

ORIGINAL RESEARCH

Effects of Yoga on Quality of Sleep of Women With Premenstrual Syndrome

Ghafoureh Ghaffarilaleh, MSc; Vahid Ghaffarilaleh, PhD; Zeinab Sanamno, MSc; Mahin Kamalifard, MSc; Leila Alibaf, MSc

ABSTRACT

Objective • Women with premenstrual syndrome (PMS) commonly complain of sleep disturbances, specifically in the luteal phase of the menstrual cycle. Therefore, the effects of yoga on quality of sleep of women experiencing PMS was investigated.

Material and Methods • Women (aged 20-45 y) monitored for PMS, who were referred to the private obstetrics and gynecology clinics in Tabriz, Iran, were referred to the private obstetrics and gynecology clinics in Tabriz, Iran. Afterward, 62 women, were selected and divided into 2 groups, randomly: 31 subjects in yoga the yoga group and 31 in the control group. Subjects in yoga performed for 10 wk in 3 sessions, with each session lasting 60 min. Subjects in the control group did not perform any yoga. Subjects completed a demographic questionnaire and the

Pittsburgh sleep quality index questionnaire before and after yoga in both groups.

Results • After yoga intervention, subjects significantly expressed improvement in sleeping ($P < .05$). Based on the Mann-Whitney U test, a significant difference was observed in the subdomains of both groups on quality of sleep ($P < .01$), sleep latency ($P < .01$), and sleep efficiency ($P < .05$).

Conclusion • Yoga reduced the disturbances of sleep in the subjects with PMS, which subsequently improved the efficiency of their sleep. Therefore, we conclude that yoga can be prescribed for improving sleep disturbances in women with PMS and medical therapy will probably be needed in severe situations. (*Altern Ther Health Med*. [E-pub ahead of print.]

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Yoga is about connection of the mind, body, emotions, logic, and attention to action. Yoga is structured from physical, breathing, and mental exercises, which improve health and relaxation and increase positive awareness. Doing stretching exercises in yoga with deep breathing and meditation strengthens muscles, consequently protecting the spine and joints of the body.¹ Yoga affects physical and mental health functions through negative regulation of the hypothalamic-pituitary-adrenal axis in association with the sympathetic nervous system. Yoga regulates the secretion of cortisol, glucose, and plasma's renin, epinephrine, and norepinephrine in the bloodstream, affecting vagal nerves, which are responsible for body functions.² In addition, yoga reduces negative effects of stress on the immune system by positively regulating the levels of immunoglobulin A.³

Menstruating women at reproductive age commonly experience poor quality of sleep with higher sleep disturbance during the premenstrual week than during other times of the menstrual cycle due decreasing concentrations of progesterone (P4) and oestrogen.^{4,5} Research has shown that

women with premenstrual syndrome (PMS) report more sleep difficulties and are at higher risk of insomnia compared with men.⁶ Women with PMS report insomnia and excessive daytime sleepiness at least twice as much as other women.⁷ Women also report other sleep-related complaints experienced during the menstrual cycle, such as frequent awakenings, disturbing dreams, difficulty initiating sleep after an arousal, sleepiness, fatigue, lethargy, decreased alertness, and poor concentration.⁸

Several remedies such as selective serotonin reuptake inhibitors,⁹ fluoxetine,¹⁰ and sertraline¹¹ are currently being used to decrease the symptoms of PMS. Prescribed medications such as alprazolam, P4, fluoxetine, and gonadotropin-releasing hormone have shown side effects (eg, exhaustion, insomnia, headaches, menstrual dysfunction, decreased sexual ability, nausea, and vomiting) in women.^{4,12-14}

Recently, yoga has been considered to be beneficial to women with PMS; for instance, women practicing yoga reported that they have used significantly less analgesics during their menstruation, and the severity of their pain was decreased, or there were improvements on the scale of body function and pain according to the short-form 36 questionnaire, in addition to reduced abdominal swelling, breast tenderness, abdominal cramps, and cold sweats.¹⁵ In another study, women with PMS decreased water retention by only practicing yoga in the luteal phase.¹⁶ Furthermore, in another study, the alpha brain wave percentage was increased as a consequence of yoga practice in the PMS group, suggesting that subjects felt calmer with a peaceful mental condition.¹⁷ Tai chi exercise, a fairly safe aerobic exercise in older populations, has been shown to improve sleep quality using the global Pittsburgh sleep quality index (PSQI) questionnaire, considering its subdomains (sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, and daytime dysfunction).¹⁸ Yoga also affects harmful secretions negatively in the body and provides a comfortable life for women suffering from common menstrual pains such as cramps.¹⁹⁻²¹

Recently, we have shown that yoga significantly relieves PMS symptoms and affects emotional, physical, and behavioral variables after practicing yoga, which implies that yoga should be considered for treating of PMS.²² Currently, there is not enough information to explain precisely the mechanism action,² but it is apparent that yoga might be effective in treating sleep disturbances. So far, there is no published scientific study using yoga on quality of sleep in women with PMS, and no sufficient data exists on the side effects related to yoga practices in patients with PMS.²³ It is, therefore, imperative that we investigate possible complementary and alternative treatment regimens that would not only alleviate causes of PMS symptoms such as sleep disturbances, but also contribute to potential improvements in quality of life.

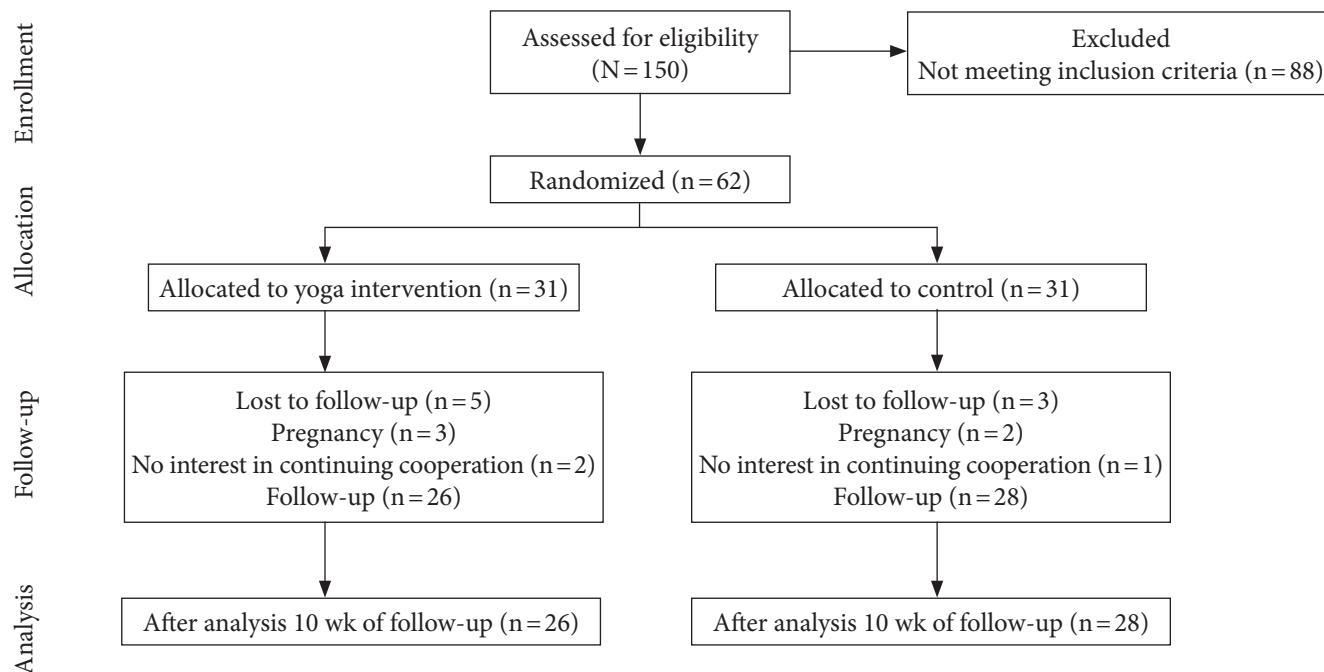
MATERIALS AND METHODS

After approval of the proposal by the ethics committee of the Medical Science University of Tabriz (No. 93184) and submission in Iranian Registry of Clinical Trials (No. IRCT201501216582N9), a list of private obstetrics and gynecology clinics were provided from the Governmental Treatment Organization in Tabriz, Iran. Then, through the random numbers table, 20 of the private clinics were randomly selected. Afterward, a controlled, randomized clinical trial was conducted from April 2015 to October of 2015 on 62 women with PMS referred to the private clinics. At the first step of dealing with subjects, the purpose of the study and eligible criteria were explained; then, 150 people with chief complaints of PMS were selected. We considered special eligibility criteria as follows: (1) the women's age (20-45 y old), (2) diagnosis as a PMS subject according to the results provided by using Premenstrual Symptoms Screening Tool (PSST) questionnaire, (3) having regular menstrual cycles, (4) being nonathletic for a duration of 3 months, (5) being under no treatment by chemical or herbal medications or oral contraceptives, (6) having no depression and genital tract diseases, (7) no alcohol utilization or smoking cigarettes, (8) not being a tobacco or illicit drugs user, (9) having no joint diseases, (10) having no rheumatoid arthritis or surgeries that could affect yoga, (11) not being a caffeine user, and (12) being willing to participate in the study. The exclusion criteria were unwillingness to participate in the study or becoming pregnant during study and having experiences in exercising yoga. Names, phone numbers, and addresses of the subjects were recorded. Subjects were asked to complete the PSQI questionnaire and a demographic questionnaire before and after intervention. Researchers always were available to clarify any question among the subjects.

Based on the research by Kanojia et al,²⁴ the sample size was calculated with a confidence interval of 95% and a power of 80% for 26 cases for the yoga group (-17.50 ± 12.43) and 26 cases for the control group (-0.65 ± 27.54). A 20% dropout was considered in cases in which the number of the subjects calculated was 31 per group. The allocation was performed randomly for the yoga and control groups in the form of 4 and 6 blocks. To ensure allocation blindness, authors used opaque envelopes containing the names of groups, which were labeled with numbers. The envelopes were prepared by a noninvolved researcher. The first subject received the first envelope. Before allocation, the researcher or subject were not aware of allocation results. The researcher and analyzer remained unaware until the end of the study. In total, 62 subjects were considered and assigned to 2 groups, with 31 subjects in the yoga group and 31 in the control group (Figure 1).

A coach with a valid certification in yoga worked with the yoga group for 10 weeks in 3 sessions for 60 minutes per week. The first 2 weeks of yoga was only for physiological adaptations.²⁵⁻²⁷ A form of Hatha yoga as a style was considered for subjects to practice, which was prepared by a

Figure 1. Flow Diagram



Note: Flow diagram depicts progress through the phases of a parallel randomized trial of yoga and control groups (ie, enrollment, intervention allocation, follow-up, and data analysis).

skilled coach from the federation of East Azerbaijan, Iran (Tables 1, 2, 3, and 4). Subjects continued yoga for 10 weeks.

Researchers were in contact with subjects phone. The first call was 30 days after admission to the study, and the second call was after finishing intervention in the yoga group. The aim of calls was following requirements for the study and reminding participants to fill out the questionnaires, asking about probably using or having used medications and filling out the PSQI questionnaire at the end.

The PSQI questionnaire is used for evaluation of sleep disturbances for the last month of the menstrual cycle. Response duration in answering the questions was approximately 5 minutes. The PSQI questionnaire includes 18 questions and has 7 categories: quality of sleep, sleep latency, sleep duration, sleep efficiency, sleep disturbance, use of sleep medications, and daytime dysfunction. Answers were scored from 0 to 3, in which 0 was normal, subacute, and intermediate, and 3 was severe. Total score was from 0 to 21; a higher score implies poor quality of sleep and scores less than 5 indicate high quality of sleep.²⁸ The data collection tools were 2 demographic surveys and PSQI questionnaires²⁹ (adopted to the Iranian society and is in Persian language). The demographic questionnaire consisted of questions regarding age, education level, marital status, and menstrual cycle. Validity of PSQI questionnaire is evaluated through content validity by Malekzadegan et al.²⁹ In studies by Malekzadegan et al²⁹ and Taavoni et al³⁰ using test-retest reliability, the correlation coefficient was reported as $r=0.84$ and by Baghaei et al,³¹ and for quality of sleep, the value was $r=0.89$.

Table 1. Preparation Movements for the Yoga Exercises for the First 2 Weeks of the Study Period

Yoga	Time (min)	Description
1. Savasana	5	Relaxation and breathing practices
2. Pawanmuktasana	1	Flip-flop pose, very slow and without pressure
3. Eka Padottanasana	4	Stretch the legs
4. Pawanmuktasana	1	Take the proximal of legs and move on the vertebrae of the spine, especially in the thighs and the back of the jaw
5. Marjariasana	3	The cat poses, a bit deep and slow breathing
6. Vajrasana	2	Kneeling pose, sitting back onto your knees
7. Adho Mukhasavasana	1	Mountain pose = downward-facing dog
8. Urdhvamukhasvanasana	3	Upward-facing dog pose
9. Vajrasana + Balasana	2	Sitting on both knees and dropping the body
10. Repeat steps 1, 2 and 3	5	-
11. Supta Padangusthasana	2	Reclining hand-to-big-toe pose, being on 1 leg stretched out and take in; it is better in this pose to use the belt and brick
13. Padangusthasana	3	Take 1 foot in the opposite hand
14. Pawanmuktasana	1	Flip-flop pose
15. Bhujang Asana	2	Cobra pose
16. Surya Namaskar	15	Sun salutation pose
17. Savasana	10	Relaxation for 10 to 15 min

Table 2. Yoga for the Third and Fourth Weeks of the Study Period

Yoga	Time (min)	Description
1. Savasana	5	Relaxation and breathing practices
2. Surya Namaskar	15	Full cycle of sun salutation
3. Tadasana pose	1	Stretching the whole body
4. Ardha Chakr Asana	1	Pull the sides
5. Trikonasana	3	Three-corner or 3-angles pose, which is often called the triangle posture
6. Ardha Matsyendrasana	2	Sitting half spinal twist poses
7. Paschimottan Asana	2	Seated forward bend pose
8. Matsyasana	1	Fish pose
9. Viparita Karani	1	Legs up the wall pose
10. Hala Asana	1	Plow pose
11. Urdhva Mukha Svanasana	2	Upward-facing dog
12. Adho Mukha Svanasana	2	Downward-facing dog
13. Balasana	2	The situation of children and drop body
14. Bhujang Asana	2	Cobra pose
15. Supta Padangusthasana pose	6	Holding legs; it is better in this pose to use the belt and brick
16. Pawanmuktasana	1	Flip-flop pose
17. Bhujang Asana	2	Cobra pose
18. Pawanmuktasana	1	Flip-flop pose
19. Savasana	10	Relaxation

Table 3. Yoga for the Fifth and Sixth Weeks of the Study Period

Yoga	Time (min)	Description
1. Savasana	5	Relaxation and breathing practices
2. Pawanmuktasana	10	Flip-flop pose, very relaxed and without pressure
3. Eka Padottanasana	5	Stretching the legs
4. Pawanmuktasana	2	Strengthens the lower back muscles and loosens the spinal vertebrae
5. Marjariasana	4	The cat poses with slow breathing
6. Urdhva Mukha Svanasana	2	Dog head-up pose
7. Adho Mukha Svanasana	2	Downward-facing dog
8. Balasana	1	Baby pose and releasing the body, the bow and the heels
9. Bhujangasana + Kurmasana	4	Cobra pose + turtle
10. Repeat steps 1 and 3	7	-
11. Two Supta Padangusthasana poses	3	Take 1 foot in the opposite hand
12. Setu Banda Sarvangasana pose	2	You can use a brick for doing this pose
13. Urdhvamukhasvanasana	2	Upward-facing dog
14. Pawanmuktasana	1	Flip-flop pose
15. Savasana poses	10	Relaxation

Table 4. Yoga for the Seventh, Eighth, Ninth, and 10th Weeks of the Study Period

Yoga	Time (min)	Descriptions
1. Savasana	5	Relaxation and breathing practices
2. Surya Namaskar	15	Sun salutation, very slow and soft
3. Pawanmuktasana	5	Flip-flop pose
4. Marjariasana	3	Cat poses
5. Vajrasana pose	1	Kneeling pose, involves siting back onto your knees
6. Balasana + Baddha Konasana	2	The cobbler pose or butterfly pose
7. Urdhva Mukha Svanasana	2	Upward-facing dog
8. Tadasana	3	Downward-facing dog or mountain pose
9. Balasana + Kurmasana	1	Baby pose + turtle
10. Bhujang Asana	5	Cobra pose
11. Setu Banda Sarvangasana	2	Bridge pose
12. Jhulana Lurhakan Asana	1	Flip-flop pose
13. Supta Padangusthasana pose	2	Sleeping big toe pose
14. Bhastrika Pranayama	3	Blacksmith's bellows
15. Savasana	10	Relaxation

Normality of data collected from questionnaires before and after intervention in yoga group was evaluated using a K-S statistical test and was confirmed. The intention to treat (ITT) was applied (87% of ITT: yoga, n = 26; control, n = 28; total = 54). The total score of the quality of sleep was normal but the domains of the quality of sleep was not normal. The data collected from variables are summarized in frequencies and percentages, where quantitative variables are summarized by mean ± SD. χ^2 and a Student *t* test were used to compare the basic and demographic variables. A paired *t* test was used for within-group comparisons. The analysis of covariance (ANCOVA) was used for comparison of the effect of the intervention on groups and the adjustments on baseline measurements as well as potential confounders. The Mann-Whitney *U* test was used to compare quality of sleep scores of subdomains. Statistical analysis was carried out using IBM SPSS statistic for windows, version 23.0 (IBM Corp, Armonk, NY, USA).

RESULTS

Of the 150 women assessed for eligibility, 62 women were randomized to the yoga group (31 subjects) and control group (31 subjects), with blocks 4 and 6. Some of the subjects were excluded from study because of being pregnant (3 in the yoga group and 2 in the control group) or unwillingness to be further involved in the study (2 in the yoga group and 1 in the control group) (Figure 1).

Comparisons for demographic characteristics of participants in each group are provided in Table 5. The job

statement was significantly different for yoga and control groups ($P < .033$), whereas marital status, number of children, education statement, and body mass index were not. The mean \pm SD for age, for both the yoga and control groups, were 34.4 ± 5.3 and 30.1 ± 6.2 , respectively (Table 5). Both groups had similar means in terms of demographic characteristics, except employment status and age (Table 5). The quality of sleep was not significant before intervention in both the control and yoga groups. However, it was significant after intervention analyzed by ANCOVA and t test paired samples ($P < .05$) (Table 6).

Based on the Mann-Whitney U test, the quality of sleep was not different in the subdomains of the yoga and control groups before intervention (Table 7). However, after intervention, a statistically significant difference existed in subdomains of the yoga group compare with the control group in the quality of sleep ($P < .01$), sleep latency ($P < .01$). and sleep efficiency ($P < .05$). In the rest of the subdomains of both the yoga and control groups, there was not significant difference (Table 7).

Data from the PSQI questionnaire showed that the following items in the yoga group after exercise significantly improved ($P < .05$): how long (in minutes) it took for participants to fall asleep each night, how many hours of actual sleep participants had, how much of a problem it was for participant to maintain enthusiasm to get things done and during the past month, and how participants rated quality of sleep overall. Regarding how often have participants had trouble sleeping in the past month, subjects from the yoga group expressed significant improvements after yoga intervention. Ability to fall asleep within 30 minutes, needing to get up to use the bathroom, feeling too cold, and having bad dreams were significant as well ($P < .05$). However, the question about waking up in the middle of the night or early morning and feeling too hot were significant in the control group ($P < .05$) (Tables 8 and 9).

DISCUSSION

The present study has shown that 3-month yoga-based interventions significantly improved the quality of sleep in women with PMS.

Studies on women with PMS have indicated problems with bed time, quality of sleep, sleep onset latency, sleep maintenance, and wake up time that occurs during the menstrual phase.³² Yoga has been shown to affect quality of sleep in women in menopausal transition,³³ older women with restless leg syndrome,³⁴ women with rheumatoid arthritis,^{35,36} women with osteoarthritis,³⁷ prenatal women,³⁸ and women with chronic insomnia.³⁹ In agreement with similar earlier studies, the results of the current study confirm significant beneficial effects of exercising yoga for 3 months in total quality of sleep.

Table 5. Comparison of Demographic Characteristics of the Subjects in the Yoga and Control Groups

Variables		Control n (%)	Yoga n (%)	P Value ^a
Job statement	Housekeeper	4 (14.3)	11 (42.3)	.033
	Practitioner	24 (85.7)	15 (57.7)	
Marital status	Single	11 (39.3)	12 (46.2)	.574
	Married	15 (53.6)	14 (53.8)	
	Divorced	2 (7.1)	0 (0)	
Number of children	0	16 (57.1)	15 (57.7)	.642
	1	9 (32.1)	6 (23.1)	
	2	3 (10.7)	5 (19.2)	
Education statement	Diploma	5 (17.9)	3 (11.5)	.473
	Associate degree	3 (10.7)	1 (3.8)	
	Bachelor	18 (64.3)	17 (65.4)	
	Master	2 (7.1)	5 (19.2)	
BMI	≤ 25	20 (74.1)	15 (57.7)	.399
	25.1-30	5 (18.5)	9 (34.6)	
	30.1<	2 (7.4)	2 (7.7)	
Variables		Control (Mean \pm SD)	Yoga (Mean \pm SD)	P Value ^b
Reproductive status	Age of first period (y)	13.357 \pm 1.747	13.115 \pm 1.306	.570
	Age (y)	30.179 \pm 6.290	34.462 \pm 5.368	.010
	Period Time (d)	28.821 \pm 2.539	29.923 \pm 2.799	.135
	Period duration (d)	6.214 \pm 1.371	6.692 \pm 2.074	.319

^a P value was obtained from χ^2 tests.

^b P value based on independent t test.

Abbreviations: BMI, body mass index; SD, standard deviation.

Table 6. Comparison of the Total Score of Sleep Quality Before and After the Yoga Intervention for the Yoga and Control Groups

Variable	Time	Yoga Group	Control Group	P Value ^a
		Mean \pm SD	Mean \pm SD	
Score of sleep quality	Before intervention	5.91 \pm 3.235	6.77 \pm 2.266	.126
	After intervention	2.77 \pm 1.51	6.27 \pm 2.931	.001
	P value ^b	.001	.448	

^a P value based on ANCOVA test.

^b P values based on t test paired samples test. The overall score of 5 and higher from 0 to 21 represent a sleep disorder. Age and occupation were confounding variables.

Abbreviations: SD, standard deviation; ANVOCA, analysis of covariance.

Table 7. Subdomain Sleep Quality Scores Before Yoga Intervention for the Yoga and Control Groups

Variable	Before Intervention			After Intervention		
	Control	Yoga	P Value ^a	Control	Yoga	P Value ^a
	Quartile (75 to 25)	Average		Quartile (75 to 25)	Average	
Subjective sleep quality (0-3)	1 (2 to 1)	1 (1 to 1)	.091	1 (2 to 1)	0 (1 to 0)	.000
Sleep latency (0-6)	1 (0.2 to 25)	1 (1 to 0)	.089	1 (2 to 1)	02 (0 to 0)	.000
Sleep duration (0-3)	1 (2 to 1)	1 (2 to 0)	.271	1 (2 to 0)	0 (1 to 0)	.139
Sleep efficiency (0-3)	0.50 (1 to 0.75)	0 (1 to 0.25)	.711	1 (2 to 0)	0 (0 to 0.25)	.050
Sleep disturbance (0-27)	1 (1 to 1)	1 (1 to 0)	.426	1 (0.1 to 75)	1 (0.1 to 75)	.236
Use of sleep medication (0-3)	0 (0 to 0)	0 (0 to 0)	.181	0 (0 to 0)	0 (0 to 0)	1.956
Daytime dysfunction (0-3)	1 (1 to 0)	1 (2 to 1)	.926	0 (1 to 0)	0 (1 to 0)	.707

^aP values of the Mann-Whitney U test is used to compare yoga and control groups because variables were abnormal.

Table 8. Comparison of the Mean and Standard Error of Yoga and Control Groups Before and After Yoga Intervention

During the past month, how often have you had trouble sleeping because you . . . (0-3)	Group	Before Intervention		P Value ^b
		Mean ± SEM	After Intervention Mean ± SEM	
Cannot get to sleep within 30 min (0-3)	Control	7.96 (15.65)	5.61 (7.5)	.496
	Yoga	1.04 (1.843)	0.04 (0.196)	.008
	P Value ^a	.090	.001	
Wake up in the middle of the night or early morning (0-3)	Control	9.44 (11.762)	5.08 (8.703)	.115
	Yoga	3.08 (5.462)	1.23 (3.024)	.263
	P Value ^a	.083	.067	
Have to get up to use the bathroom (0-3)	Control	7.13 (12.487)	6.17 (10.513)	.233
	Yoga	5.50 (9.003)	1.15 (2.310)	.015
	P Value ^a	.739	.027	
Cannot breathe comfortably (0-3)	Control	0.35 (1.294)	1.54 (6.127)	.257
	Yoga	0.28 (0.843)	0.00 (0.00)	.025
	P Value ^a	.423	.273	
Cough or snore loudly (0-3)	Control	0.32 (0.9)	0.72 (2.558)	.194
	Yoga	0.00 (0.00)	0.13 (0.612)	.317
	P Value ^a	.169	.089	
Feel too cold (0-3)	Control	2.25 (5.877)	0.58 (1.53)	.631
	Yoga	1.40 (2.958)	0.00 (0.00)	.026
	P Value ^a	.592	.013	
Feel too hot (0-3)	Control	0.88 (2.787)	5.5 (10.078)	.029
	Yoga	0.67 (1.606)	0.42 (1.316)	.206
	P Value ^a	.981	.006	
Have bad dreams (0-3)	Control	1.5 (5.982)	1.08 (1.495)	.359
	Yoga	1.36 (2.856)	0.20 (0.707)	.023
	P Value ^a	.649	.004	
Have pain (0-3)	Control	1.54 (5.907)	1.69 (5.891)	.480
	Yoga	0.25 (0.676)	0.00 (0.00)	.046
	P Value ^a	.768	.007	

^aMann-Whitney U test.

^bWilcoxon signed-rank test.

Table 9. Comparison of the Averages and Standard Error of Yoga and Control Groups Before and After Intervention

Question	Group	Before Intervention	After Intervention	P Value ^b
		Average (SE)	Average (SE)	
1. During the past month, how often have you taken medicine to help you sleep? (0-3)	Control	0.19 (0.786)	0.11 (0.424)	.564
	Yoga	0.72 (2.052)	0.04 (0.04)	.096
	P Value ^a	.181	.956	
2. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activities? (0-3)	Control	0.77 (3.011)	1.08 (2.296)	.305
	Yoga	0.88 (3.139)	0.21 (0.658)	.160
	P Value ^a	.612	.194	
3. During the past month, how much of a problem has it been for you to keep up enthusiasm to get things done? (0-3)	Control	4.63 (6.579)	2.50 (4.304)	.228
	Yoga	3.64 (4.855)	0.95 (1.430)	.017
	P Value ^a	.881	.326	

^aMann-Whitney U test.

^bWilcoxon signed-rank test.

Abbreviation: SE, standard error.

In a study on a 6-month yogic program in older women exercising physical posture, relaxation techniques, voluntary regulated breathing, and lectures on yoga philosophy, subjects expressed improvements in sleep latency, sleep duration, and feelings of being rested in the morning.⁴⁰ In a randomized clinical trial, it has been shown that a specific sequence of yoga might be effective in decreasing insomnia and menopausal symptoms as well as improving quality of life in postmenopausal women with insomnia.⁴¹ In another randomized controlled trial, among menopausal women, quality of sleep was assessed using aerobic training; results showed that 6-month aerobic training may improve quality of sleep and decrease hot flushes that disturb sleep in symptomatic menopausal women.⁴² In a preliminary randomized controlled trial of older women with restless legs syndrome, the effects of a gentle yoga program on sleep by PSQI, mood (profile of mood states, state-trait anxiety inventory), blood pressure, and heart rate was evaluated, and the authors showed a significant improvement in quality of sleep and greater reductions in insomnia prevalence, anxiety, perceived stress, and blood pressure.³⁴

However, based on the belief of lesser or no side effects and low or no cost of exercising yoga, there is a need to scientifically authenticate beneficiary of yoga. Besides believing, exercising yoga has been shown to cause alterations in central, autonomic, and neuroendocrine nervous systems. Furthermore, yogic exercises affect physiological functions of the body via affecting sympathetic nervous system, resulting in parasympathetic dominance and physiological reactivity to stress. Gerbarg et al⁴³ have explained that yoga can affect through enhancing autonomic tone in reacting to stress, decreasing chemoreflex response, dominating parasympathetic system via vague nerve stimulation, synchronizing the cortical areas via mediating the thalamic nuclei, reducing the cortical areas involved in executive functions, activating the limbic system, and increasing the secretion of prolactin and oxytocin. It has also been suggested that an association exists between yoga and melatonin levels as a regulator of biological rhythms. Furthermore, yoga leads to an increase of the levels of brain g-aminobutyric acid, a potent inhibitory neurotransmitter. These alterations induce a belief that yoga affects neuroendocrine and autonomic nervous systems, decreases sympathetic tones, and enhances parasympathetic tones, the factors that may play roles in improving sleep patterns and decrease sleep disturbance in women with PMS.

CONCLUSION

Yoga reduced the disturbances of sleep in subjects with PMS. The findings indicate that yoga would have beneficial effects in treating sleep disturbances in women with PMS, but medical treatment will probably be needed in severe situations.

Limitations

All the participant's responses in the current study WERE considered to be honest and correct. Detection of the accuracy and untruth of the responses collected from participants were beyond the researcher's capacity. Authors

in the questionnaires did not include an item about monitoring the side effects of yoga practice.

Recommendations

The current study recommends that mechanisms of yoga in affecting PMS symptoms related to the sleep disturbances can be considered by measurements of hormones and blood metabolite levels before and after yoga.

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AUTHOR DISCLOSURE STATEMENT

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