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Highlights

- Job stress at the workplace influences nurses' health and care quality;
- Effects of aromatherapy using lavender and rose on nurses' job stress have not been compared;
- Aromatherapy using rose scent can reduce nurses' overreliance on medications for relieving job stress.

Effects of Rose and Lavender Scents on Nurses' Job Stress: A Randomized Controlled Trial

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Abstract

Introduction: A high percentage of nurses working in hospitals suffer from job stress and related psychological problems. This study aimed to examine and compare the effects of aromatherapy using lavender and rose scents on nurses' job stress.

Materials and methods: This randomized placebo controlled trial was conducted on 118 eligible nurses who were randomly assigned into three groups of lavender (n =39), rose (n =40), and sesame seed as placebo (n =39). The nurses received lavender and rose scents for two hours a day during four weeks. The Gray-Toft and Anderson's Nursing Stress Scale (NSS) was used to measure job stress before the interventions on the first day, at the end of the second and fourth weeks. Descriptive and inferential statistics tests were used for data analysis. The statistical significance level was set at $p < 0.05$.

Results: No statistically significant differences between the groups in job stress before the interventions and at the end of the second week were observed. There were statistically significant differences between the groups at the end of the fourth week ($p <0.003$). Aromatherapy using rose scent had a positive effect on the nurses' job stress at the end of the fourth week compared to the placebo ($p = 0.002$).

Conclusion: Aromatherapy using rose scent is a safe and non-pharmacologic method that can be used by nurses for improving their own comfort at the workplace. It can reduce nurses' overreliance on medications for relieving the symptoms of job stress.

Key words: Aromatherapy; Lavandula; Rose; Job stress; Nurses; non-pharmacologic method

1. Introduction

Job stress is a big health problem in modern societies and 40–50% of all job losses have been attributed to job stress (1). Nurses are the largest healthcare providers that provide care to patients 24 hours a day. They are exposed to high psychological pressure at the workplace (2). Job stress influences nurses' health and can reduce the quality of patient care (3). Although all healthcare professionals experience job stress, nurses experience it more than others (4-5).

Stress is the psychological and physiological response to events that upset one's personal balance. It has social, environmental, physiological and cognitive sources, and can cause physical, mental and behavioral symptoms (6). Occupational stress has a variety of effects on people's physical and mental conditions. Physical problems encompass fatigue, high blood pressure, sleep disturbances, and changes in appetite. Psychological symptoms are anxiety, emotional and cognitive problems, anger, and fear leading to the reduction of care quality and job satisfaction (7,8).

The results of studies conducted in Iran also have shown that nurses working in hospitals experience job stress and suffer from related psychological problems (9-11). Job stress damages nurses' professional performance and personal life leading to conflicts in their work and personal life (7). Job dissatisfaction can cause nurses to quit their job. Also, it discourages volunteers to enter the nursing profession. Low quality of patient care is one of the manifestations of job stress among nurses (8). Therefore, nurses need support to be able to reduce their job stress and improve the quality and safety of patient care (12).

Complementary medicine and alternative therapies such as acupuncture (13), cold and heat therapy (14), acupressure (15), massage therapy (16), relaxation (17), meditation (18), yoga (19), and aromatherapy (20-21) have been recommended for the reduction of job stress among nurses. Aromatherapy as one of the most common methods of alternative and complementary therapy has been shown effective in the promotion of individuals' physical and mental health (22).

Aromatherapy involves the controlled use and inhalation of pure essential oils extracted from plants and/or the application of massage along with aroma oil leading to skin absorption (23). Aromatherapy is performed using lavender as an aromatic oil. It has anti-anxiety, antibacterial, antifungal, carminative, antispasmodic, anti-inflammatory, and anti-histamine properties. Also, its

effectiveness in relieving sleep disorders among middle-aged women has been shown empirically (24). This plant contains compounds such as terpenes, glycosides, flavonoids, and anthocyanin that have useful effects on the human health. Also, rose scent has hypnotic, antiepileptic, and sedative effects on the central nervous system (25).

Previous studies have shown the effectiveness of lavender essential oil in the reduction of job stress (20, 26-27). However, no study has compared the effects of lavender and rose scents on nurses' job stress. Therefore, this study aimed to examine and compare the effects of aromatherapy using rose and lavender essential oils on nurses' job stress. The research hypothesis was as follows: aromatherapy using lavender and rose essential oils had different effects on the reduction of nurses' job stress at the workplace.

2. Material and methods

2.1.Design and participants

This randomized placebo controlled clinical trial was carried out on 118 nurses working in two selected hospitals in an urban area of Iran from October 2015 to December 2016. They were randomly assigned to three groups of lavender (n =39), rose (n =40), and sesame seed as placebo (n =39). The research protocol was registered on the Iranian Registry of Clinical Trials (IRCT CODE: IRCT201407176342N4).

Inclusion criteria for the recruitment of nurses were: having a bachelor's degree in nursing, working in fixed work shifts, willingness to participate in the study, having a healthy sense of smell, having at least one year work experience in nursing, no history of asthma and allergy, no history of a traumatic event within one month prior to the study, and no smoking habit. Reluctance to take part in the study and the feeling of discomfort when smelling essential oils led to the nurses' exclusion.

A pilot study was carried out and the mean scores and standard deviations of job stress in rose and lavender groups were estimated as 72.6 ± 8.75 and 78.5 ± 9.19, respectively. With the consideration of alpha 0.05 and power 0.80 using the following sampling formula, the sample size was estimated 36 people in each group. To cover the dropout rate, the sample size was increased to 40 people per group.

$$n = \frac{(\sigma_1^2 + \sigma_2^2) + \left(z_{1-\alpha/2} + z_{1-\beta}\right)^2}{|\mu_2 + \mu_1|^2}$$

The nurses were randomly assigned to three groups of lavender, rose, and sesame seed as placebo using the block randomization method by which the participants were matched according to gender and age. Six blocks of four were used for the group assignment:

AABB	ABAB	ABBA
BAAB	BABA	BAAB

The random allocation sequences were developed by the statistical expert. Four categories were developed based on gender (male and female) and age (two groups with a cutoff point of 35 years). The intervention type was written on pieces of paper and placed in sealed opaque envelopes, which were opened by the first author to determine the order of entry of the participants to the groups. The nurses were placed according to the assigned code to each category. They were randomly assigned to three groups of lavender, rose, and sesame seed as placebo (n=40 in each group).

The research process has been depicted in figure 1.

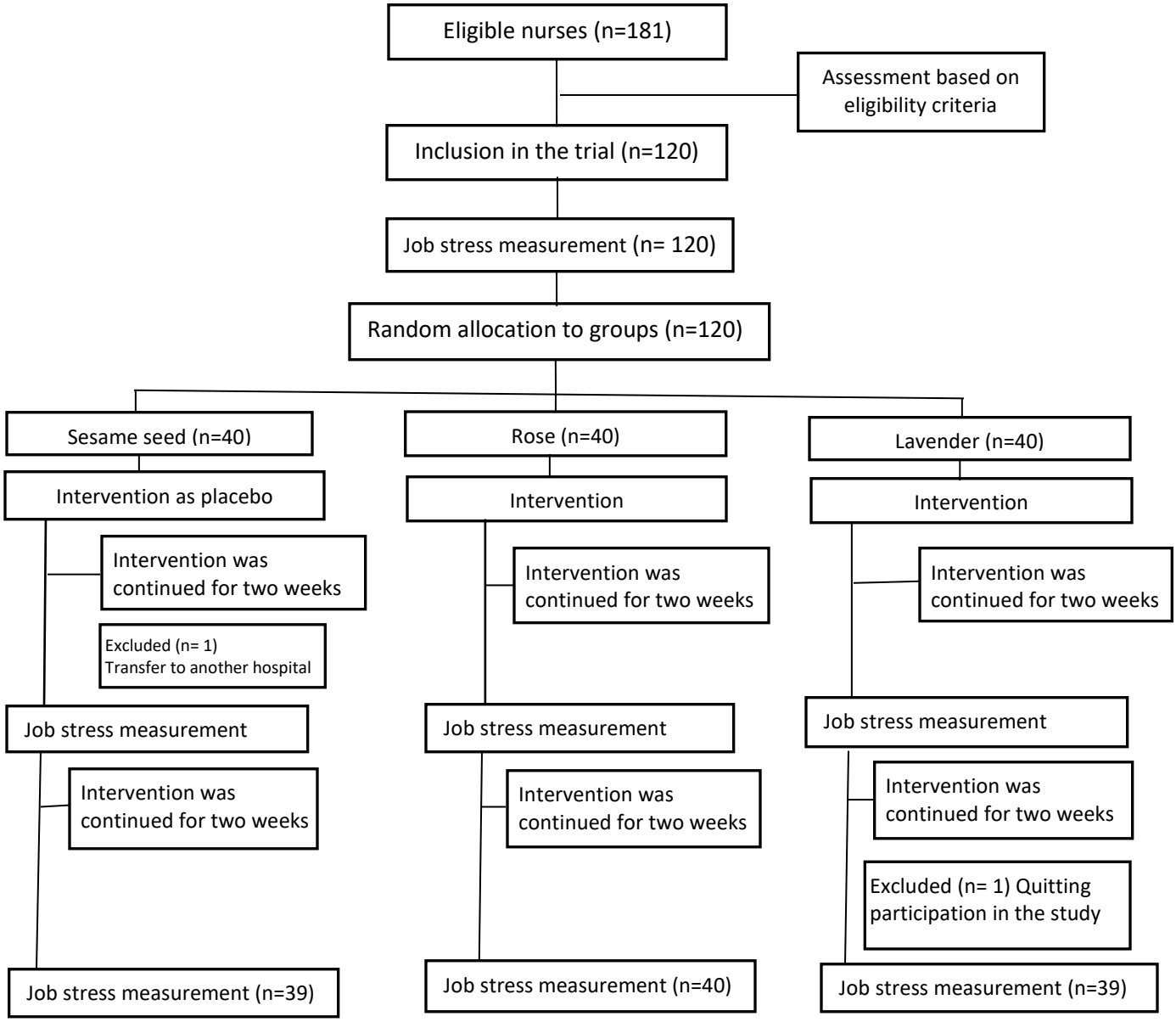

Figure 1. Flow diagram of the research process according to the Consolidated Standards of Reporting Trials (CONSORT).

Data collection

A demographic questionnaire was used to collect data about the participants' age, gender, height, weight, body mass index (MBI), marital status, number of children, ward, work shift, overtime hours, and work experience as a nurse.

Also, the Gray-Toft and Anderson's Nursing Stress Scale (NSS) was used to measure nurses' job stress at their workplace. This 34-item questionnaire has a four-point Likert type scale: never

stressful (score 1), occasionally stressful (score 2), often stressful (score 3), and always stressful (score 4). The lowest and highest possible total scores are 34 and 136, respectively. The total score is interpreted as either low stress (score ≤ 68), moderate stress (score 69-103), or high stress (score ≥ 104) (28-30). The reliability of the NSS using the Cronbach's alpha calculation method in Indian nurses has been reported 0.84 (31). The Cronbach's alpha coefficient of the NSS in this study was reported 80.5% indicating its acceptable reliability.

2.2.Interventions

At the beginning of the study, 181 nurses were assessed against the eligibility criteria, and 120 nurses were recruited.

Lavender essential oil used in this study was from the lavender plant as Lavandula officinalis. It is cultivated in the research farm of Semnan Jihad Agricultural Scientific-Applied Training Center and corresponded to Dr. Ghahraman's flora (decree code: 001/004/114; number: 1316). The laboratory of the center manufactured lavender essential oil using the Clevenger essential oil extraction machine via water distillation called hydro distillation. Information about the chemical constituency of lavender essential oil was not provided by the manufacturer.

Rose essential oil (Rosa damascena essential oils or Damask rose) and sesame oil had health approval license numbers of 10516/40 and 99-91-sa, respectively. They were manufactured by Barij Essential Oil Pharmaceutical Company® of Kashan, Iran. The main chemical constituents of rose essential oil were β-Chamigrene (9/47%), β-Himachalene oxide (9/39%), Viridiflorene (8/25%), γ-dehydro-ar-Himachalene (8/19%), α-Selinene (6.92%), and Caryophyllene oxide (5.29%).

The lavender and rose essential oils were used in the intervention groups and sesame seed oil was used in the placebo group. The NSS was filled out by the nurses before the intervention at the first day, end of the second week, and end of the fourth week. At the beginning of each work shift, the nurses received 0.5 ml of essential oil of his/her respective group including rose, lavender and sesame seed. However, they were not informed of the type of essential oil, as they were kept blind to it.

The essential oil was poured in a laboratory tube and was installed on the first button of his/her shirt approximately 20 cm from the nose. The participants were exposed to the scent for

two hours a day within a 4-week period. The interventions were quite safe and had no possibility of harm.

2.3.Data analysis

To avoid bias during the data analysis, the biostatistician was not informed of the group assignments. To check for the normal distribution of numerical variables, the Kolmogorov-Smirnov test was run. Descriptive statistics including the mean score and standard deviation, as well as the inferential statistics such as Chi-square test, one-way ANOVA test, and Bonferroni post hoc test were used for the data analysis. The statistical significance level was set at $p < 0.05$.

2.4.Ethical consideration

The permission from the Ethics Committee of the university (decree code: 469707) was obtained. The willing participants were asked to sign the written informed consent form before the study. They were assured that collected data would remain confidential and their identifies would not be disclosed. The participation in this study was voluntary so that they could withdraw from the study at any time.

3. Results

3.1.Participants' demographic characteristics

Two nurses were excluded from the study because they changed their perspectives to cooperate with this research and transferred to work in another hospital. Therefore, data collected from 118 nurses in three groups of lavender (n =39), rose (n =40), and sesame seed (n =39) were used for the data analysis.

The mean age of the nurses was 35.75 ± 5.18 years. Their overtime work hours and work experiences were 88.60 ± 37.51 hours and 11.31 ± 5.02 years, respectively. The participants mostly were female (64.4%) that had a bachelor's degree in nursing (95.8%), worked in rotational work shifts (74.6%), and worked at non-critical wards (60.2%). The group-based distribution of the participants' demographic characteristics has been presented in table 1.

3.2.Effect of aromatherapy

There were no statistically significant differences between the groups in terms of demographic characteristics indicating their homogeneity (Tables 1-2).

Table 1. The mean and standard deviation of the participants' demographic characteristics.

Variable	Mean±SD in groups			p-value*
	Rose n=40	Lavender n=39	Sesame seed n=39	
Age, year	35.90±5.30	34.87±4.85	36.49±5.38	0.382
Height, cm	164.80±8.75	167.56±8.94	166.08±9.01	0.389
Weight, kg	67.13±9.06	70.46±11.11	71.95±13.08	0.150
Overtime work, hour	88.98±35.83	90.56±32.35	86.26±44.26	0.879
Work experience, y	11.35±4.92	10.13±5.12	12.46±4.87	0.121

**One-way ANOVA test*

Table 2. The number and percentages of the individuals' characteristics of the nurses.

Characteristics		Groups				p-value*
		Rose N (%)	Lavender N (%)	Sesame seed N (%)	Total N (%)	
Gender	Male	13(32.5)	14(35.9)	15(38.5)	42(35.6)	0.875
	Female	27(67.5)	25(64.1)	24(61.5)	76(64.4)	
Marital status and children	Single	4(10)	11(28.2)	6(15.4)	21(17.8)	0.113
	Married people with children	27(67.5)	20(51.3)	29(74.4)	76(64.4)	
	Married people without children	9(22.5)	8(20.5)	4(10.3)	21(17.8)	
Work shift	Fixed	7(17.5)	10(25.6)	13(33.3)	30(25.4)	0.271
	Rotational	33(82.5)	29(74.4)	26(66.7)	88(74.6)	
Education level	Bachelor	40(100)	38(97.4)	35(89.7)	113(95.8)	0.063
	Master and higher	0(0)	1(2.6)	4(10.3)	5(4.2)	
Ward	Non-critical care	22(55)	26(65)	23(57.5)	71(60.2)	0.639
	Critical care	18(42)	14(35)	17(42.5)	49(39.8)	

**Chi-square test*

Of the participants, 62.7% reported to have moderate job stress, 18.3% had low job stress, and 18.3% experienced high job stress. Table 3 shows the group-based mean scores of nurses' job stress before the interventions, and two and four weeks after the interventions.

Table 3. The comparison of job stress among the nurses in the groups.

Timing	Mean ±SD** Groups				P-value*
	Rose	Lavender	Sesame seed	Mean/total	
Before the intervention	84.80±19.47	88.97±14.95	87.56±17.66	87.09±17.41	0.559
At end of the second week	82.60±17.96	83.44±16.53	88.13±16.47	84.17±17.04	0.304
At the end of the fourth week	74.03±16.17	80.08±13.39	85.56±14.03	79.84±15.23	0.003

**One-way ANOVA test*
***Standard deviation*

No statistically significant differences between the groups in job stress before the interventions (p = 0.559) was reported (Table 3). At the end of the second week, no statistically significant differences were also found (p = 0.304). At the end of the fourth week, the groups had statistically significant differences in job stress (p = 0.003). The results of Bonferroni post hoc test for the pairwise comparisons of the groups in terms of differences in the mean scores of job stress at the end of the fourth week (Table 4) showed a statistically significant difference between the rose scent group and the placebo group (p = 0.002).

Table 4. The post hoc comparison of job stress at the end of the fourth week of the interventions.

Comparing groups	Mean difference ±SE**	P-value*
Rose and lavender	6.05±3.286	0.204
Rose and sesame seed	11.539±3.286	0.002
lavender and sesame seed	5.487±3.306	0.299

**Bonferroni test*
*** Standard error*

4. Discussion

This study aimed to examine and compare the effects of aromatherapy using rose and lavender scents on nurses' job stress. According to our study findings, no significant difference was found in the nurses' job stress between the groups before the interventions and at the end of the second week. However, at the end of the fourth week, the difference was reported between the rose and sesame seed oil groups. Rose scent for two hours a day and during a long period of time effectively reduced job stress among the nurses. The lavender group also experienced a reduction in job stress at the end of the fourth week of aromatherapy, but it was not considerable compared to the rose group. Sesame seed oil had no effect on job stress as it was in line with its identity as placebo.

The research results revealed that the nurses mostly had moderate job stress. Consistent with our results, another Iranian study by Hazavehei (2012) showed that 51.5% of nurse reported moderate job stress (32). Conversely, the Rezaee et al.'s study (2006) showed that 59% of Iranian nurses had high stress, which was attributed to nurses' low age range (33) compared to our study participants. Variations in the levels of job stress also can be attributed to the influential factor of the participants' gender given that female nurses often report a higher stress level than male nurses (34).

According to our study results, rose scent did not significantly reduce the nurses' job stress at the end of the second week of the intervention. However, it created a positive effect at end of the fourth week indicating its effectiveness in the long run. No study can be found in the international literature to show the effect of rose aroma on nurses' job stress. However, the Wilkinson's study (2007) showed that aromatherapy massage using various essential oils after 6-10 weeks significantly reduced nurses' anxiety compared to the control group (35). The Miao-Chuan-Chen's study (2015) showed that aromatherapy using lavender essential oil had no effects on the reduction of nurses' job stress in the short run, but it reduced their stress on the 3rd and 4th intervention days (36).

Aromatherapy influences the brain and nervous system (37,38). During inhalation, essential oil molecules stimulate the olfactory nerves having direct links with the limbic system and are responsible for emotions (37). Moreover, aromatherapy using rose scent can relieve anxiety and job stress through the reduction of sympathetic stimulations (39). As the explanation of the effect

of rose scent on job stress, rose essential oil through citronellol and phenethyl alcohol influences the central nervous system and reduces anxiety and stress (40).

Considering that job stress in both intervention groups decreased over time, the effect of aromatherapy can be cumulative and augmented over time with the continued use. It has been suggested that the duration of aromatherapy has a significant association with the effectiveness of aromatherapy (41).

The nurses' mental condition might have affected their job stress that was out of the researchers' control. Our research results should be cautiously interpreted considering probable confounding variables that might have interfered with the effects of the interventions on the nurses' job stress. Information about the chemical constituency of lavender essential oil was not provided by the manufacturer. Therefore, the standardization and identification of the type of lavender used in this research were impossible.

Conclusion

Aromatherapy using rose scent had a positive effect on the nurses' job stress in the long run. Aromatherapy as a safe and non-pharmacologic method is suggested to be used by nurses to improve their own comfort at the workplace. It can reduce overreliance of clinical nurses on medications for relieving their stress symptoms at the workplace. The comparison of the effects of various complementary and alternative therapies on nurses' job stress needs further investigation.

Authors contribution

The authors of this article had main role in the conception and design of the study, or acquisition of data, or analysis and interpretation of data, drafting the article or revising it critically for important intellectual content, and final approval of the version to be published.

Conflicts of interest

No conflict of interest is declared by the authors.

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