Original Article

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Effect of Suryanamaskar on the Sleep Quality and General Well-being among Young Adults: A Quasi-experimental Study

Physiotherapy Section

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ABSTRACT

Introduction: Rapid decline in physical functionality has an adverse impact on both physical and psychological health. Deteriorating sleep quality during the pandemic is one such common manifestation, that further affects the general well-being. Therefore, safe non pharmacological treatments are warranted, and the practice of suryanamaskar is one such intervention.

Aim: To find the effectiveness of suryanamaskar on sleep quality and general well-being among young adults.

Materials and Methods: This quasi-experimental study was conducted in Physiotherapy Department at Ashirwad Bhagwat Multispecialty Clinic, Sonipat, Haryana, India, from March to July 2021. A total of 30 young adults were enrolled in the study and randomly divided into two groups of 15 participants each. The experimental group practiced eight weeks of suryanamaskar yogic exercise, also known as sun salutations, which comprises of 12 different postures performed with controlled breathing. The control group performed 20 minutes of walk. Sleep quality and General Well-being (GWB) were evaluated preintervention and postintervention using the Pittsburgh Sleep Quality Index (PSQI) and Psychological General Well-Being Index (PGWBI) respectively, along with the resting Heart Rate (HR) and Blood Pressure (BP). A higher PGWBI score denotes greater psychological well-being and a total PSQI score of 5 or more indicates poor sleep quality. The effect of the intervention on GWB, sleep quality, BP and HR were assessed using Wilcoxon signed-rank test within the group and the Mann-Whitney test was used to find a statistical difference between the two groups.

Results: After eight weeks of yoga training, a significant difference was found in the overall sleep quality (9.53±1.68, p-value=0.001), GWB (78.33±14.76, p-value=0.001), HR (77.07±5.48, p-value=0.001), SBP (116.67±2.99, p-value=0.001) and BMI (23.01±3.17, p-value=0.019) in the experimental group. However, the control group revealed a significant difference only in the GWB (50.80±13.87, p-value=0.019) postintervention. Additionally, when compared to the control group, the experimental group revealed statistically significant results for sleep quality (p-value=0.001), GWB (p-value <0.001) and HR (p-value=0.007).

Conclusion: The study suggests, that yoga training comprising suryanamaskar has positive effects on sleep quality and general well-being.

Keywords: Coronavirus disease-2019, Physiological response, Psychological health, Sleep insufficiency, Stress, Yoga

INTRODUCTION

Sleep constitutes approximately one-third of our lives, which is nearly double the time we spend working [1]. Good sleep is the essence ofa healthy mind and the overall well-being of an individual. However, all over the world, insufficient sleep has been acknowledged as a lifestyle disorder, that has now become an epidemic [2]. Sleep disturbances are often caused by insufficient physical activity, stress, excessive napping during the daytime, and poor sleeping habits [3]. Further, the Coronavirus Disease-2019 (COVID-19) pandemic has introduced unprecedented social and environmental changes, thereby affecting both the timing and duration of sleep. The studies conducted during the period of lockdown state, that the majority of the general population demonstrated poor sleep quality [4,5]. Likewise, in comparison to ordinary times, the prevalence of poor sleep quality has increased considerably in the Indian population as well [6].

Globally, stress is accounted to be one of the major problems linked with sleep quality and poor cognitive dysfunction [7]. Furthermore, there are various other associated covariates that directly or indirectly impact the well-being of an individual [8]. General Well-being (GWB) connotes the harmony that exists between the individual's physical and psychological functioning that provides satisfaction to both self and society [9]. The GWB is not necessarily deteriorated by any physical trauma, but it might also be affected by a change in working pattern, unhealthy standards of living, increased stress [10]. Owing to the current scenarios, where people have started working from home that has substantially placed them under psychological distress thereby affecting their sleep quality and GWB [11].

Sleep quality constitutes different subjective parameters- total sleep time, ease of sleep onset, maintenance of sleep and early awakening [12]. These changes in the sleeping habits were attributed to shifting in bedtime, prolonged latency of sleep onset, reduced nighttime sleep duration and increment in daytime napping [13].

Lack of good sleep and its increasing prevalence in the general population can lead to the development of various co-morbidities, thus interventions for the treatment of lack of sleep has become the need of the hour. Pharmacological therapies for the rapidly emerging sleep-related problems are widespread, however, they have adverse side effects which further compromise the GWB of an individual [8]. Therefore, clinicians advise safer and effective non pharmacological methods of treatment for this disorder. One of the popular methods is yoga, an astonishing spiritual science that is known to improve the GWB and achieve improvement in sleeping patterns [14].

Yoga embraces different practices that aim to develop a state of sound mental and physical wellbeing [15]. It is known to have extensive psychological and physiological benefits with a defined scientific basis [16]. Literature suggests that the practice of yoga enhances the overall well-being of an individual [17]. Yoga techniques are believed, to down regulate the action of the Hypothalamic-Pituitary-Adrenal (HPA) axis which releases cortisol and regulates

the function of catecholamines released from the Sympathetic Nervous System (SNS) [18]. The immediate effect of yoga on the HPA/SNS axis is not known, however, it has been hypothesised that certain yoga exercises cause a change in the dominance of the Parasympathetic Nervous System (PNS) via vagal stimulation, thereby reversing the effects of stressors [19].

Yoga incorporates various exercises and postures. Suryanamaskar or sun salutation is one such type of yogic practice that contains a series of 12 postures which are practiced in 10 counts thereby considered as an 'Upasana (worship) and 'Vyayayam' (exercise) [20,21]. Every sound of suryanamaskar is performed along with deep breathing i.e., inhalation and exhalation to the maximum extent possible. Further, chanting 'OM' is believed to invoke mental calm and peace [22]. Suryanamaskar is also reported to improve the cardiopulmonary function of healthy individuals by reducing resting Heart Rate (HR) and Blood Pressure (BP) [23].

Therefore, the objective of the present study was to assess the efficacy of suryanamaskar in sleep quality and GWB among young adults along with other cardiovascular variables. Authors hypothesised that the practice of suryanamaskar will improve sleep quality and GWB.

MATERIALS AND METHODS

This quasi-experimental study was conducted in Physiotherapy Department at Ashirwad Bhagwat Multispecialty Clinic, Sonipat, Haryana, India, from March to July 2021. The study protocol was approved by the Institutional Ethical Committee (NTCC/BPT/20-21/JAN.2021/26). Prior to enrollment, the participants were informed regarding the protocols and the impact of the study. Informed consent was obtained. Convenient sampling was adopted.

Inclusion and Exclusion criteria: Participants aged between 18-40 years. Individuals of either gender, with Pittsburgh Sleep Quality Index (PSQI) score >5 which is indicative of poor sleep were included in the study [24]. Further, individuals with a history of any illness in the last six months, accidental injury, musculoskeletal or neurological disorder, individuals suffering from any pulmonary or chronic infectious disorder, history of fracture in the last six months, Deep Vein Thrombosis (DVT) were excluded from the study.

From among the available population who volunteered participation in this research, 33 individuals were assessed for eligibility. A total of 31 participants fulfilled the inclusion criteria and were further randomly allocated by chit method into two groups-

- Experimental group
- Control group

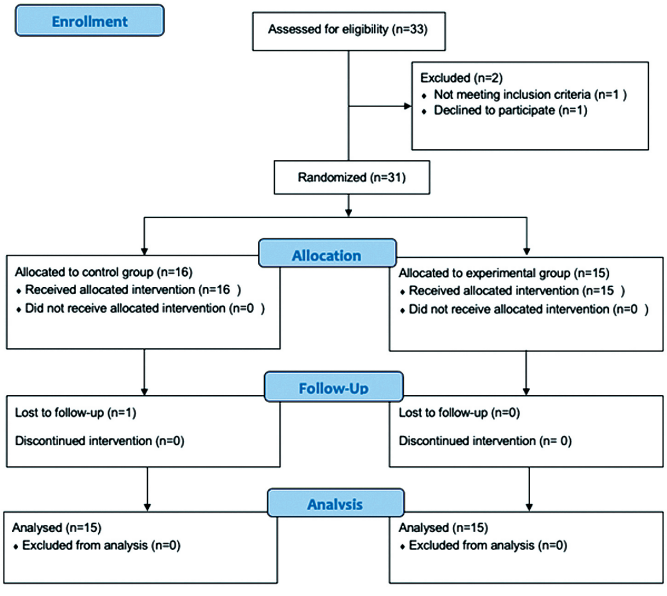
Further with attrition of a participant due to some personal reasons, the subjects in the experimental and control group dropped to 15 each. The Consolidated Standards of Reporting Trials (CONSORT) diagram represents the experimental protocol of this study [Table/Fig-1].

Study Procedure

Each and every individual was asked to fill a questionnaire concerning their demographical details and questions related to physical activity and medical history, along with self-reported questionnaires- PSQI and Psychological General Well-Being Index (PGWBI).

Pittsburgh sleep quality index: The PSQI is a 19 item questionnaire that measures various aspects of sleep and yields, seven component score with a single composite score. The overall score ranges from 0-21, where better sleep quality is denoted by lower scores. Poor sleep quality is indicated by a global score of 5 or more [25].

Psychological general well-being index: The PGWBI is a 22 item subjective questionnaire that measures wellbeing and produces a single summary score that ranges from 0-110. A higher PGWBI score represents greater psychological well-being [26].



[Table/Fig-1]: CONSORT flowchart of the study participants.

The preintervention and postintervention readings for PSQI, PGWBI, HR, and BP {Systolic Blood Pressure (SBP) and Diastolic Blood Pressure (DBP)} for the two groups were obtained prior to the treatment and after eight weeks respectively. Individuals in the experimental group performed suryanamaskar for eight weeks, three sessions per week with each session lasting from 40-45 minutes daily. General warm-up exercises included self-stretching of the lower leg muscles, prior for 10 minutes followed by performing suryanamaskar (12 asanas) for 35-40 minutes and 10 minutes of relaxation in the supine resting position. The sets for suryanamaskar were progressed gradually, starting from three sets of suryanamaskar in the first week and further a set was increased every consecutive week. The exercise protocol was performed under strict COVID-19 norms. On the other hand, participants in the control group were asked to walk at a normal pace for 20 minutes daily, for a duration of eight weeks.

STATISTICAL ANALYSIS

The data was analysed using Statistical Package for Social Sciences (SPSS) software version 20.0. The demographic data of the two groups were assessed using Wilcoxon signed-rank test to compare the age and Body Mass Index (BMI), and Chi-square test was used to compare the gender ratio. The effect of the intervention on GWB, sleep quality, BP and HR were assessed using Wilcoxon signed-rank test for preintervention and postintervention within the group, and the Mann-Whitney test was used to find statistical difference between the two groups. Statistical significance was fixed at p-value <0.05.

RESULTS

The two groups had comparable age, experimental group (21.87±2.29) and control group (23.73±3.43) with no significant difference between the two groups (p-value=0.112) [Table/Fig-2].

Variables	Experimental group (Mean±SD)	Control group (Mean±SD)	Test	p-value
Age (years)	21.87±2.29	23.73±3.43	74.500**	0.112
Body mass index (kg/m^2)	23.34±3.11	22.32±2.80	88.000**	0.309
Gender				
Male	4	5	0.159#	0.690
Female	11	10		

[Table/Fig-2]: Descriptive and demographic data of the two groups.
†Data are mean±SD; SD: Standard Deviation; **Z values for Wilcoxon signed-rank test; # Chi-square value

Sleep quality had significantly improved in the experimental group (p-value=0.001), however, no significant difference was found in the control group (p-value=1). General well-being showed a significant difference in both groups (p-value <0.05). A significant difference was found in HR (p-value=0.001) and SBP (p-value=0.001) in the experimental group [Table/Fig-3].

Groups	Preintervention (Mean±SD)	Postintervention (Mean±SD)	Z	p-value
Pittsburgh sleep quality index				
Experimental group	13.93±2.66	9.53±1.68	-3.422	**0.001**
Control group	12.47±2.64	12.47±2.20	0.000	1
Psychological general well-being index				
Experimental group	43.20±12.42	78.33±14.76	-3.409	**0.001**
Control group	49.47±14.55	50.80±13.87	-2.342	**0.019**
Heart rate (beats/min)				
Experimental group	90.73±9.81	77.07±5.48	-3.410	**0.001**
Control group	87.07±11.82	86.53±10.06	-0.492	0.623
Systolic blood pressure (mmHg)				
Experimental group	121.20±4.14	116.67±2.99	-3.424	**0.001**
Control group	118.67±2.50	118.53±2.45	-0.238	0.812
Diastolic blood pressure (mmHg)				
Experimental group	79.47±4.34	78.73±2.79	-1.092	0.275
Control group	78.27±2.76	78.33±2.94	-0.060	0.953
Body mass index (kg/m^2)				
Experimental group	23.34±3.11	23.01±3.17	-2.342	**0.019**
Control group	22.32±2.80	22.10±2.89	-1.705	0.088

[Table/Fig-3]: Comparison of PSQI, PGWBI, HR, BP and BMI within the group at preintervention and postintervention.
p-value<0.05 was considered as statiscally significant; Z: Values of Wilcoxon Signed-rank test

The results of Mann-Whitney test, suggests that a significant difference was found between the experimental and control group, postintervention in the sleep quality (p-value=0.001), GWB (p-value=0.0001) and HR (p-value=0.007), suggesting that there was significant improvement in all these variables in the experimental group when compared with the control group after eight weeks of intervention [Table/Fig-4].

Variables	Independent t-test values			
	Preintervention		Postintervention	
	W	p-value	W	p-value
PSQI Experimental and control group	79.5	0.168	33.5	0.001*
PGWBI Experimental and control group	81.5	198	21	<0.0001*
Heart rate Experimental and control group	85.5	0.262	47.5	0.007*
Systolic blood pressure Experimental and control group	63	0.038*	67	0.056
Diastolic blood pressure Experimental and control group	84	0.231	102	0.659
Body mass index Experimental and control group	88	0.309	93.5	0.431

[Table/Fig-4]: Comparison of PSQI, PGWBI, HR, BP and BMI between both the groups at preintervention and postintervention.
Level of significance taken at p<0.05; W=Values for Mann-Whitney test

DISCUSSION

The objective of the present study was to ascertain the effect of suryanamaskar on sleep quality, GWB and selective physiological parameters of the body. The results from the current study, suggest that the practice of suryanamaskar is effective in improving the GWB, sleep quality, and HR of individuals, however, it did not show a significant effecton BP in the participants of the experimental group in comparison to the control group.

Direct correlations have been established by researchers between poor quality of sleep and increase in psychiatric and physical morbidity, decrease in the cognitive function and disrupted GWB [27]. Yoga is known to improve the energy levels and balances the emotional quotient of an individual [28]. The result of this current study corroborate with the results of Halpern J et al., and Hariprasad VR et al., that yoga improves sleep quality [28,29]. The sleep quality has significantly improved in the present study for the experimental group (9.53±1.68) however, the scores of PSQI were still in the undesirable range (PSQI>5). This can be attributed to the shorter duration of intervention, as according to the literature, changes in the PSQI with 12 weeks of yoga exercise showed sleep quality in the normal range [30]. In addition, it is believed to improve the quality of sleep by lengthening the sleep stage and consecutively shortening the latent period (the duration of time between the onset and the first stage of sleep) [31]. Previous study reveals that yoga, when performed for a shorter duration causes a significant change in the vagal tone, this increase in the vagal tone leads to decreased sympathetic discharge which presents itself in the form of significantly decreased HR response along with reduced levels of catecholamines in plasma. Yoga, therefore, leads to decreased physiological arousal which can be attributed to less sleep disturbances [32].

Another possible explanation for this improvement in sleep quality could be, the involvement of stretching and relaxing of muscles in the asanas that causes physical exertion thereby increasing sleep efficacy [33]. Physiologically, it has been suggested that yoga affects three psychological mechanisms (positive effect, self-compassion, and mindfulness along) with four biological mechanisms (interleukin-6, cortisol, C-reactive protein and posterior thalamus) by mediating the salivary cortisol, posterior hypothalamus inhibition, and inducing positive affect and self compassion thereby, improving the stress levels [34]. Also, suryanamaskar when performed at a slower pace, generates a positive effect on the response of the HPA axis to stress [35].

Further, it is claimed that the practice of suryanamaskar improves the general health and overall fitness of the individuals and improves pulmonary and cardiovascular function. Similar observations were noted in the present study, which depicted decreased HR for the individuals. This positive effect could be due to increased vagal tone thereby, reducing the sympathetic discharge that further causes a decrease in the HR on standing and decreased levels of catecholamines (epinephrine and norepinephrine) in the plasma [36]. Additionally, Bhavanani A et al., suggest that suryanamaskar when done at a slower pace decreases the resting HR which is attributed to the relaxed state of mind which further decreases the peripheral resistance, as a result of reduced sympathetic tone [23]. Previous studies have also documented the positive effect of suryanamaskar on BP as well [23,37,38]. However, authors believe that the small sample size, physiological variations in the selected sample and shorter duration of intervention did not induce significant variations and therefore, the same effects could not be observed in the current study. Nonetheless, the present study had its own strengths, the highlight of this study was, it was conducted at the time, when the second wave of COVID-19 was active in India. This study was one of its kind, which had taken into account the disturbed sleep quality of individuals when the nation was gripped with the news of pain and death during the second wave, which was one of the major causes of stress which impacted the sleep quality.

Limitation(s)

Owing to the pandemic scenario, a small sample size was kept, taking into consideration the COVID-19 norms with a brief duration of intervention, which added to the limitation of the study. Findings of this study revealed only the short-term effect of suryanamaskar, future studies can be conducted with the aim to add to the existing

data by prolonging the duration of intervention and administering its long-term effects.

CONCLUSION(S)

The findings of present study uphold the implications, in terms of the usefulness of suryanamaskar as a strategy to mitigate the worsening sleep quality and GWB. Therefore, the present study suggests that suryanamaskar is an efficient method that can be employed to improve the sleep quality and GWB of young adults, amongst these stressful times of the ongoing pandemic.

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