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Determination the effects of lavender oil quality of sleep and fatigue of students

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Abstract

Purpose: This study was conducted to determine the effects of lavender oil on the quality of sleep and fatigue of students.

Design and Methods: This study is an experimental study conducted with the intervention and control groups (pretest/posttest). In the intervention group, the students were treated with aromatherapy for one week.

Findings: It was found that the posttest Pittsburgh sleep quality index and checklist individual strength scores of the students in the intervention group were lower than those of the students in the control group, and the difference was statistically significant.

Implications for Practice: The results show that the use of lavender oil is an effective, reliable, and accessible method to relieve insomnia and fatigue problems of students.

KEYWORDS

fatigue, lavender, nursing students, sleep

1 | INTRODUCTION

Insomnia is one of the most common sleep disorders in the society. The condition is commonly defined as the difficulty of falling asleep, disruption of sleep integrity, and lack of restful sleep. Although the incidence of sleep disorders varies according to the societies and age groups, it is generally between 5% and 71%.[1] Studies from countries across the world have reported a prevalence of sleep disorders ranging from 1.6% to 56.0%.[2–4]

University students are one of the groups in which sleep disorders are common. Especially in recent studies, it has been reported that the amount and quality of sleep of university students has reduced significantly, sleep time has decreased, and sleep disturbances have increased. Students can often experience sleep problems due to adverse environmental conditions, such as leaving home, staying in dorms, and exhaustive courses and exams.[6–8,23]

Insomnia may cause serious social and medical problems, such as impaired social functions and decreased quality of life, psychiatric disorders, decreased mental activity, memory loss, slow response, autonomic dysfunction, and decreased immune function among the students. Especially in applied disciplines, such as nursing faculties, sleep problems experienced by students may also cause some accidents and injuries during training in clinical practice and skill laboratories as well as the above-mentioned problems. This poses serious risks both for the health of the students and for the patients they care for. [6,23] Ensuring adequate sleep and rest is important for protecting the physiological and psychological health, reducing accidents/injuries, and enhancing the students' academic success.[9,10] Therefore, it is extremely important to treat the sleep problems experienced by students.

In the treatment of insomnia, different treatment methods, such as sleep hygiene education, elimination of secondary causes, such as medical or psychiatric diseases, regulation of drug or substance use that causes sleep disruption, stimulus control, sleep shortening and relaxation treatments, cognitive behavioral therapies, pharmacotherapies, chronotherapy, phototherapy, acupuncture, hypnosis, and aromatherapy can be used.[7,11]

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An increasing number of researchers are keen on exploring new, simple, and safe auxiliary or alternative solutions to treat insomnia. Aromatherapy is an alternative that assists in the medical treatment by using the pure essential oils of an aromatic plant. Essential oils with different fragrances and colors are extracted from naturally aromatic plants. These essential oils mainly contain terpenes, aldehydes, esters, alcohols, and other chemical components. Essential oils can be directly inhaled, bathed in, or used in massages. Furthermore, they have been used to reduce insomnia, anxiety, pain, fatigue, and other symptoms.[12–14] Lavender oil is often used to treat sleep disorders. The main components of lavender oil, linalol and linalyl acetate, act on the central nervous system and facilitate falling asleep with a sedative effect.[15–17]

A limited number of studies have been conducted to determine the effect of lavender oil on the sleep quality of nursing students, and new studies are needed on the subject. In these limited number of studies, lavender oil was dropped on a cotton ball and placed at the bedside of the students, and it was found that inhalation of lavender oil facilitated students to fall asleep.[14,18,19] In this study, unlike previous studies, it was preferred to use lavender stone for the application of lavender oil. It is aimed to make aromatherapy application easier and more attractive by using lavender stone. This study was conducted to determination the effects of lavender oil on quality of sleep and fatigue of students.

2 | MATERIALS AND METHODS

2.1 | Desing and sample

This study is an experimental study conducted with the intervention and control groups as a pretest and posttest. The research was carried out in the nursing department of a university in the east of Turkey. The universe of the study consisted of the fourth grade students studying in the spring semester of the 2018–2019 academic year ($n = 160$). Since the exam, study, laboratory and hospital applications are much more intense, it was preferred to take fourth grade students.

The inclusion criteria were as follows:

- Not having a neurological-psychiatric disorder
- Not having any olfactory allergy or asthma problems
- Having no condition that would affect the sense of smell, such as upper respiratory tract infection, at the time of the study
- Not receiving any medical treatment related to sleep, and
- Willing to participate in the study

In this study, priori power analysis was performed to determine the sample size. In the power analysis, the method of taking Cohen's standard effect sizes as reference was chosen. In the power analysis performed, it was determined that at least 80 people should be reached to reach 80% power in the 95% confidence interval at 0.05 significance level and in the medium effect size range.

The participants were randomized into one of two groups upon enrollment using a 1:1 allocation ratio. Simple randomization was completed by a non-investigator, and envelopes were used to maintain blinding. In the intervention group ($n = 40$), the students were treated with aromatherapy for a week and there were no interventions for students in the control group ($n = 40$).

2.2 | Data collection

Student presentation form, Pittsburgh sleep quality index (PSQI) and checklist individual strength (CIS) were used to collect the data.

2.2.1 | Student presentation form

This form consists of questions to determine the socio-demographic characteristics (age, gender, class, marital status, etc.) and quality of sleep (sleeping at the same time every night, taking medical assistance for falling asleep).[14,18,19]

2.2.2 | Pittsburgh sleep quality index (PSQI)

Developed by Buysse et al.,[20] PSQI is a consistent and reliable tool that provides a quantitative measurement of the quality of sleep for discriminating between good and bad sleep. In the reliability analysis of the scale, the Cronbach alpha internal consistency coefficient was determined as 0.95. The scale provides information about the quality of sleep in the last month and the type and severity of the sleep disturbance. Of the 24 items in the scale, 19 are answered by the subject, while 5 are answered by the subject's bedmate. When the questions answered by the subject are evaluated, the questions answered by the bedmate are not taken into consideration. The scale has seven sub-dimensions: subjective sleep quality, sleep latency, sleep time, habitual sleep activity, sleep disturbance, sleep medication use, and daytime dysfunction. The sum of the points for the seven sub-dimensions gives the total PSQI score. The score of each sub-dimension ranges from 0 to 3. The total PSQI score ranges from 0 to 21. The sleep quality of those with a total score of ≥5 is considered "good."[20] In our study, the internal consistency Cronbach alpha coefficient for PSQ showed that the scale was highly reliable (0.90).

2.2.3 | Checklist individual strength (CIS)

Developed by Vercoulen et al.,[21] CIS is one of the most widely applied surveys globally to assess chronic fatigue. In the reliability analysis of the CIS scale, the Cronbach alpha internal consistency coefficient was determined as 0.92. The survey consists of 20 items that measure the fatigue of the person in the last 2 weeks, and a seven-point Likert type scale is used for answers. The sub-

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dimensions of CIS include subjective fatigue perception (questions 1, 4, 6, 9, 12, 14, 16, and 20), concentration (questions 3, 8, 11, 13, and 19), motivation (questions 2, 5, 15, and 18), and physical activity (questions 7, 10, and 17). The total CIS score ranges from 20 to 140, and a higher total score indicates increased chronic fatigue.[21] In our study, the Cronbach alpha coefficient was found to be 0.82.

2.3 | Research process

Aromatherapy by inhalation was applied to the students in the intervention group and decorative lavender stones were used for this purpose. Stone powder, water, lavender oil and a mold were used to make the lavender stones. For each mold, 20 g of stone powder was mixed with 30 ml of water, then seven drops of lavender oil were added into it. The essential oil used was chemically consistent with the International Organization for Standardization for Lavandula angustifolia. The prepared mixture was mixed thoroughly and made homogeneous. The homogenized mixture was poured into decorative heart-shaped molds and lavender stones were obtained. Prepared lavender stones were placed in lidded glass jars in order not to lose their smell. Each lavender stone is made in the same way and standardization of all stones is ensured. As long as it is used as specified by the manufacturer, lavender stone can remain for 6–7 days without losing its scent (Figure 1).

The lavender stones prepared were distributed to the students in the intervention group (one per student). Students in the intervention group were asked to remove the lavender stones from the glass jar and place them in a suitable place 10–15 cm from the bed, 20–25 min before going to bed every night for a week. They were advised to keep the lavender stone at the bedside overnight and put it back in the jar in the morning to preserve its fragrance. Students were asked to do this regularly every night for 7 days.

The amount of lavender oil to be used in the study and the other application procedure were determined in accordance with the previous studies and the relevant literature. Seven drops of lavender oil were used to create the desired lavender scent. It was placed 10–15 cm away from the headboards so that the students could sufficiently inhale the lavender scent. Before sleeping, the lavender stone was asked to be removed from the jar 20–25 min before sleeping to allow the lavender scent to spread into the room. It was requested to continue the application for a week to better determine the effectiveness of the aromatherapy.[14,16–18,22]

No intervention was made to the students in the control group and they were asked to maintain their normal sleeping habits for a week.

2.4 | Collection of research data

At the beginning of the research, the student information form, PSQI, and CIS were applied to the students in the experiment and control groups as a preliminary test. One week after the preliminary test was applied (after aromatherapy application ended), the PSQI and CIS were reapplied to the students in the intervention and control groups, and the final tests were completed. The questionnaire forms were distributed by the researcher to the students and collected back after the students filled them out. The filling of each form took about 10–15 min.

2.5 | Analysis of data

SPSS 21 package program was used in the analysis of research data. Descriptive (percentage, arithmetic mean, standard deviation, min–max) tests in the analysis of individual characteristics; to determine the effectiveness of interference between intervention and control groups, independent samples t test and χ^2 was applied.

2.6 | Ethical considerations

Before the research, ethical permits were obtained from the ethics committee of the university and from the relevant faculty where the research was conducted (22.04.2019 b.30.2. ATA.0.01.00/187). Before collecting data, the students' questions were answered and they were informed about the study (the principle of informed approval). Written consent was obtained from all students. Permission was obtained from the scale owners for the scales used in data collection.

3 | RESULTS

The mean age of the students was 19.88 ± 0.96 years. In this study, 82.5% of the students were female, 97.5% were single, and 76.3% were staying in a state dormitory. Furthermore, 87.5% of the students did not smoke and 96.3% did not use alcohol. It was noted that 55% of the students slept 6–7 h a night. Moreover, 62.5% of the

FIGURE 1 Lavender stone

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TABLE 1 Comparison of the groups according to the identifying characteristics of the students

Identifying characteristics	Control group *X* ± *SD*		Intervention group *X* ± *SD*		Test/significance
Age (years)	20.32 ± 0.91		19.45 ± 0.81		$t = 4.512$ $p = 0.640$
	n	%	*n*	%	Test/significance
Gender					
Female	34	85	32	80	$\chi^2 = 0.087$
Male	6	15	8	20	$p = 0.769$
Marital status					
Married	2	5	0	0	$\chi^2 = 0.513$
Single	38	95	40	100	$p = 0.474$
Employment					
Yes	1	2.5	3	7.5	$\chi^2 = 2.446$
No	39	97.5	37	92.5	$p = 0.294$
Smoking status					
Yes	5	12.5	5	12.5	$\chi^2 = 2.500$
No	35	87.5	35	87.5	$p = 0.287$
Alcol use status					
Yes	3	7.5	0	0	$\chi^2 = 1.385$
No	37	92.5	40	100	$p = 0.239$
Place of residence					
Student dormitory	28	70	33	82.5	$\chi^2 = 2.077$
Snug student dormitory	3	7.5	1	2.5	$p = 0.557$
Student house	2	5	1	2.5	
Family house	7	17.5	5	17.5	
Chronic dısease					
Yes	0	0	3	7.5	$\chi^2 = 3.117$
No	40	100	37	92.5	$p = 0.777$
Total time asleep (h)					
4–5	9	22.5	12	30	$\chi^2 = 1.029$
6–7	22	55	22	55	
8–9	9	22.5	6	15	$p = 0.598$
9 and over	0	0	0	0	
State of waking up rested					
Yes	7	17.5	7	17.5	$\chi^2 = 5.280$
No	29	72.5	21	52.5	$p = 0.071$
Sometimes	4	10	12	30	
Falling asleep during the lessons					$\chi^2 = 2.704$
Yes	5	12.5	9	22.5	$p = 0.259$
No	29	72.5	22	55	
Sometimes	6	15	9	22.5	

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TABLE 2 Between-group comparison of pretest and posttest score averages of PSQI of participants in intervention and control groups

	Pretest $X \pm SD$	Posttest $X \pm SD$
Intervention group	8.27 ± 3.00	5.60 ± 1.90
Control group	7.52 ± 2.89	7.57 ± 2.94
t	1.060	−3.472
p	0.292	**0.001**

Abbreviation: PSQI, Pittsburgh sleep quality index.

students stated that occasionally they woke up rested, and 63.7% experienced problems of falling asleep during the lessons.

Table 1 shows the comparison of the intervention and control groups according to the characteristics related to sociodemographic and sleep habits of the students included in the study. It was determined that there was no statistically significant difference between the groups in the distribution of characteristics related to sociodemographic and sleep habits ($p > 0.05$, Table 1).

The distribution of PSQI pretest and posttest scores is given in Table 2. When the PSQI pretest scores of the students in the intervention (8.27 ± 3.00) and control (7.57 ± 2.89) groups were compared, it was determined that there was no statistically significant difference between the groups and that both groups were similar ($p > 0.05$, Table 2). When the PSQI posttest scores of the students were compared, it was determined that the mean scores of the students in the intervention group were lower (5.60 ± 1.90) than those of the students in the control group (7.57 ± 2.94), and the difference between the groups was statistically significant ($p = 0.001$, Table 2, Figure 2).

TABLE 3 Between-group comparison of pretest and posttest score averages of CIS of participants in intervention and control groups

CIS and subscale	Intervention group $X \pm SD$	Control group $X \pm SD$	*t*	*p*
Subjective experience of fatigue				
Pretest	34.42 ± 9.14	31.00 ± 10.02	1.596	0.114
Posttest	26.02 ± 8.04	34.22 ± 9.74	−4.101	**0.000**
Consantration				
Pretest	18.87 ± 5.85	18.55 ± 6.33	0.218	0.812
Posttest	18.32 ± 5.03	19.45 ± 5.77	−0.926	0.326
Motivation				
Pretest	13.42 ± 5.63	13.62 ± 5.00	−0.168	0.816
Posttest	13.97 ± 5.71	13.52 ± 4.20	0.401	0.689
Physical activity				
Pretest	11.15 ± 3.99	10.15 ± 3.97	1.122	0.265
Posttest	10.70 ± 4.02	10.42 ± 3.88	0.311	0.756
Total				
Pretest	77.87 ± 17.91	73.32 ± 20.05	1.070	0.288
Posttest	69.02 ± 17.65	77.62 ± 19.01	2.097	**0.039**

Abbreviation: CIS, checklist individual strength.

The distribution of pretest and posttest score averages for CIS and its sub-dimensions in the experiment and control groups are given in Table 3. The pretest CIS scores of students in both groups were similar, and there was no statistically difference between the groups ($p > 0.05$, Table 3). However, when the posttest CIS scores

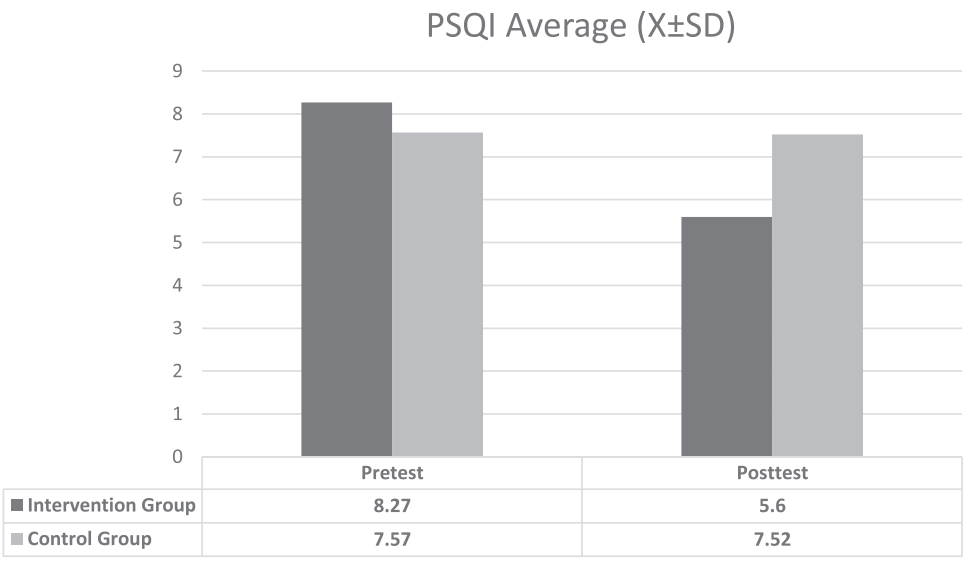

FIGURE 2 Pittsburgh sleep quality (PSQ) index average

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were examined, it was found that the total CIS score (69.02 ± 17.65) and perception of subjective fatigue score (26.02 ± 8.04) in the intervention group was higher when compared with the total CIS score (77.62 ± 19.01) and perception of subjective fatigue score (34.22 ± 9.74) of students in the control group, and the difference was statistically significant ($p = 0.039$, Table 3, Figure 3). No statistical difference was detected between the groups for the posttest scores of other CIS sub-dimensions ($p > 0.05$, Table 3). However, it was found that the posttest scores of students in the intervention group were lower when compared with the pre-test scores in all the CIS sub-dimensions (Table 3).

4 | DISCUSSION

In this study, the mean age of the students was 19.88 ± 0.96 years and 82.5% of the students were female. It was noted that 55% of the students slept 6–7 h a night and that 45% woke up at the same time every day. Moreover, 62.5% of the students stated that occasionally they woke up rested, and 63.7% experienced problems of falling asleep during the lessons (Table 1). Tümer et al.[23] determined in their study that the average age of the students was 20.99 ± 2.06% and 67.4% of them were female, 23% slept less than 6 h on average, 12.6% had physician-diagnosed insomnia. The findings of the study are similar to the findings of Tümer et al.[23]

The number of studies on sleep disorders experienced by students is very few and new studies are needed.[5–8] It is of great importance to determine the prevalence of sleep disorders among students, to raise awareness among students and to take initiatives to solve the problem with these studies to be carried out in the field outside the clinic.

Based on the results of this study, it was found that the posttest PSQI scores of the students in the intervention group treated with lavender stone were lower than those of the students in the control group, and the difference was statistically significant ($p = 0.001$, Table 2, Figure 2). Our results assert that aromatherapy applied through lavender stone improves the sleep quality of students. The molecules found in essential oils are absorbed through the nasal mucosa and enter the circulatory system after gas exchange. In the literature, it has been stated that aromatherapy administered by inhalation not only stimulates the sense of smell but also regulates enhanced brain functions, regulates memory, emotions, the nervous system, and enhanced functions of the brain, such as wakefulness and sleep through olfactory regulation.[15,19,24,25] The main components of lavender oil, linalol and linalyl acetate, which are frequently preferred in aromatherapy applications, have sedative-hypnotic effects and anti-anxiety effects. Owing to these effects, lavender oil can significantly reduce autonomic activities, shorten latency of sleeping time, prolong the duration of sleeping time, and increase gamma-aminobutyric acid and 5-hydroxytryptamine (5-HT) content in the brain.[26,27]

A limited number of studies have been conducted to determine the effect of lavender oil on sleep quality of nursing students. In a study involving nursing faculty students, Lee et al.18 found that lavender fragrance had a positive effect on students' insomnia and depression problems. In another study on college students, Lillehei et al.19 found that lavender inhalation improved the sleep quality of the students. Hirokawa et al.14 conducted a study on Japanese students and found that the smell of lavender applied at night increased the quality of sleep and made it easier for the students to wake up rested. The results of the present study are consistent with those of the previous studies

According to the results of this study, it was found that the total CIS score and perception of subjective fatigue sub-dimension score of students in the intervention group who inhaled lavender smell were lower than those of the control group and the difference was statistically significant ($p = 0.039$, Table 3, Figure 3). Our results establish that aromatherapy applied through lavender stone reduces the level of fatigue in the students. In the literature, it has been reported that sleepiness and fatigue are frequent in students during the day owing to the lack of sufficient rest due to insomnia.[28–30] Therefore it is expected that with the

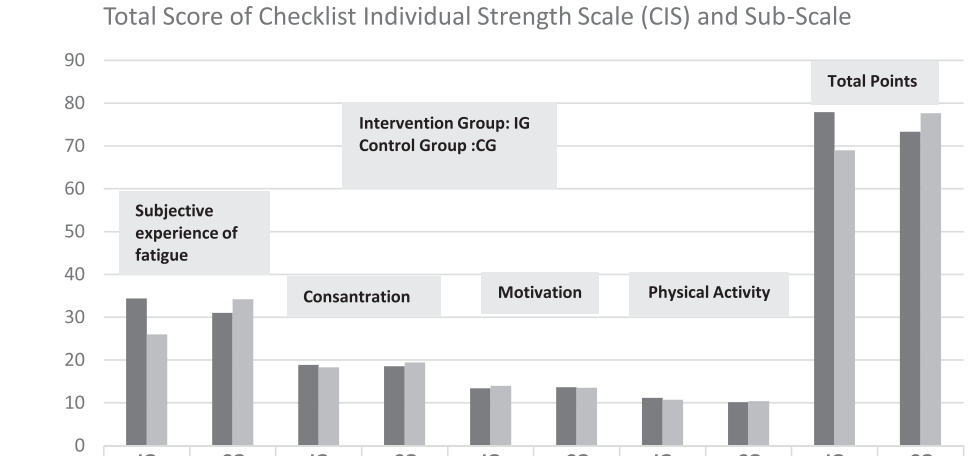

FIGURE 3 Total score of checklist individual strength scale (CIS) and subscale

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effect of aromatherapy, fatigue levels of students would decrease because of increased sleep quality. Consistent with our results, Lillehei et al.[19] also found that lavender oil improved the quality of sleep of students and reduced daytime fatigue. In their study, Sakamoto et al.[31] applied lavender oil to students through inhalation during rest breaks after intensive work at the computer and found that lavender oil relieved fatigue and increased the concentration levels.

4.1 | Limitations of the study

The greatest strength of the research is the use of a randomized controlled design. The limitation of the research is that the only with students in the related faculty.

5 | IMPLICATIONS FOR NURSING PRACTICE

In the present study, it was found that aromatherapy applied through lavender stone improved the sleep quality of students and reduced their fatigue. The results show that the use of lavender oil is an effective, reliable, and accessible method to relieve insomnia and fatigue problems of students.

Considering the encouraging results obtained, students can be informed about this subject to spread the use of lavender oil in the treatment of problems, such as insomnia and fatigue among students and awareness can be raised. We also believe that the use of decorative products, such as lavender stones will facilitate the application of aromatherapy and make it more visually attractive. Repeating this study in different groups with larger samples will increase the level of evidence and reliability of the findings.

CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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