study. The study group included 50 Healthy medical and paramedical female students aged 18 to 25 years, with regular menses, with pre-menstrual stress and post-menstrual stress, willingness to participate and with normal sensory and motor functions. Subjects with irregular menstrual cycle, undertaking hormonal medication,

using contraceptives (hormonal & non hormonal), untreated visual and auditory problem or hearing and visual disorder, suffering from diabetes mellitus, cardiovascular disease, tuberculosis etc., history of any neurologic, psychiatric illness, smokers and alcoholics, on any psychotic drugs or anti-anxiety drugs were excluded from the study.

Detailed record of menstrual history was noted and the pre-menstrual and post-menstrual phases were calculated as follows - 1st day of bleeding per vaginum is considered as 1st day of cycle.

Pre-menstrual phase - 1 to 7 days prior to onset of next menstruation.

Post-menstrual phase - 5th to 10th day after menstruation.

Their Anthropometric measures were taken, Body Mass Index (BMI) (kg/m^2) was then calculated. Auditory reaction time (ART) and Visual reaction time (VRT) were measured both during pre-menstrual phase on 25th day of menstrual cycle and during post-menstrual phase on 8th day of menstrual cycle by using "Research reaction time apparatus" (Yantrashilp) manufactured by Anand agencies, Pune-2, supplied by Medisystem Yamunanagar. It is a portable device with inbuilt four digit chronoscope with least count of 1/1000 sec i.e. 1 millisecond.

The subjects were instructed to avoid any kind of medication during study period and to visit the Department of Physiology, Mahatma Gandhi Medical College, Jaipur between 10 AM to 12 PM. The reaction time was noted with the subject in a comfortable position. During the Audio-Visual Reaction Time (AVRT) examination, the examiner presents the visual and auditory signal to the student. The student immediately responds by pressing an appropriate corresponding switch on her side. The time duration between the application of stimulus by examiner and registering the response from the student was taken as reaction time. A set of three recordings of visual and auditory reaction time was taken and an average of these was taken.

Observation & Result:

Table 1: Comparison of Mean \pm SD of Auditory Reaction Time (ART) in seconds between Pre Menstrual stress and Post Menstrual stress by Paired t-test:

GROUP	N=50	ART (in seconds)		t VALUE	p VALUE	REMARKS
		MEAN	STD. DEVIATION			
Pre Menstrual	0.203		0.042	3.64	<0.001	HS
Post Menstrual	0.188		0.049			

n = number of subjects in each group ART = Auditory reaction time

HS = Highly Significant

Table 1 presents the mean values of Auditory Reaction Time (ART) in seconds along with standard deviation in Pre Menstrual and Post Menstrual stress by using paired t-test.

A highly statistically significant difference ($p < 0.001$) was observed between Pre-Menstrual stress and Post-Menstrual stress.

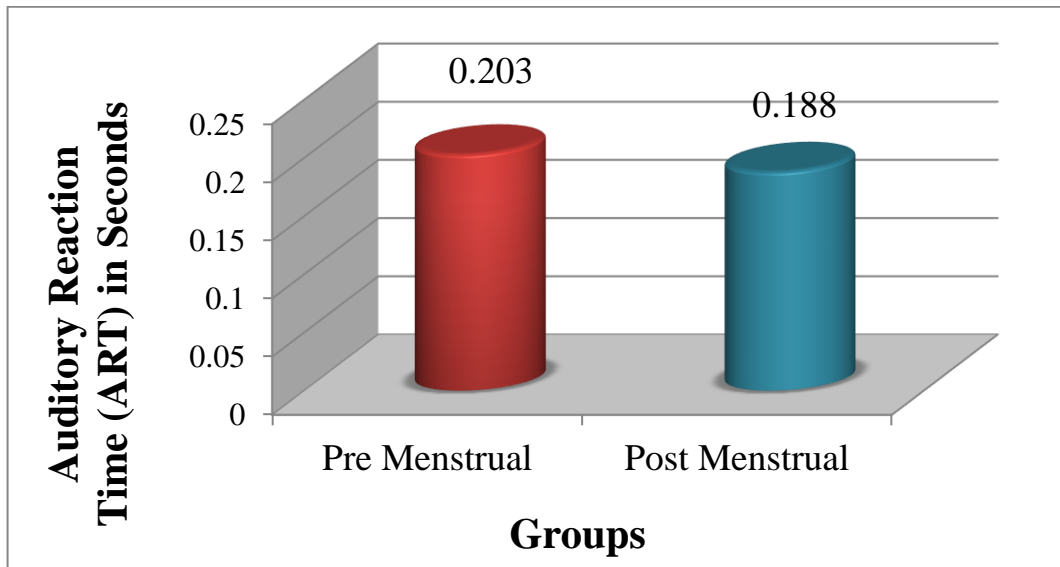


Figure 1: Mean ART (seconds)

Table 2: Comparison of Mean \pm SD of Visual Reaction Time (VRT) in seconds between Pre Menstrual stress and Post Menstrual stress by Paired t-test:

GROUP	N=50	VRT (in seconds)		T VALUE	p VALUE	REMARKS
		MEAN	STD. DEVIATION			
Pre Menstrual	0.238		0.065	3.75	<0.001	HS
Post Menstrual	0.219		0.082			

n = number of subjects in each group VRT = Visual reaction time

HS = Highly Significant

Table 2 presents the mean values of Visual Reaction Time (VRT) in seconds along with standard deviation in Pre Menstrual and Post Menstrual stress by using paired t-test.

A highly statistically significant difference ($p < 0.001$) was observed between Pre Menstrual stress and Post Menstrual stress.

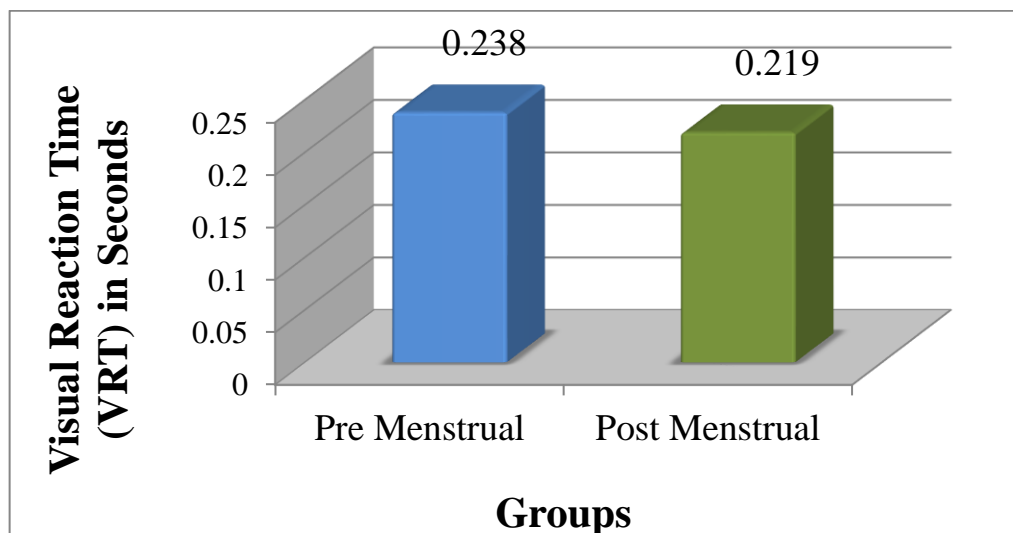


Figure 2: Mean VRT (seconds)

Discussion:

The present study also shows a significant increase in Auditory Reaction Time (ART) and Visual Reaction Time (VRT) during Pre Menstrual phase as compared to the Post Menstrual phase.

Prolongation of auditory and visual reaction time during premenstrual phase, can be explained on basis of hormonal fluctuations during premenstrual period that in turn, modulate activity of centrally acting neurotransmitters involved in the process ⁽¹²⁾.

Progesterone is the major hormone present during the premenstrual phase of menstrual cycle ⁽¹²⁾. Progesterone acts at the level of plasma membrane of selected cells by inhibiting the activation of adenylyl cyclase. Progesterone is metabolized by extra adrenal 21- hydroxylation to deoxy corticosterone, which acts by way of mineral corticosteroid receptor ⁽⁴⁾. Metabolite formed by reduction of progesterone acts in the brain as an anesthetic/anxiolytic agent by binding to 'gamma amino butyric acid - GABA' (A) receptor. GABA is an inhibitory neurotransmitter, an endogenously produced anxiolytic like compound. These metabolites are formed in women during premenstrual phase when progesterone excretion is high. These conformational changes of GABA (A) receptor after anxiolytic steroid binding increase the affinity of GABA for this receptor. GABA favors influx of chloride ions into the cells. Increased chloride entry into brain cells serves to hyperpolarize the membrane and thereby inhibits neural transmission⁽⁴⁾.

This neurotransmission inhibition affects sensory motor association and processing capability of CNS, thus prolonging reaction time during premenstrual phase ⁽¹²⁾.

Conclusion:

From the present study, it can be concluded that there was a significant increase in both auditory reaction time (ART) and visual reaction time (VRT) in female students of Pre Menstrual stress as compared to Post Menstrual stress. Visual reaction time (VRT) was more prolonged in Pre Menstrual stress as compared to Post Menstrual stress.

This suggests that state of Pre-menstrual stress changes the level of ovarian steroid hormone, causes the retention of salt and fluid, reduced velocity of nerve impulse, impaired sensory motor coordination and processing speed of central nervous system (CNS).

The present findings emphasize the consideration in neurological and behavioral assessment of women and also in designing the research protocols ⁽¹¹⁾.

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