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ORIGINAL ARTICLE

The effect of self-foot massage on anxiety and sleep quality in nursing students: A single-blind randomized controlled study

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ABSTRACT

BACKGROUND

Anxiety and poor sleep quality have always caused problems for nursing students. Today, self-foot massage is considered adjunctive therapy for reducing anxiety and improving sleep quality. This study aimed to evaluate the effects of self-foot massage on anxiety levels and sleep quality among nursing students with high anxiety.

METHODS

An experimental study with pre-test and post-test control groups, included 40 first-year nursing students who met the inclusion criteria (intervention= 20, control= 20). The students were randomized into intervention and control groups using block randomization. A block size of four was employed to maintain equal group sizes. State Anxiety Inventory (SAI) and Pittsburgh Sleep Quality Index (PSQI) were used to collect the data. In the self-foot massage group, subjects attended foot massage sessions at the same time every day for 10 days. Independent t-test and Chi-square method was used to analyze the data.

RESULTS

The intervention group performing self-foot massage demonstrated significantly lower mean scores for PSQI (7.70 ± 1.5) and SAI (34.10 ± 4.82) compared to the control group, whose mean scores were 8.00 ± 2.65 and 38.80 ± 3.04, respectively (p=0.03; p=0.021). These differences indicate improved sleep quality and reduced anxiety in the intervention group. Subjective sleep quality was also found to be better among participants in the intervention group. However, no significant differences were observed between the groups in the PSQI subcomponents (p>0.05).

CONCLUSION

Self-foot massage can be considered as a potential therapeutic intervention that improves sleep quality and reduces anxiety among nursing students with high level anxiety.

Keywords: Foot massage, state anxiety, sleep quality, nurses, nursing students.

INTRODUCTION

Nurses have been the practitioners of the healing process, aiming to heal the wounds of their patients, relieve their suffering, and help them regain their grip on life, along with the existence of humanity.[1] Today, nurses have the ability to provide care in accordance with accurate and up-to-date information in the recovery and care process of patients, thanks to the education they receive at the undergraduate level.[2,3] Nursing education is influenced by the developments in the medical field, which is constantly changing.[4]

Nursing is a discipline that requires both fast and accurate as well as rational decision making, and in order to achieve this, theoretical education and clinical education that they can apply are given together in nursing education.[4,5] However, clinical practice can be anxiety-provoking and stressful for students in the early stages. When factors such as students' grade anxiety, post-graduation employment concerns, a new life in a different city, changes in eating and exercise habits, and an increase in interpersonal relationships are added to this situation, the level of anxiety, which is defined as "a widespread, unpleasant feeling of an unknown threat",[6-10] also increases.

In a study by Cho and Kim,[5] it was found that as a result of increasing anxiety levels, students experienced physiological symptoms such as headache, nausea, back and neck pain, and fatigue; behavioral symptoms such as crying, anger, and eating disorders; and emotional symptoms such as anxiety, depression, excitement, anger, and loneliness. In addition, increasing anxiety levels also lead to changes in sleep habits and a decrease in sleep quality.[5] The decrease in the quality of sleep, which is one of the basic human needs, also negatively affects the achievement levels of students. Studies have shown that anxiety especially affects sleep quality and that anxiety-related sleep problems are common in society.[8-10]

It is also seen in the literature that students develop harmful habits such as smoking, alcohol and substance abuse due to their inability to manage their anxieties.[5,6,10,11] Disorders caused by unmanageable anxiety can be treated with pharmacological and non-pharmacological interventions. Recently, there has been an increased interest in non-pharmacological interventions, which are also called complementary and supportive interventions (biofeedback, autogenic relaxation, meditation, yoga, hypnosis, music and massage therapies, progressive relaxation, etc.) that have no side effects. Many studies have reported positive effects of non-pharmacological methods on anxiety, pain, and sleep quality.[1,12-14] One of these methods is classical foot massage, which is preferred because the foot has more dense nociceptors on its surface than other regions and thus increases endorphin release. In addition, its ease of application and low cost are important factors that increase the frequency of choosing this method. The literature suggests that classical foot massage reduces anxiety levels and improves sleep quality.[14-19]

Foot massage in Turkey is usually performed by a practitioner on patients or healthy individuals. However, studies from East Asian countries have shown that when self-foot massage skills were taught to individuals, symptoms such as pain, anxiety, sleep disorders, and fatigue were reduced.[5,20] In addition, in nursing students after self-administered foot massage,[6,21-25] anxiety levels decreased, vital signs improved, and fatigue decreased.[21,22] In hypertensive patients, blood pressure decreased after foot massage administered by a nurse,[23,26-28] while sleep quality improved.[24] In contrast, Fazlollah et al.[29] found that reflex foot massage did not impair patients' quality of sleep following heart surgery. Since earlier studies have found conflicting results, it is necessary to conduct a new study, because sleep plays an essential role in maintaining health, improving work performance, and in delivering high-quality services.

Nursing students who are new to university education are assumed to have increased anxiety levels and impaired sleep quality due to the process of adaptation to the nursing profession, concerns about the future, and changes in the psychosocial environment. In light of this information, this study aimed to determine the effects of self-foot massage on anxiety and sleep quality in nursing students experiencing high levels of anxiety.

METHODS

Research design

This pretest–posttest, randomized controlled experimental study was conducted with first-year nursing students at Niğde Ömer Halisdemir University, Zübeyde Hanım Faculty of Health

Sciences. The study was conducted between December 1, 2021, and March 31, 2022.

Study subjects

The study population consisted of 105 students who were studying in the 1st grade of the Nursing Department in the fall semester of the 2021-2022 academic year. The study sample included 65 female students who scored 37 and above on the state anxiety scale. Since male students' SAI scores were below 37, the study sample consisted of only female students. Twenty-five students were excluded from the study based on the exclusion criteria. The remaining 40 female students were randomized into intervention and control groups using block randomization. A block size of four was employed to maintain equal group sizes. Within each block, two students were randomly assigned to the intervention group and two to the control group, ensuring balance across the study groups.

To determine the sample size for this study, a priori power analysis was performed using G*Power 3.1.9.7. Based on an effect size of 0.80, a margin of error of 0.05, and a power level of 0.80, the required sample size was calculated as 20 participants per group. Accordingly, 20 participants were assigned to the intervention group and 20 to the control group.The inclusion criteria for the study were as follows: a score of 37 or higher on the State Anxiety Inventory, being educated in the 1st grade, voluntary agreement to participate in the study, residing in a student dormitory, being 18 years of age or older, having no prior self-foot massage training or experience, and not having any contagious skin diseases on the foot, local infections, open lesions/wounds, scar tissue, edema, hematoma, thrombophlebitis, deep vein thrombosis, lymphangitis, coagulation disorders, varicose veins, osteoporosis, osteomyelitis, hepatitis, inflammatory and degenerative joint diseases, advanced neuropathy due to diabetes, toe deformities, or recent fractures, dislocations, and muscle fiber, tendon, or fascia ruptures.

The exclusion criteria for the study were as follows: students scoring 36 or lower on the State Anxiety Inventory, residing outside the student dormitory, such as in a family home, student house, or hotel, withdrawing from the university or changing their accommodation during the study period, and failing to attend the mandatory study training and activities.

Measurements

The data collection tool was a three-part questionnaire consisting of demographic information,[6,7] the Pittsburgh Sleep Quality Index,[10,30] and the State Anxiety Inventory.[31,32] The first part included demographic questions such as age, gender, and marital status, which were developed by the researchers based on relevant literature.[6,7] Although all participants completed the demographic form, the entire sample consisted of female students who were 18 years old and single. Therefore, no variation was present in the demographic characteristics, and these variables were not included in further analyses.

Pittsburgh sleep quality index (PSQI)

A self-report measure that evaluates sleep quality and sleep disturbances in the past month. It was developed by Buysse et al.[30] and has shown adequate internal consistency, test-retest reliability and validity. The validity and reliability of the index in our country was done by Ağargün et al.[10] and it was determined to be suitable for the Turkish society. There are 18 items that contribute to the scoring of the PSQI. The PSQI has 7 components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances-situations affecting sleep, use of sleeping pills/substances, and daytime dysfunction-sleepiness. The total PSQI score ranges from 0 to 4, indicating good sleep quality, and from 5 to 21, indicating poor sleep quality and showing that there is a serious impairment in at least two components or a moderate impairment in three components of the PSQI.

State anxiety inventory (SAI)

The scale was developed by Spielberger et al.[31] to measure the state anxiety levels of normal and abnormal individuals, and was adapted by Öner and Le Compte.[32] It is a self-evaluation type of scale consisting of short statements, that was developed to measure the anxiety of a person at a specific moment and condition, and that determines how a person feels at a certain time and situation. The state anxiety inventory items are answered by marking one of the options (1) none, (2) a little, (3) a lot, or (4) completely, according to the intensity of the emotion or behavior expressed in the items. There are 10 direct statements and 10 reverse-coded statements in the inventory, the reverse-coded statements being items 1, 2, 5, 8, 10, 11, 15, 16, 19 and 20. The state anxiety score is calculated by adding 50 points to

the difference between the weighted scores of direct statements and reverse-coded statements. The scores obtained from the state anxiety scale vary theoretically between 20-80 points. In the evaluation of the scale, it is accepted that there is no anxiety in those who score below 36, mild anxiety between 37-42 points and high anxiety in those who score 42 and above.[31,32]

Preparation stage

At this stage, the researchers, who had completed 16 hours of classical foot massage training at a private reflexology center (8 hours theoretical and 8 hours practical), designed a 10-day program to provide self-administered foot massage training to the intervention group twice a week. Following the five-week training program, a self-administered foot massage protocol was implemented. According to this protocol, participants in the self-administered foot massage group attended foot massage sessions (n=20) at the same time each day for 10 consecutive days.

Intervention

The details of the classic foot massage application are as follows**:** The intervention was conducted individually for each participant in the faculty's technical room, under conditions of appropriate lighting and temperature, and was based on the training given to the students before hand. At each session, students washed and dried their feet with a towel, then sat in a comfortable chair, with a small pillow placed under the knees to prevent fatigue. During the massage, the students used three main movements that they had learned to give an effective massage to their feet: (i) Effleurage movement: with this technique, the students slid their hands and fingers lightly and continuously over the foot, stimulating blood circulation and relaxing the muscles; (ii) Friction movement: In this method, local pressure was applied using the fingers and thumb, especially on the muscles and tendons, which allowed reaching deeper layers of the muscles; (iii) Petrissage movement: With this technique, kneading-like movements were applied, reducing tension on the muscles with more intense pressure and increasing circulation even more.

In addition to these movements, the students applied a small amount of liquid glycerin to their hands to increase the slipperiness and effectiveness of the massage. The massage, which was carefully applied to each foot, started with the right foot and lasted 10 minutes, then moved to the left foot and lasted another 10 minutes, making a total of 20 minutes of massage applied to the feet by each student. During this time, the students' comfort and the correct application of the massage techniques were observed and guided by the researchers if necessary. In addition to this massage process, the students were instructed not to talk to each other during the massage in order to maximize the calming and therapeutic effects of the massage. This silent environment was designed to help the students fully relax and focus on the peace brought by the massage. The researchers created the atmosphere needed for the students to remain silent during the massage and to fully benefit from the potential stress-reducing effects of the massage in this way.

Self-foot massage application protocol

First day:

1. A form is filled out to determine the participants' characteristics.
2. SAI is applied.
3. PSQI is applied.
4. Participants perform self-foot massage for 20 minutes according to the training given beforehand.

For the next 9 days, every day, participants apply the 20-minute self-foot massage under the supervision of the researchers. On the last day, which is the 10th day, SAI and PSQI scales are applied after the massage.

This protocol is prepared to ensure that each participant completes all the steps in the specified time and order throughout the research. Participants should be in a comfortable and quiet environment during the massage and should not talk to each other. This process is important to maintain the integrity of the research and increase the reliability of the results.

Application phase

This research involves self-massage for the intervention group and none for the control group. Both groups were administered a form that identifies their specific characteristics, SAI and PSQI. While the students in the intervention group repeated these measurements before and after self-massage, the control group was administered the SAI and PSQI scales at the same time intervals without any self-massage. The massage was applied in the faculty's technical room based on the training given to the students. As before. after cleaning and drying their feet, the students started to apply classical foot massage techniques while

being comfortably seated in a chair. The techniques applied were effleurage, friction and petrissage, and a small amount (3-5 drops) of room temperature liquid glycerin was used to increase the smoothness of the massage. The students applied 10 minutes of massage to each foot, and the application lasted a total of 20 minutes. Silence was maintained during the massage, and the aim was to allow the students to relax completely.

Statistical analysis

The statistical analysis of the data was performed using the Statistical Package for the Social Sciences (SPSS) 24.0 software package. The difference between the intervention and control groups in terms of numerical variables was examined by independent t-test if the homogeneity of the groups was ensured. The Chi-squared test was used to determine whether there was a difference between the intervention and control groups in terms of categorical variables, for which a p-value of <0.05 was considered statistically significant.

Ethical clearance

The study was started after approval was obtained from the Nigde Omer Halisdemir University Ethics Committee (Meeting Date: November 22, 2021, Decision No: 2021/17-08) and an institutional permission was granted from the institution where the study was conducted.

RESULTS

The accessible sample was 65 female students who scored 37 or above on the State Anxiety Inventory (SAI) test. Male students were excluded from the sample as their SAI scores were below 37. Female students who scored 36 or below on the State Anxiety Inventory were also excluded from the study. Due to exclusion criteria, 25 students were removed from the study, resulting in a final sample of 40 students, with 20 assigned to the intervention group and 20 to the control group (Figure 1).

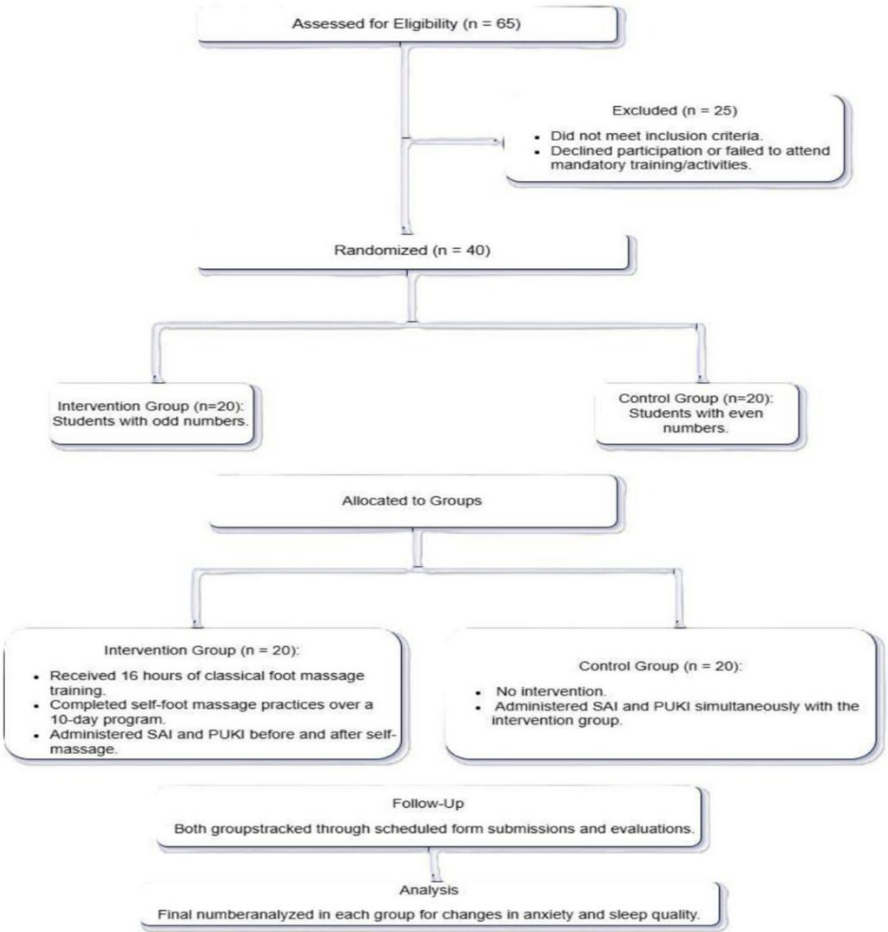

Figure 1. Flowchart of the participants

Table 1. Base-line characteristics of the two intervention groups

Scales	Groups		p value
	Self-foot massage (n=20)	Control (n=20)	
PSQI			
Subjective sleep quality	3.20 ± 0.77	1.40 ± 0.94	0.265
Sleep latency	2.90 ± 1.02	2.15 ± 0.88	0.716
Sleep duration	0.00 ± 0.00	0.00 ± 0.00	-
Habitual sleep efficiency	0.15 ± 0.67	0.00 ± 0.00	0.152
Sleep disturbance	2.90 ± 1.37	3.20 ± 1.43	0.210
Use of sleeping medication	0.00 ± 0.00	0.00 ± 0.00	-
Daytime dysfunction	1.50 ± 0.69	1.50 ± 0.89	0.327
Total	10.65 ± 1.95	8.25±2.69	0.524
SAI Total	38.70 ± 6.22	38.25±3.04	0.358
Subjective sleep quality			
Very well	4 (57.1)	3 (42.9)	0.842
Quite good	8 (47.1)	9 (52.9)	
Quite bad	8 (61.5)	5 (38.50	
Too bad	0 (0.0)	3 (100.0)	

Note: PSQI : Pittsburgh sleep quality index; SAI : State anxiety inventory; data preented as mean ± SD, except Subjective sleep quality n (%)

Since all participants were female, 18 years old, and single, no demographic variability existed within the sample. As a result, demographic data were not reported, and no comparisons based on demographic variables were conducted. The results are presented solely based on the scores obtained from the PSQI and the SAI.

At base-line, data analysis did not find significant differences between the two groups in terms of PSQI and SAI factors (p>0.05) (Table 1). These results indicate that the study's randomization process effectively balanced baseline sleep quality (measured by the PSQI) and anxiety levels (measured by SAI) across the intervention and control groups.

The mean sleep quality score in the control and intervention groups at base-line was 8.25 ±2.69 and 10.65±1.95, respectively, indicating no significant difference (p=0.524). Similarly, mean anxiety level in the control and intervention groups at base-line was 38.25 ±3.04 and 38.70 ± 6.12, respectively, indicating no significant difference (p=0.350) (Table 1).

When examining the findings presented in Table 2, some significant differences were observed between the intervention group performing self-foot massage and the control group. The total PSQI score was significantly lower in the intervention group compared to the control group (p=0.033). Similarly, the total SAI score was significantly lower in the intervention group (p=0.021). Regarding the distribution of subjective sleep quality, individuals in the intervention group reported “very good” and “quite good” sleep quality at higher rates, whereas a greater proportion of the control group reported “quite poor” and “very poor” sleep quality, the difference being statistically significant (p=0.018). On the other hand, no significant differences were found between the groups in the PSQI subcomponents, including subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction (p>0.05). These results suggest that self-foot massage may have positive effects on overall sleep quality and anxiety levels.

DISCUSSION

The main findings of this study revealed that the intervention group performing self-foot massage demonstrated significant improvements in sleep quality and anxiety levels compared to the control group. Specifically, the intervention group had a significantly lower total PSQI score, as well as a significantly reduced total SAI score. In terms of subjective sleep quality, a greater proportion of participants in the intervention group reported “very good” and “quite good” sleep quality, whereas higher rates of “quite poor” and “very poor” sleep quality were observed in the control group. No significant differences were detected between groups with respect to PSQI subcomponents such as sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction.

Table 2. Comparing mean scores of PSQI and SAI between self-foot massage and control groups after the intervention

Scales	Intervention		p value
	Self-foot massage (n=20)	Control (n=20)	
PSQI			
Subjective sleep quality	1.00 ± 0.56	1.25 ± 0.85	0.466
Sleep latency	1.95 ± 0.76	2.05 ± 0.94	0.714
Sleep duration	0.00 ± 0.00	0.00 ± 0.00	-
Habitual sleep efficiency	0.00 ± 0.00	0.00 ± 0.00	0.324
Sleep disturbance	3.70 ± 0.98	3.30 ± 1.34	0.119
Use of sleeping medication	0.00 ± 0.00	0.00 ± 0.00	-
Daytime dysfunction	1.05 ± 0.51	1.40 ± 0.82	0.114
Total	7.70 ± 1.59	8.00 ± 2.65	0.033*
SAI Total	34.10 ± 4.82	38.80 ± 3.04	0.021*
Subjective sleep quality			
Very well	3 (50.0)	3 (50.0)	0.018*
Quite good	14 (58.3)	10 (41.7)	
Quite bad	3 (37.5)	5 (62.5)	
Too bad	0 (0.0)	2 (100.0)	

Note : PSQI : Pittsburgh sleep quality index; SAI : State anxiety inventory; data presented as mean ± SD; except Subjective sleep quality n(%); p-value<0.05 means that the variable is statistically significant

These findings are largely consistent with previous research reporting that foot massage may enhance sleep quality and reduce anxiety among nursing students. Wang et al.[33] demonstrated in a meta-analysis that reflexology improves depression, alleviates anxiety, and enhances sleep quality. Similarly, in the study by Gholitabar Omrani et al.,[35] which examined the effect of foot massage on nurses' sleep quality, foot massage was found to improve overall sleep quality while reducing sleep latency, sleep inefficiency, and sleep disturbances.

The underlying mechanism may be explained by the stimulation of peripheral nerves in the feet through massage, which promotes relaxation, enhances blood circulation, and reduces physiological arousal. Collectively, these processes may contribute to improved sleep and decreased anxiety.[21,25,35] Therefore, foot massage appears to be an effective, non-pharmacological intervention to support sleep quality and mental well-being among students.

These results are especially important in the context of nursing education, as students often experience high levels of stress due to academic pressures.[2,4,6,12-15] Sleep quality is assessed by how refreshed and energetic a person feels after waking up and is influenced by factors such as gender, lifestyle, occupation, academic status, socio-economic conditions, and general health.[23-25,36] This diversity can significantly affect the quality of sleep experience and therefore it is important to consider each factor for the purpose of improving individual sleep quality. Studies have shown that sleep quality of university students who are educated in health fields is generally low.[37,38] Intensive training programs in fields such as nursing, medicine, and pharmacy limit the sleep duration of students and increase the sleep problems that are common among these students over time. In addition, research conducted with students in this group indicates that their stress levels have a significant effect on sleep quality.[39,40] Additionally, in our study the intervention group demonstrated an improvement in subjective sleep quality compared to the control group. Specifically, the proportion of participants reporting "quite good" sleep quality increased from 47.1% to 58.3%, while those reporting "quite bad" sleep quality decreased from 61.5% to 37.5%. These findings clearly indicate the effectiveness of foot massage, an intervention known to enhance sleep quality, in helping students prevent sleep-related problems.

This study shows that foot massage reduces the stress levels and improves the sleep quality of nursing students, and these results are in line with the findings of Cho and Kim [5] on nursing students, Kırca and Çetin[40] on pregnant women, and the systematic review of Li et al.[41] on nurses. The outcomes of these studies support the idea that massage interventions have stress-reducing and sleep-enhancing effects on health professionals.[40,41]

Arslan et al.[38] conducted a study on women with essential hypertension and found that foot and back massage were effective in lowering blood pressure and improving sleep quality Similarly, Solmaz[39] demonstrated that foot massage had positive effects on peripheral edema and sleep quality in patients with congestive heart failure. These studies highlight the potential benefits of foot massage on both physical and mental health.

Nursing students, as a part of an applied discipline, may experience anxiety and sleep quality problems, especially in the first year of their study program. Self-foot massage, as a non-pharmacological method to cope with these problems, is seen as an effective tool for managing them if students can acquire the skill to do it correctly.

This study highlights the potential of classical foot massage as a therapeutic intervention for improving sleep quality and reducing anxiety among nursing students. Despite its promising findings, the limitations of this study include the short intervention duration, and the lack of long-term follow-up, which restrict its generalizability and the ability to assess sustained effects. The reliance on self-reported data also presents potential bias. Clinically, foot massage offers a non-pharmacological, cost-effective approach that could be integrated into nursing education and potentially applied in healthcare settings for stress management. Future research should expand sample diversity, compare different massage techniques, assess long-term effects, and investigate underlying physiological mechanisms to refine its practical applications.

A key limitation of this study is the absence of a placebo group, which may have influenced the interpretation of the intervention's effectiveness. Although both an intervention and a control group were included, a placebo group was not implemented due to practical constraints related to time, setting, and available resources. Furthermore, considering that the intervention involved self-administered foot massage, designing a convincing placebo condition that would not introduce potential confounding variables or participant awareness posed a methodological challenge. Despite this limitation, the inclusion of a control group allowed for meaningful comparisons, and the findings still offer valuable insights into the potential benefits of self-administered foot massage among students. Future studies should consider incorporating a placebo group to overcome this limitation and provide more robust evidence regarding the efficacy of the intervention.

CONCLUSIONS

As a result, this study suggests that self-foot massage can be an effective method for reducing anxiety and improving sleep quality for nursing students with high level of anxiety, and recommends that such simple, applicable interventions should be evaluated for the integration of foot massage into the stress management strategies and educational programs of nursing students.

Conflict of Interest

No relevant disclosures.

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Authors Contributions

KKS: conceptualization, methodology, data curation, supervision, formal analysis original draft preparation, visualization; SG: conceptualization, validation, reviewing and editing, All authors have read and approved the final manuscript.

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Data Availability Statements

The datasets generated during and/or analyzed during the current study are not publicly available due protection of personal data of participants but are available from the corresponding author on reasonable request.

Declaration the Use of AI in Scientific Writing

No support from artificial intelligence.

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