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Effect of relaxation techniques on fatigue and headaches in premenstrual syndrome

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Abstract
Premenstrual syndrome is a common psycho-physiological stress induced condition where recurrence of physical, emotional and psychological symptoms cyclically occurring 7-10 days prior to the start of menstruation. PMS may be the ultimate stressor leading to an inability to cope for someone with an underlying affective disorder. Prevalence of PMS in India is 61.7% to 72.3%. Nausea, headaches, fatigue and bloating are some physical symptoms. Psycho-neuro-immunology researches recommend relaxation for enhancement of immune power. Relaxation techniques cause reduction and elimination of stress, fatigue and anxiety. The aim of this study was to compare the effect of Meditation with visualization and Mitchell's Relaxation Technique on Fatigue and Headaches in PMS. The participants (N=30) were divided into two groups; group A received meditation with visualization & Group B received Mitchell's Relaxation Technique. Fatigue and headache were assessed pre and post intervention using outcome measures of Global Fatigue Index (GFI) and Headache Disability Index (HDI). Data analysis was done using paired and unpaired 't' test. In Group A, pre and post intervention GFI scores were 37.128±8.16 and 27.674 ±9.362 respectively with t-value -12.73493($p < 0.01$). The pre and post intervention HDI scores were 64.67±9.5 and 45.733±9.764 respectively with t-value -16.197434($p < 0.01$). In Group B, the pre and post intervention GFI scores were 37.447±6.4893 and 19.502±5.485 respectively with t-value -15.961213($p < 0.01$). The pre and post intervention HDI scores were 59.467±6.739 and 34.933±7.44 respectively with t-value -17.19015($p < 0.01$). All the t-values are extremely statistically significant.The result showed statistically significant improvement in the Group B as compared to Group A.

Keywords: premenstrual syndrome, relaxation, fatigue, headaches, meditation, visualization

Introduction

Premenstrual syndrome (PMS) is a relatively common psycho-physiological stress induced condition in women in which there is recurrence of physical, emotional and psychological symptoms in a cyclic fashion which occur 7-10 days prior to the start of menstruation [1, 2, 3, 4]. It begins with the luteal phase of menstruation and resolves during or at the end of menstrual flow [1, 5, 6]. The term "premenstrual tension" was first coined by R. T. Frankin 1931 and "pre-menstrual syndrome" by Greene& Dalton in 1953 [4]. PMS is said to be stress-induced but thus onset of the luteal phase of menstruation causes an exacerbated psycho-physiological response of the symptoms [1, 5]. It is also said to cause evident detriment and disruption to interpersonal relationships, family, and personal functioning, social interactions, lifestyle, occupational performance, emotional well-being and overall health-related quality of life [2, 7].

The prevalence of PMS during the life span of a women with an isolated symptom is 75% to 85%, of cases that request medical assistance is 10% to 15% and of those women whose social activity is interrupted, it is 2% to 8% [8]. Prevalence of PMS in India is 61.7% to 72.3% [9]. There are more than 300 different premenstrual changes reported, out of which *headaches*, nausea, pain in breasts, *fatigue*, bloating, tension, irritability, depression, anxiety and mood swings are the most common [10, 5].

Stress causes dominance of the sympathetic nervous system [5]. PMS may be the ultimate stressor leading to an inability to cope for someone with an underlying affective disorder [4]. Even though it is believed that it is caused by the estrogen and serotonin level, it is also considered that a combination of psychological, genetic, nutritional and behavioral factors are possibly involved [5]. Decreased gonadal hormones cause decreased seratogenic activity leading to worsening of symptoms [4]. Normal cyclical ovarian function is paramount to the syndrome and abolishing it either medically by suppression of ovaries using GRH analogues or by surgical bilateral oophorectomy can provide to its cure [4, 11]. In the late luteal phase when estrogen levels have decreased, women with PMS show specific serotonin (5-HT) abnormalities [12]. It is generally agreed that there is no singular biological substrate that can be considered causative in isolation [4].

Halbreight (1996) divides pharmacological treatments into 2 categories: symptomatic treatment and ovulation suppression. Symptomatic treatment for PMS in recent years has been the use of selective serotonin re-uptake inhibitors (SSRIs). GRH agonists effectively suppress ovulation and are effective against a range of premenstrual symptoms. Ovariectomy is also curative, but such extreme irreversible surgery is rarely required. Many psychological interventions exist that are broadly subdivided into lifestyle modifications such as dietary changes, relaxation and exercise programmes, and specific therapeutic approaches such as support groups and cognitive–behavioural therapy (CBT) [4].

Unspecified headache is one of the symptoms of PMS occurring exclusively during the period prior to menstruation & is considered as a diagnostic criteria for PMS. Fragoso *et al*. (2009) had observed that PMS symptoms are seemingly the same monthly, similarly, the characteristics of the headaches were observed to be the same [3]. Physiological impairments causing muscle fatigue can be due to a number of different mechanisms, ranging from the accumulation of metabolites within muscle fibers to that of production of an inadequate motor command in the motor cortex, and also that there is no global mechanism accountable for occurrence of muscle fatigue. There is evidence that the duration of some sustained tasks are not limited by fatigue of the principal muscles [12]. Marcora *et al* (2009) has stated that mental fatigue also impairs physical performance in human beings, it being a psycho-biological state caused by prolonged periods of demanding cognitive activity and characterized by subjective feelings of tiredness and lack of energy. The effects of fatigue on cognitive performance and the skilled performance of human beings is highly extensive [13].

Relaxation therapy techniques are useful in the treatment of many conditions, are very simple and can be practiced at a beings own comfort along with no side effects. Psycho-neuro-immunology researches recommend relaxation for enhancement of immune power [1]. Due to it's effect on the sympathetic and parasympathetic nervous systems, physiologic functions such as heart rate, blood pressure, temperature, respiratory rate, muscle tension and sweating are affected. The response of relaxation techniques in the patients suffering from PMS has shown a significant decrease in the abnormally high basal sympathetic activity and a heightened relaxation response [2]. Relaxation therapy also improved emotional symptoms and social withdrawal symptoms [6]. Stress causes physical symptoms that can be alleviated by body relaxation and improve immune power [1]. These techniques cause reduction and elimination of stress, fatigue and anxiety [2]. It seems that awareness and use of various techniques improve psychological safety, alleviate stress and enhance self-confidence [14].

Although widely used, the terms *"meditation"* and *"visualization"* are often employed in a highly general sense such that its descriptive power is greatly decreased. This attention to the particularity of contemplative traditions is related to another aspect of the approach, it being strongly agreeable with our knowledge of the neurosciences. Cognitive and affective neuroscience have matured, and we now understand about the brain mechanisms that sub-serve different attentional and affective processes. Meditation with visualization techniques that target specific fundamental processes are likely to engage different neural circuitry. When actually engaged in the practice of Focused Attention, the meditator directs the mind on the object to be meditated upon. This object may be a sensory object, or the object might be mental (Thrangu, 2004; Wangchug Dorjé, 1989). To a great extent, the particular object chosen depends largely on the particular practice that forms the overall context for the development of focused attention that is pertinent to the practice of meditation with visualization [15].

Mitchell's relaxation technique is a standardized method for management of stress and is widely used especially in the field of obstetrics and gynecology [16]. Mitchell's physiological relaxation technique is founded on reciprocal inhibition and involves diaphragmatic breathing and a series of serial isotonic contractions. Laura Mitchell (1977) stated that the technique leads to postural realignment by reversing stress-related posture, being termed as 'the punching position'. This position is commonly adopted while working at a table or desk and it includes forward head, clenched jaw, rounded shoulders, bent elbows, and crossed legs. The position is thus thought to increase muscle tension, thus affecting the nervous and endocrine systems. This releases epinephrine and nor-epinephrine, which if sustained may enlarge the adrenal and lymphatic glands, consequently resulting in physical illness and death. This relaxation technique is aimed at correcting the nervous system imbalance by initiating a phenomenon known as the 'relaxation response'. This response is caused by the release of hormones, which have a widespread effect on the cardiorespiratory system [17].

Current Study

The prevalence of PMS in India is 61.7% to 72.3%. It is a disease that is affecting a majority of the women not only in India but all over the world. Stress is one of the main causes of most of these symptoms. Relaxation techniques help to cope with stress and with stress related symptoms. It is highly beneficial to a person's well-being. In order to combat stress and other problems; there have been a variety of methods developed that have been proven to reduce stress and its symptoms associated with premenstrual syndrome. Meditation with visualization and Mitchell's relaxation technique are two relaxation techniques that have been seen to be effective on normal human beings experiencing fatigue and headache. The relaxation response of these techniques reduces the body's metabolism, heart rate and breathing rate, blood pressure, muscle tension, and calms brain activity. Thus there is a need of application of these techniques so as to prove them effective in women with premenstrual syndrome suffering from fatigue and headaches. Relaxation training is a useful addition to behavioural treatment packages for PMS, but there is limited research evidence to support its use in isolation specific to fatigue and headaches. Exercise has been more rigorously studied [4]. In accordance, we have hypothesized that there will be a significant difference in the effect of relaxation techniques in terms of fatigue and headaches in premenstrual syndrome.

Methodology

Study type, subjects and inclusion criteria

The present study is a comparative interventional study. The study received approval from Institutional Ethical Committee Ref no PIMS/CPT/IEC/2018/562 of Dr. APJ Abdul Kalam College Of Physiotherapy, Pravara Institute of Medical Sciences; Loni. The data was collected by the principal investigator from the 30 normal healthy female individuals with premenstrual syndrome studying in Pravara Institute of Medical Sciences, Loni over a period of 4 months with an intervention of 3 weeks for three 10 minute sessions daily. Those who met the following criteria were included in the study: females of ages 18-26 years with regular menstrual cycles diagnosed with PMS experiencing fatigue and headaches and are co-operative. Those females with history of Polycystic Ovarian Syndrome and other conditions related to the ovary, bilateral oopherectomy, migraine, chronic fatigue syndrome, asthma, allergy and

those on oral contraceptives or hormone replacement therapy were excluded from this study. The participants were explained about the type of study benefits and hazards. Then informed written consent was obtained from the participants regarding the procedure prior to the study. The participant's name, age, height (m) and weight (kg) was entered in the data sheets accordingly. The participants were diagnosed for PMS on the basis of Daily Severity Record of Problems (DSRP) questionnaire and also the severity of their fatigue and headaches prior of their coming menstrual cycle were evaluated on the basis of Global Fatigue Index (GFI) and Headache Disability Index (HDI) respectively.

Assessment Measure

Daily Record Severity of Problems (DRSP)

Diagnostic Screening of PMS was done using Daily Record Severity of Problems (DRSP). The Daily Record of Severity of Problems (DRSP) form was developed to help in the diagnosis and evaluation of DSM-IV Premenstrual Dysphoric Disorder (PMDD). The reliability and validity of this procedure was tested in two studies. Study A included 27 subjects who ranged from having very few or no premenstrual problems as to those who met criteria for PMDD. Study B included 243 subjects, all of whom met the criteria for PMDD. Individual items and Summary Scores had a high test-retest reliability in both studies. Internal uniformity of Summary Scores was also high in both the studies. Summary Scores had a moderate to high correlation with other measures of severity of illness. Also, items and Summary Scores have shown to be sensitive to change and to treatment differences in Study B. The DRSP stipulates sensitive, reliable, and valid measures of the symptoms and impairment criteria for PMDD [18].

Outcome Measures

i) Global Fatigue Index (GFI)

Fatigue was assessed using Global Fatigue Index (GFI). The GFI is a measure that quantifies four dimensions of fatigue from the Multidimensional Assessment of Fatigue (MAF) instrument into one score. The questionnaire measures the dimensions of self reported fatigue: degree and severity, amount of distress it causes, its timing, and the degree to which fatigue interferes with ADLs. Participants are asked to reflect on their experience of fatigue for the past week. A GFI is calculated. To calculate the GFI, item 15 was converted to a 0–10 scale by multiplying each score by 2.5. Mean scores for Severity, Interference in ADLs, and Timing (items 4-14) were also calculated. Then the items 1,2, and 3, the average of items 4–14, and the newly scored item 15 were summed up. Item 16 is not used in the GFI. No score is assigned to items if participant indicates they "do not do any activity for reasons other than fatigue." For GFI, score range is 1–50 (1 =no fatigue, 50 =severe fatigue). Higher scores indicate more severe fatigue, fatigue distress, or interference with ADLs. The GFI was found to be easily self-administered, reliable, and a valid measure of overall fatigue burden. This instrument may be used by clinicians and researchers for assessing fatigue [20].

ii) Headache Disability Index (HDI)

Headaches was assessed using Headache Disability Index (HDI). To quantify the impact headaches have on daily living the HDI was self-administered by the participants. The HDI consists of 25 items each requiring a "yes" (4 points) "sometimes" (2 points) or "no" (0 points) response based on items derived empirically from case history responses from subjects with headache. This index has been reported in the headache literature as a criterion standard measure for disability in patients with headache. For HDI, the score range is 0-100% (10% to28%-mild disability, 30% to 48%-moderate disability, 50% to 68% -severe disability and ≧78% - complete disability). A total score change of at least 29 points is necessary for effects of any treatment to be considered clinically significant. Emotional and functional sub-scales are contained within the inventory. The 25-item Headache Disability Index has good internal consistency reliability(0.89), robust long-term (2 month) test-retest stability(0.83), and good construct validity. The short-term test-retest reliability of the Headache Disability Inventory was excellent [21].

Intervention Procedure

The 30 subjects were then divided in two groups i.e. Group A and Group B of 15 participants each. The participants in Group A were given Meditation with Visualization and group B were given Mitchell's Relaxation Technique. Both the groups received verbal instructions for the first two days of treatment after which they self-practiced the techniques for the remainder of the period.

The group A i.e. Meditation with Visualization

The participants were told to relax in a position comfortable to them (sitting, reclined or supine-lying) and were engaged in deep breathing with their eyes closed at a comfortable rate. They were told to perform an imagery task, such as that of recalling a pleasant occasion, scenery, object or concentrating on a pleasant repetitive sequence (e.g. song, prayer) for 5-10 minutes. It was prescribed for the 10 days prior to the assumptive next menstrual cycle to be self-practiced in the morning after waking up, midday and just before going to sleep.

The group B i.e. Mitchell's Method Relaxation Technique

This technique involves getting to know and understanding the muscles and how they are able to create tension within your body. It involves stretching and then relaxing of the different muscle groups. In the beginning the participant works through the whole sequence of commands. This helped the participants in identifying the parts of their body that seemingly contained the most tension and the parts that they felt the most relief from. The participant begins by lying down or sitting on a comfortable and supportive surface with their head supported by pillows.

When practicing this technique the participant had to make sure they could feel the stretch but not feel painful. They kept each of the muscles stretched for around 5 seconds. When they relaxed the muscle, they kept it relaxed for a slow count to 10. They focused on the difference between how the muscle felt before they stretched it and how it felt after they had let it go. They stretched and relaxed each muscle twice before having to move onto the next one. The following are the commands that the participants followed.

1. **Shoulders.** Pull your shoulders down towards your feet and hold them for a count to 5 and then release for a count to 10. Feel the new position of your muscles as you release them.
2. **Elbows.** Stretch your elbows so that your arms

straighten out and hold them for a count to 5 and then release them for a count to 10. Feel the new position of your muscles as you release them.

3. **Hands.** Stretch your fingers out straight. Hold for a count to 5 and then release for a count to 10. Feel the new position of your muscles as you release them.
4. **Trunk.** Push your trunk into the bed or chair so that your body makes contact with the chair or bed**.** Let it go and release your muscles. Feel the new position of your body as you release the muscles. Feel that your body is completely supported by the chair and body and your muscles aren't having to tighten to support yourself.
5. **Thighs.** Roll your thighs away from one another and hold for a count to 5 and then let them go. Feel the new position of your muscles as you release them.
6. **Calves.** Pull your toes and ankles up so the back of your calves are stretched. Hold them for a count to 5 and then let them go. Feel the new position of your muscles as you release them.
7. **Eyes.** Close your eyes but raise your eyebrows up as far as they will go. Feel the tightness in the muscles in your forehead for a count of 5. Then just let them go. Feel the new position of your muscles as you release them.
8. **Mouth and jaw.** Keep your lips lightly together but keep your teeth part and make sure that your tongue is dangling in the middle of your mouth. Feel the difference in your mouth and cheek muscles as you are doing this.
9. **Breathing.** Focus on your breathing and make sure it is relaxed. Now breathe in deeply to the count of 3 thus allowing your stomach to expand and then breathe out slowly to a count of 6. Do this once more and then return to your relaxed breathing pattern. With each breath feel yourself relaxing further down into the surface you are resting against [16, 17].

It was prescribed for the 10 days prior to the assumptive next menstrual cycle to be self-practiced in the morning after waking up, midday and just before going to sleep.

On the first day of menses post the treatment, the severity of the fatigue and headaches was evaluated by the outcome measures Global Fatigue Index (GFI) and Headache Disability Index (HDI). Then effect of meditation with visualization and Mitchell's method of relaxation technique on fatigue and headache were compared.

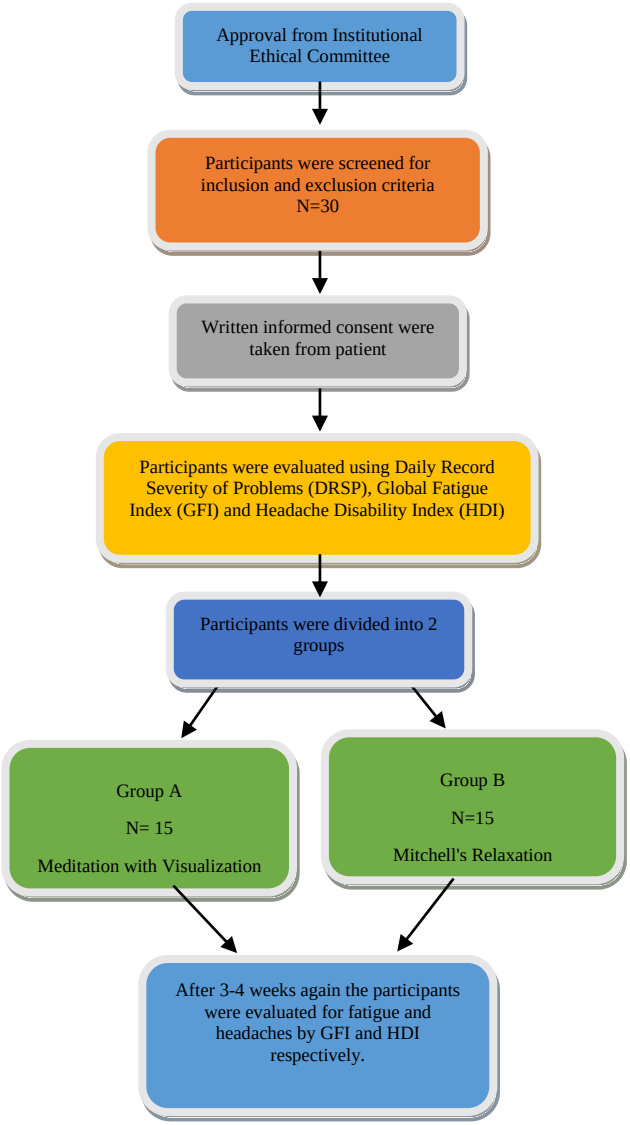


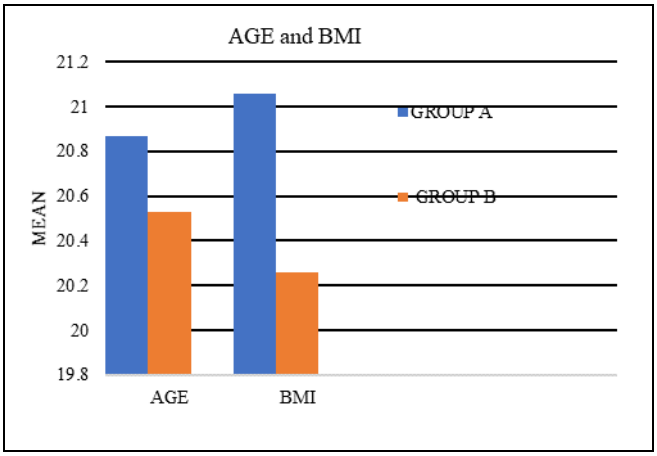
Fig 1

Statistical Data Analysis and Results

The data was coded and entered into Microsoft Excel spreadsheet. Analysis was done using INSTAT demo version. Data was collected and presented in tabular form and analysed by using the Unpaired and paired "t" test to compare mean values. Both the groups were homogeneous with respect to age and BMI.

Table 1: Demographic profile of all participants

Demographic Characteristics				
Group	**No. of participants**	**Gender**	**Age (mean±sd)**	**Bmi (mean±sd)**
GROUP A	15	All Females	20.86±1.45	20.06±3.79
GROUP B	15	All Females	20.53±1.45	20.25±3.23

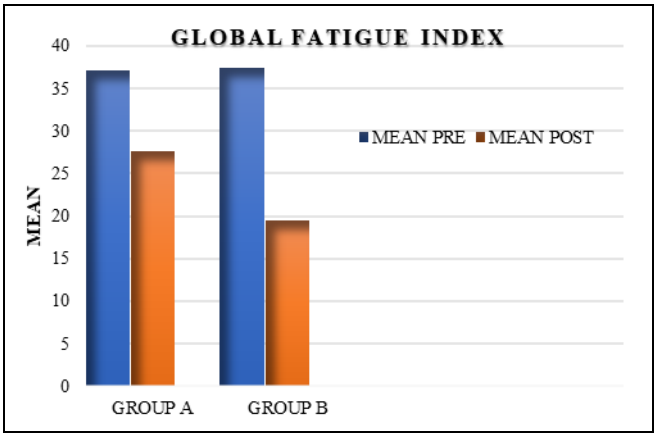


Graph 1: Represents comparison of mean age and BMI in Group A and Group B.

Comparison of Pre and Post Intervention of Global Fatigue Index of Group A and Group B

Table 2: Comparison of mean in pre and post intervention of Global Fatigue Index of Group A and Group B.

Global Fatigue Index					
Mean±SD	**Pre**	**Post**	**P value**	**T value**	**Result**
GROUP A	37.13±8.15	27.67±9.36	<0.01	-12.73493	Extremely Significant
GROUP B	37.45±6.48	19.50±5.48	<0.01	-15.961213	Extremely Significant



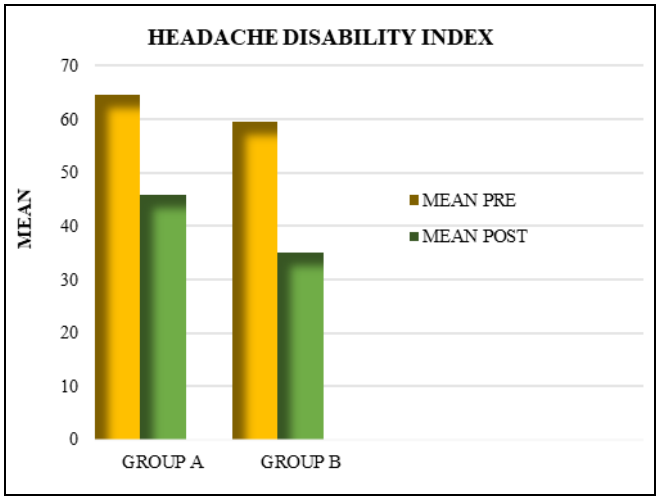
Graph 2: Represents comparison of mean of pre and post of Global Fatigue Index of Group A and Group B.

The comparison of mean in pre and post using Global Fatigue Index of Group A where t value is -12.73493 and p value <0.01 and comparison of mean in pre and post using Global Fatigue Index of Group B where t value is -15.961213 and p value <0.01 are extremely statistically significant using paired 't' test. They show that both the intervention were effective in decreasing the severity of fatigue.

Comparison of Pre and Post Intervention of Headache Disability Index of Group A and Group B

Table 3: Comparison of mean of pre and post intervention of Headache Disability Index of Group A

Headache Disability Index					
Mean±SD	**Pre**	**Post**	**P value**	**T value**	**Result**
GROUP A	64.67±9.49	45.73±9.76	<0.01	-16.197434	Extremely Significant
GROUP B	59.47±6.73	34.93±7.43	<0.01	-17.19015	Extremely Significant



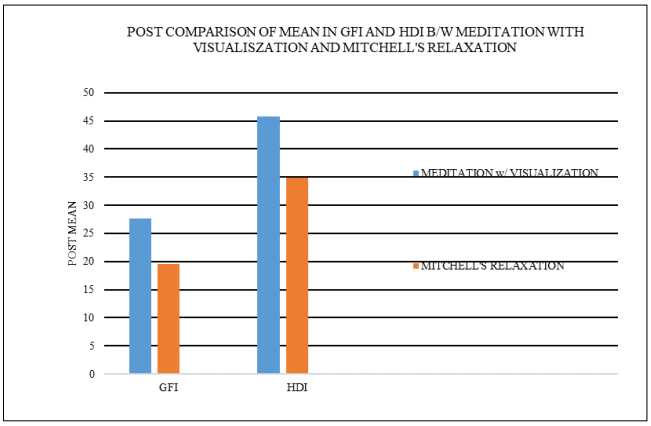
Graph 3: Represents comparison of mean of pre and post of Headache Disability Index of Group A and Group B.

The comparison of mean in pre and post using Headache Disability Index of Group A where t value is -16.197434 and p value <0.01 and the comparison of mean in pre and post using Headache Disability Index of Group B where t value is -17.19015 and p value <0.01 are extremely statistically significant using paired 't' test. They show that both the intervention were effective in decreasing the severity of headache.

Comparison of Group A and Group B-Post Intervention

Table 4: Comparison of mean in post intervention between Meditation with Visualization and Mitchell's Relaxation Technique using GFI and HDI using unpaired 't' test.

Mean±SD	**Meditation With Visualization**	**Mitchell's Relaxation Technique**	**P value**	**T value**	**Result**
GFI	27.67±7.64	19.5±6.67	<0.01	2.91667	Extremely Significant
HDI	45.73±9.76	34.93±7.43	<0.01	3.40727	Extremely Significant



Graph 4: Represents comparison of mean in post intervention between Meditation with visualization and Mitchell's Relaxation Technique using Global Fatigue Index.

The comparison of mean in post between Meditation with Visualization and Mitchell's Relaxation Technique using Global Fatigue Index where t value is 2.91667 and p value 0.01 and the comparison of mean in post between Meditation with Visualization and Mitchell's Relaxation Technique using Headache Disability Index using HDI where t value is 3.40727 and p value <0.01 are extremely statistically significant using unpaired 't' test. They show that Mitchell's relaxation technique was more effective compared to that of meditation with visualization in terms of fatigue and headaches in premenstrual syndrome.

Discussion

The present study "Effect of Relaxation Techniques on Fatigue and Headaches in Premenstrual Syndrome" was conducted with the main purpose of finding out the effect of Meditation with Visualization and Mitchell's Relaxation Technique on fatigue and headaches in premenstrual syndrome (PMS). In this study 15 participants were given Meditation with Visualization and the other 15 participants were given Mitchell's Relaxation Technique. The result was that Mitchell's Relaxation Technique was more effective in reducing the severity of fatigue and headaches in premenstrual syndrome in individuals as compared to that of meditation with visualization.

Meditation with visualization techniques target specific fundamental processes that engage different neural circuitry. Studies done by Thrangu (2004) and Wangchug Dorjé (1989) showed that when actually engaged in the practice of focused attention, the meditator directs the mind on the object to be meditated upon. The object may sensory, such as an object visible to the meditator, or mental, such as a visualized image. The particular object chosen depends mostly on the particular practice that forms the overall context for the development of focused attention that is pertinent to the practice of meditation with visualization.[15]

A study done by Morone *et al* (2009) proved the supportive effect of meditation with visualization on the reduction of pain and improvement of physical function in participants suffering from chronic low back pain [25]. A study by Boellinghaus *et al* (2014) has also shown that visualization and meditation reduces the chances of empathetic distress fatigue and burnout, and maintains well-being in health care professionals [26]. Richard J. Davidson and Bruce S. McEwen (2012) have stated that interventions such as that of meditation along with visualization are explicitly designed to encourage positive emotive qualities such as kindness and mindfulness implying that these qualities are best be regarded as the outcome of skills that are increased through training. They improve self-control which are apparent in social and interpersonal contexts thus strengthening attention and executive function [27].

The physiological changes induced by Mitchell's technique are due to diaphragmatic breathing affecting the sympathetic nervous system, and also isotonic contractions reducing muscle tension. Changes in the muscle tension with Mitchell's technique have also been assessed using electromyography. The gentle isotonic muscle contractions elicit the relaxation response and thus a decreased heart rate. A study by Jackson (1991) measured the frontalis muscle of four rheumatoid arthritis patients trained in the Mitchell method and compared this with untrained controls obtaining positive results. Reductions in heart rate between baseline and pre-intervention measurements within each group is explained by the body's reduced oxygen consumption in supine lying. A study by Marieb (1995) stated that at rest, oxygen consumption decreases drastically, accompanied by reductions in carbon dioxide elimination. Wallace and Benson (1972) in their research have also reported decreases in respiratory rate and oxygen consumption associated with parasympathetic activity at rest. Due to the use of a standardized supine acclimatization period, heart rate reductions in the Mitchell's relaxation groups can be attributed to the relaxation techniques. This was confirmed because no significant differences in heart rate were found between pre- and post-intervention measurements in the control group [17].

A study by Soheir M.A. El Kosery *et al* on the effect of Mitchell's simple physiological relaxation technique in alleviating pain and tension of primary dysmenorrhea concluded that the relaxation technique showed highly significant decrease in pain intensity, pulse rate, respiratory rate and T.G. MYO feed back 420v. Thus, it was effective, non invasive, risk-free, cheap, easy to perform and successful treatment method in decreasing pain and tension of primary dysmenorrhea [24].

The present study showed that the intervention given to both the groups was effective irrespective in terms of reduction of the severity of fatigue and headaches, irrespective of the treatment received. However, Mitchell's Method Relaxation Technique showed more significant improvement as compared to the Meditation with Visualization group in overall outcomes.

As seen in the present study, Mitchell's Method Relaxation Technique can be a much more useful intervention as compared to that of meditation with visualization for reducing the severity of fatigue and headaches in premenstrual syndrome in individuals with a history of it affecting their daily lifestyle.

The present study concluded that there is significant effect of Mitchell's Method Relaxation Technique compared to that of Meditation with visualization in reducing the severity of fatigue and headaches in premenstrual syndrome in individuals.

Conclusions

The present study showed that both meditation with visualization and Mitchell's relaxation technique were effective in reducing the severity of fatigue and headaches in premenstrual syndrome. It was also chiefly concluded

that there is significant effect of Mitchell's Method Relaxation Technique compared to that of Meditation with visualization in reducing the severity of fatigue and headaches in premenstrual syndrome in individuals.

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