EXPLORING THE EFFECTS OF YOGIC PRACTICES ON PSYCHOLOGICAL WELL-BEING IN COLLEGE STUDENTS: A SMARTPHONE USE PERSPECTIVE

ДОСЛІДЖЕННЯ ВПЛИВУ ЙОГІЧНИХ ПРАКТИК НА ПСИХОЛОГІЧНЕ БЛАГОПОЛУЧЧЯ СТУДЕНТІВ КОЛЕДЖІВ: ПЕРСПЕКТИВА ВИКОРИСТАННЯ СМАРТФОНІВ

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Absracts

Introduction. Well-being refers to an individual's assessment of the quality of their life, which includes their overall happiness and various factors that reflect their overall state of well-being. Yogic practices include a collection of asanas, pranayama, meditation, mantras and relaxation techniques that aim to promote harmony and health to an individual's mental, physical, and emotional aspects.

Purpose. The objective of the study was exploring the effects of yogic practices on psychological well-being such as sleep quality and memory ability among college students frequently engaged in smartphones.

Material and Methods. Between January 2024 and April 2024, the SRM Institute of Science and Technology students participated in a simple random control study. 80 students between the ages of 18–25 were the subjects of this intervention. They were allocated into two groups at random, the control group (n=40) and the yoga practicing group (n=40). To evaluate sleep quality through the Pittsburgh Sleep Quality Index and memory ability through a Multifactorial Memory Questionnaire (MMQ), We analysed the data using an independent t test and a paired t test with a p-value of 0.05.

Results. The yoga intervention revealed a substantial enhancement in sleep quality and memory agility within and between the group comparison. Notably, mean value of yoga group was a significant decrease in sleep quality from [7.93±1.62] to [4.93±1.67], indicating a marked enhancement in sleep quality following the intervention. In contrast, the control group showed [7.88±1.77] negligible change in sleep parameters. Moreover, the yoga group exhibited a notable improvement in memory performance, with the mean MMQ score increasing from [45.4 ± 8.88] to [55.35 ± 8.55]. In contrast, the control group showed [41.1±10.07] negligible change in memory ability. Both variables were significant at the 0.001 confidence level and accompanied by a large effect size (Cohen's $d > 0.8$).

Conclusion. The yoga intervention group developed sleep quality and memory ability comparable to the control group. Therefore, it is concluded that the yoga intervention group significantly increased sleep quality and memory power among college students who frequently engaged in smartphone.

Key words: Yogic practices, sleep quality, memory agility, smartphone.

Вступ. Благополуччя – це оцінка людиною якості свого життя, що включає загальне щастя та різні фактори, які відображають загальний стан благополуччя. Йогічні практики включають комплекс асан, пранаяму, медитацію, мантри та техніки релаксації, які спрямовані на досягнення гармонії та здоров'я в психічному, фізичному та емоційному аспектах людини.

Мета. Метою дослідження було вивчення впливу йогічних практик на психологічне благополуччя, таке як якість сну та здатність до запам'ятовування, серед студентів коледжу, які часто користуються смартфонами.

Матеріали та методи. З січня 2024 року по квітень 2024 року студенти Інституту науки і технологій SRM брали участь у простому рандомізованому контрольному дослідженні. Об'єктами цього втручання були 80 студентів віком від 18 до 25 років. Вони були випадковим чином розподілені на дві групи: контрольну групу (n=40) та групу, що практикувала йогу (n=40). Для оцінки якості сну за допомогою Піттсбурзького індексу якості сну та здатності до запам'ятовування за допомогою багатофакторного опитувальника пам'яті (MMQ) ми проаналізували дані за допомогою незалежного t-критерію та парного t-критерію з p-значенням 0,05.

Результати. Вплив йоги виявив істотне поліпшення якості сну та швидкості пам'яті як у межах групи, так і між групами. Примітно, що середнє значення групи йоги показало значне зниження якості сну з [7,93±1,62] до [4,93±1,67], що вказує на помітне поліпшення якості сну після впливу. На відміну від цього, контрольна група показала незначну зміну параметрів сну [7,88±1,77]. Більше того, група йоги продемонструвала помітне поліпшення пам'яті, середній бал MMQ зріс з [45,4 ± 8,88] до [55,35 ± 8,55]. На відміну від цього, контрольна група продемонструвала незначні зміни в пам'яті [41,1±10,07]. Обидві змінні були значущими на рівні достовірності 0,001 і супроводжувалися великим ефектом (Cohen's d > 0,8).

Висновок. Група, яка займалася йогою, продемонструвала якість сну та пам'ять, порівнянні з контрольною групою. Отже, можна зробити висновок, що група, яка займалася йогою, значно покращила якість сну та пам'ять серед студентів, які часто користуються смартфонами.

Ключові слова: йогічні практики, якість сну, швидкість пам'яті, смартфон.

Introduction. A person's well-being is how they personally rate the quality of their life based on their own standards. It includes their general happiness with life and a wide range of indicators that show how good their life is [7]. As advances in technology, utilizing a smartphone has become a necessity for daily living. In the modern developing world, all people use electronic media daily, including computers, laptops, smartphones, televisions, gaming consoles, tablets, and other connected devices. Despite some knowledge of the potentially harmful impacts on health, the use of mobile phones has increased dramatically, particularly as they have become more affordable and widely available [2]. According to ITU (International Telecommunication Union) projections, 67% of the world's population, or over 5.4 billion people, will be online by 2023. In comparison to 2018, when an anticipated 1.7 billion people engaged online, this is a 45 percent rise [8]. Low-level radiofrequency (RF) electromagnetic waves (EMW), are emitted by smartphones, ranging in frequency from 800 to 2200 MHz, that can be absorbed by the body and may negatively impact both human and animal DNA as well as the brain, heart, and endocrine system. They disrupt sleep and affect the electroencephalographic activity of the brain, resulting in difficulty in concentration, fatigue, and headache [3]. But sleep is necessary for good health.

Multiple research investigations have proven the important function that sleep plays in memory and learning. Seven hours of sleep at night and eight to nine hours of sleep per day are generally required by the human body. Good quality of life and maintaining excellent health depend on getting adequate sleep. It enhances one's physical and social well-being, performance, longevity, and contentment [19]. The National Sleep Foundation (NSF) has disclosed the primary markers of high-quality sleep, ascertained by a team of experts. Sleep latency of 15 minutes or less is regarded adequate sleep quality across all age groups, while 45–60 minutes or more suggests poor sleep quality, except for older adults [12]. Maharishi Patanjali who is known as the father of yoga mentioned about sleep in his yoga sutra book (PYS) that '*Abhava-pratyaya alambana vrttir nidra – PYS 1.10* which means sleep is the mental process that is connected to the perception of the non-existent [22].

Melatonin, a photoperiodic pineal hormone, is important in regulating physiological rhythms such as temperature. Melatonin is not only regulated by the circadian oscillator, but it also functions as a darkness signal, providing feedback to the oscillator. The darkness signal

provides feedback to the circadian pacemaker, and it synchronizes activity at dusk and dawn [4]. It synchronizes the circadian rhythm and increases the quality and duration of sleep [31]. Exposure to electromagnetic fields in smartphones at night inhibits the pineal gland's ability to convert serotonin to melatonin [23]. Thus, electromagnetic fields disrupt the melatonin rhythms and insufficient melatonin disturbs the quality and duration of sleep. Lack of sleep has a risk factor associated with metabolic dysregulation, cognitive impairments, cardiovascular issues, temper disturbances, immune dysfunction, and challenges in interpersonal relationships [28]. Children and adolescents who suffer sleep disturbances may do worse academically and cognitively. Learning-memory deficits can result from insufficient sleep impairs attention, cognitive, and memory functions [12]. Lack of sleep has a significant impact on academic performance [10]. In the same way, students in lower grades typically have later bedtimes on school nights and sleep onset delays on weekends [30].

Humans and other animals use a group of cognitive abilities called memory to store information and reconstruct the past, usually for their present purposes [26]. Memory is the ability to store objects without changing from past experiences which is mentioned as "*Anubhuta visaya asampramosah smrtih*" – *PYS 1.10* [22]. The presence of a smartphone and frequent thoughts about it significantly impacted memory recall accuracy, leading to an increase in cognitive load and a 'bandwidth effect' that interrupted participants' memory processes [27].

Yogic practices include a collection of physical postures known as "asanas", breathing exercises known as "pranayama", deliberate concentration known as "meditation", repeated recitation of phrases known as "mantras", and relaxation techniques that aim to promote harmony and health to an individual's mental, physical, and emotional aspects [21; 22]. Yoga activities have been shown to enhance memory and attention in more scientific studies. When practiced regularly, yoga poses improve working memory, learning, attention span, and processing speed among older adults with modest cognitive impairment [6]. The word asana means postures. Asanas are a form of exercise that purifies and calms the body. According to Patanjali yoga sutra (PYS) "Sthira sukhamāsanam" – PYS 2.46, that is asana means, the posture must be comfortable and stable [22]. After gaining success of the asanas, one must practice pranayama which is the in and out of the breath. The above concept was expressed in PYS as "Tasminsati śvāsa praśvāsayorgativicchedaḥ prāṇāyāmah" – PYS 2.49 [22]. Here prana means bioenergy that powers living things, and it may also be found in inanimate materials like jewels. One who practices yoga can understand the relationship between prana, breath, emotion, and mind. Meditation is also a part of yogic practices. Meditation is explained as *tatra pratyayaikatānatā dhyānam* – PYS 3.2, that is Continuous concentration lead s to a state known as meditation (dhyana) [22]. The meditative state does not eliminate mental clarity; rather, it improves consciousness, even when there is no or little awareness of the outside world [22]. Yogic practices were selected from above mentioned practices and along with these practices OM (AUM) chanting was also given to the experimental group. The Sanskrit word Om is formed by combining three letters: A, U, and [22]. When AUM is declined in sound, it is pronounced as Om [24]. The letter Om is not specifically designated for God but rather serves as a universal symbol of divinity. This divinity is commonly referred to as 'OM' (tasya vācakaḥ praṇavaḥ – PYS 1.27) [22]. It is recommended to engage in the practice of repeating and meditating on 'OM' (Taj japas tadartha bhāvanam – PYS 1.28) [22]. By consistently repeating and meditating on 'OM', one can experience the removal of obstacles and the emergence of a higher state of consciousness (tataḥ pratyakcetanādhigamo'pyantarāya abhāvaśca – PYS 1.29) [22]. Practicing asana is beneficial for achieving a stable posture, good health, and a sense of physical lightness (*kuryāttadāsanaṃ sthairyamāroghyaṃ chānggha-lāghavam* – Hathapradipika / HYP 1.19) [25]. When respiration is disrupted, cognitive function is also disrupted. By regulating respiration, the

Yogi attains mental clarity, stability (chale vāte chalaṃ chittaṃ niśchale niśchalaṃ bhavet|| yoghī sthāṇutvamāpnoti tato vāyuṃ nirodhayet – HYP 2.2) [25]. The above slogan elucidates the connection between the consciousness and the breath. The mind is directly impacted by the respiration, which in turn disrupts the mind [29]. Consequently, to regain control of the mind, it is necessary to control the breath. Pranayama activates the parasympathetic nervous system, leading to a decrease in tension and ultimately promoting relaxation and enhancing the quality of sleep [29].

Aim of study. This current study examines exploring the effects of yogic practices on sleep quality and memory ability level among college students who frequently engaged in smartphone.

Material and Methods. The study is a simple randomized control study conducted on college students aged from 18 to 25 years recruited from a selected university in Chengalpattu district, Tamil Nadu, based on the following inclusion and exclusion criteria. Healthy male students aged from 18–25 years and interested in participating in the study were included. Students who are not under the age limit, affected by any physical and mental illness, and taking medication for any disease were excluded from the study. Before starting the study, 246 students were gathered and informed about the study. Out of them, only 110 students decided to be involved in the research solely based on their volunteer involvement. Finally, informed consent was acquired from 90 students. The participants were allocated into two groups, namely the Yoga Practicing Group (YPG) and the Control Group (CG), with each group involving 45 students. During the intervention period, a total of 10 students had withdrawn from the research, resulting in a remaining participant count of 80. The rationale for withdrawing participation is illustrated in Figure 1.

Informed consent

Study participants were informed about the study design, procedure, data collection process, expected benefits, and other relevant information. Every participant possesses the entitlement to discontinue their involvement in the study at any given moment during the intervention. Participants were assured in the

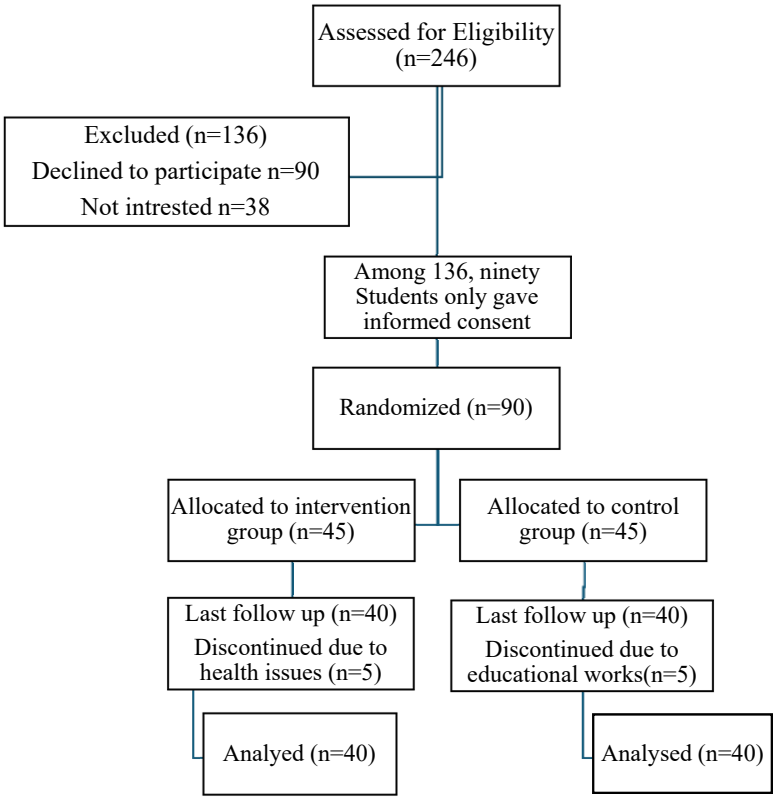

Fig. 1. Participants allocation flowchart Subject

informed consent form that the collected data would be used for scientific purposes only, keeping them anonymous.

Data collection

Once the consent documents were collected from the students, the study began.

Prior to commencing the intervention, pre-data were gathered from both the Yogic Practices Group (YPG) and the Control Group (CG) utilizing the questionnaires. The YPG students completed a 4-month training program consisting of 60-minute yoga practice sessions. The pupils in the control group were not involved in any practice and adhered to their regular daily routine. Four months later, data were obtained from all the groups using appropriate above-mentioned questionnaires.

Outcome Measurements

The Pittsburgh Sleep Quality Index (PSQI)

The study used the Pittsburgh Sleep Quality Index (PSQI), a self-reported questionnaire to evaluate the quality of sleep and disruptions experienced over a period of one month. The PSQI comprises 19 questions divided into seven components to assess different facets of sleep. The 7 components include subjective sleep quality, sleep latency, sleep length, habitual sleep efficiency, sleep disruptions, usage of sleeping medication, and daytime dysfunction. The scoring for each question varies from 0 to 3 and the total scores for the seven components is mentioned as the global PSQI score, which can vary from 0 to 21. Acceptable measures of internal homogeneity, consistency (test-retest reliability), and validity were obtained [5]. A PSQI score above 5 suggests suboptimal sleep compared to clinical and laboratory assessments, with higher values indicating lower sleep quality. The seven component scores of the PSQI exhibited a high level of internal consistency, as shown by an overall reliability coefficient (Cronbach's α) of 83 [5].

Multifactorial Memory Questionnaire (MMQ)

The Multifactorial Memory Questionnaire (MMQ) is a self-report assessment consisting of

Table 1

Yoga Intervention – Training schedule for four months

First Two Months				Last Two Month			
No	**Name of Yogic Practices**	**Set**	**Duration in minutes**	**No**	**Name of Yogic Practi-ces**	**Set**	**Duration in minutes**
1	Opening prayer	1	2	1	Opening prayer	1	2
2	Sukshma Vyayama	1	20	2	Sukshma Vyayama	1	10
3	Surya Namaskar	2	5	3	Surya Namaskar	5	10
4	Super-brain yoga	1	3	4	Super-brain yoga	1	3
5	Tadasana	1	2	5	Parivruta Trikonasana	1	2
6	Tadasana	1	2	6	Vrikshasana	1	2
7	Vrikshasana	1	2	7	Parvatasana	1	2
8	Vajrasana	1	2	8	Halasana	1	2
9	Padmasana	1	2	9	Setubandasana	4	2
10	Urthva Prasarita Padasana	1	2	10	Shasangasana	1	2
11	Jnana Mudra	1	2	11	Chin mudra	1	2
12	Brahmari Pranayama	6	3	12	Jnana Mudra	1	2
13	Relaxation in savasana	1	10	13	Om chanting	1	2
14	Closing player	1	3	14	Ujjayi	4	2
				15	Kaphalapati	1	2
				16	Trataka Meditation	1	5
				17	Relaxation in savasana	1	5
				18	Closing player	1	3
	Total Duration		60 minutes		Total Duration		60 minutes

three subscales: memory satisfaction, memory ability, and memory strategy. This study solely utilized the memory ability sub-scale. The survey consists of 57 items in total that are rated on a five-point Likert scale. The Cronbach's alpha values for Satisfaction, Ability, and Strategy are .95, .93, and .83 respectively, showing a high level of internal consistency reliability. The study conducted by Yang et al., (2023) found that the content and convergent validity of the questionnaire are very good. Scoring was computed for each subscale separately. The study used the memory ability subscale only for data collection [32].

Statistical analysis

The distribution of numerical values was assessed using the Kolmogorov-Smirnov normality test, while the homogeneity of variances was evaluated with Levene's test. Paired t-test was used for within the group analysis, and independent t-test had been used for between-group analysis. The significance level of P is set at 0.001. Tables presented the data as mean, standard deviation (SD), t value, and p value. The statistical analysis was done by using DATA Tab Software.

Results. Table 2 shows the key demographic and smartphone-use variables. The yoga and control groups (n = 40 each, total N = 80) were well balanced; independent t-tests comparing groups at baseline returned p-values all > 0.05, indicating no statistically significant differences between groups on these baseline measures.

Changes in sleep quality. The Table 3 shows the results of independent – t-test which was executed between post values of YPG and CG. In the Kolmogorov-Smirnov Test, the p values for YPG and CG are 0.23 and 0.206, respectively, and they are both greater than 0.05. So, normality for both groups YPG and CG thus confirmed. The p value of the Levene test of variance equality for sleep quality is 0.635 which is greater than 0.05 reveals that there were no significant variations in the variances of the post-values of YPG and CG on sleep quality. Hence both groups have equal variances on sleep quality values. After confirming normality and equal variances the data proceeded on independent t test. The independent t-test between YPG and CG on sleep quality showed p value is lesser than 0.001. Thus, it proved that both groups significantly differ at 0.001 level of confidence. Cohen's d is a measure of effect size, which quantifies the size of the difference between the two groups. A Cohen's d of 1.71 is considered a large effect size. YPG Post mean 4.93±1.67 (expressed in mean ± standard deviation) is lower than CG Post mean (7.88±1.77). Thus, the yogic practice

Table 2

Demographic and smartphone-use variables Baseline Characteristics

Characteristic Mean ± SD	YPG (n = 40)	CG (n = 40)	p-Value*
Age (years)	21.3 ± 1.7	21.5 ± 1.9	0.65
Height (cm)	167.2 ± 7.8	168.0 ± 8.1	0.58
Weight (kg)	63.4 ± 9.5	64.1 ± 10.0	0.70
Daily Smartphone Use (hours)	6.1 ± 1.4	6.3 ± 1.6	0.48

CG – control group, YPG – yoga practice group.

Table 3

Independent t test for between the group changes

Measures	Normality		Equality of variance	CG-Post Mean± SD	YPG-Post Mean ± SD	t	p	Effect Size d
	CG POST	YPG Post						
Sleep Quality	0.206	0.230	0.635	7.88±1.77	4.93±1.67	7.66	<0.001***	1.71
Memory Ability	0.784	0.671	0.45	41.1±10.07	55.35±8.55	6.82	<0.001***	1.53

CG –control group, YPG – yoga practice group, SD – standard deviation, p<0.001*** – Highly significant

significantly reduced sleep quality index value. As per Pittsburgh Sleep Quality Index (PSQI) test sleep quality index value less than 5 indicate a good sleep level [5].

The Table 4 shows the results of paired – t-test which was executed between pre and post values of YPG. The normality was checked by Kolmogorov-Smirnov Test between the pre and post values of YPG and the p value is 0.316 which is greater than 0.05. Therefore, normality was confirmed for pre and post values of YPG. After confirming normality, the data proceeded on paired t test. The paired t-test showed p value is lesser than 0.001 for sleep quality. Thus, it proved that YPG post values significantly differ from YPG Pre values at 0.001 level of confidence. The Cohen's d value of 1.54 represents a large effect size. YPG Post mean 4.93±1.67 (expressed in mean ± standard deviation) was higher than YPG Pre mean 7.93 ±1.62. Thus, the yogic practice significantly reduced sleep quality index value.

Changes in memory ability. The Table 3 shows the results of independent – t-test which was executed between post values of YPG and CG. In the Kolmogorov-Smirnov Test, the p values for YPG and CG are 0.671 and 0.784, respectively, and they are both greater than 0.05. So, normality for both groups YPG and CG thus confirmed. The p value of the Levene test of variance equality for memory ability is 0.45, which is greater than 0.05 reveals that there were no significant variations in the variances of the post-values of YPG and CG on memory ability. Hence both groups have equal variances on memory ability values. After confirming normality and equal variances the data proceeded on independent t test. The independent t test between YPG and CG on memory ability showed p value is lesser than 0.001. Thus, it proved that both groups significantly differ at 0.001 level of confidence. The Cohen's d value of 1.53 represents a large effect size. YPG Post mean 55.35±8.55 (expressed in mean ± standard deviation) is higher than CG Post mean (41.1±10.07). Thus, the yogic practice significantly increased memory ability value.

The Table 4 shows the results of paired – t-test which was executed between pre and post values of YPG. The normality was checked by Kolmogorov-Smirnov Test between the pre and post values of YPG and the p value is 0.945 which is greater than 0.05. Therefore, normality was confirmed for pre and post values of YPG. After confirming normality, the data proceeded on paired t test. The paired t test showed p value is lesser than 0.001 for memory ability. Thus, it proved that YPG post values significantly differ from YPG Pre values at 0.001 level of confidence. The Cohen's d value of 0.85 represents a large effect size. YPG Post mean 55.35±8.55 (expressed in mean ± standard deviation) was higher than YPG Pre mean (45.4±8.88). Thus, the yogic practice significantly increased memory ability value.

Discussions. Based on the above research findings, college students frequently use smartphones got significant improvements in sleep quality and memory abilities after four months of yoga practice compared to the control group. The results achieved here are in line with those of previous research shows that Practicing yoga and meditation on a regular basis can help control the inappropriate behaviour symptoms linked to smartphone addiction [18]. Research by S. Kodidala et al. in 2022 demonstrated that college students' attention and orientation, memory, fluency, and visuospatial function significantly improved after 12 weeks of Surya Namaskar [11]. Surya Namaskar was one of the yoga poses we used in our research, and the results that we obtained were similar to those of the previous study. V.R. Hariprasad et

Table 4

Paired t test for within the group changes

Parameter Names	Normality	YPG- PRE Mean ± SD	YPG-Post Mean ±SD	t	p	Effect Size d
Sleep Quality	0.175	7.93±1.62	4.93±1.67	9.74	$<0.001^{***}$	1.54
Memory Ability	0.945	45.4±8.88	55.35±8.55	5.36	$<0.001^{***}$	0.85

CG – control group, YPG – yoga practice group, SD – standard deviation, $p<0.001^{***}$ – Highly significant.

al. showed that a six-month yoga intervention such as Loosening the joints and muscles, Asana, Pranayama and meditation in the form of Nadanusodhana has positive effects on psychological well-being, the environment, social interactions, and physical health of senior citizens residing in assisted living homes [9]. The current study also used OM meditation, asanas, pranayama, and loosening. The results are like those of the earlier research exhibited that the yoga group significantly improved the individuals' overall sleep quality Score which is also a reflection of a healthy psychological state of participants. Because sound mental well-being results in sound sleep.

The study conducted by Tyagi et al. showed that the experimental group's global PSQI score (mean ± SD) were significantly decreased in the within-group pre-post analysis ($P < 0.001$), but the control group did not change any significant difference ($P = 0.941$) [28]. As per the results of current research yoga practices proved that the experimental group's global PSQI score (4.93 ± 1.67 expressed in mean ± SD) was lower than control group (7.93 ± 1.62 expressed in mean ± SD). The study conducted by Sheela Joice P.P., Khaleel Ahmed Manik, Sudhir P.K. shows that three-months of yogic practices like Surya namaskar and asanas had significant improvements in attention, concentration, and memory [17]. In this study, suryanamaskar, asanas, and pranayamas were given, and the results proved that the results we achieved were comparable to those previously mentioned. A study conducted by Panjwani et al. (2021) revealed that yogic practices enhanced sleep and cognitive skills. A study by Parajuli et al found that four weeks of yogic practices reduced perceived stress and enhanced sleep quality among nursing professionals. [13; 16]. In this study, it is revealed that a sixteen-week regimen of yoga practices had significant beneficial effects on the memory ability and sleep quality of the experimental group in comparison to the control group who frequently engaged in smartphone. The current study used sample size of 80 which is comparatively small. In future upcoming studies may use a larger sample size.

Conclusions. The current study examined the impact of a four months of yoga training on college students' sleep quality and memory ability. The research findings revealed that yoga practice is excellent at improving sleep quality and memory ability, among college students frequently engage in smartphone usage.

Conflict of interest. The author has no conflicts of interest in the material presented in this article.

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