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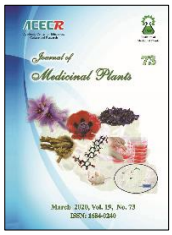

Research Article

The impacts of inhalation aromatherapy with lavender essential oil on students' test anxiety: a randomized placebo-controlled clinical trial

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ABSTRACT

Background: Test anxiety (TA) can hinder students' academic achievement and cause them educational decline and psychological problems. **Objective:** The effect of inhalation aromatherapy with lavender essential oil on nursing students' test anxiety was investigated. **Methods:** This was a quasi-experimental study was conducted on 33 nursing students who had taken the Community Health Nursing II course and were going to take its final exam. Before taking the exam of the course, the students were allocated to the aromatherapy (n = 16) and the control groups (n = 17). For the aromatherapy group, ten drops of lavender essential oil was added to one liter of water and the solution was distributed in the room space for fifteen minutes by using a humidifier. However, the humidifier which was used for the control group included of only pure water without any essential oil. The students' test anxiety was measured both before and after the study intervention by employing the Test Anxiety Inventory. **Results:** There was no significant difference between the study groups regarding the participating students' demographic characteristics as well as the pretest and the posttest values of test anxiety. However, within-group comparisons indicated that in the aromatherapy group, the posttest value of test anxiety was significantly lower than the pretest value. **Conclusions:** The findings indicated that inhalation aromatherapy with lavender essential oil had no positive effects on students' test anxiety. However, as the level of test anxiety in the aromatherapy group decreased significantly after the intervention and the students in this group reported that aromatherapy was pleasant to them. Aromatherapy is probably insignificant in alleviating acute or state anxieties.

1. Introduction

Test anxiety (TA) is a big problem among students and can lead to serious physiological consequences [1]. Spielberger and Sarason (1989) defined TA as a certain state anxiety which is experienced during a test [2]. TA can

Abbreviations: TA, Test Anxiety

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cause educational decline, school drop-out, and psychological disorders and impose heavy financial burden on students [3]. Test anxiety affects as many as 30% of all nursing students [4]. Compared with students in other healthcare fields, nursing students experience higher levels of TA [5], especially because of the high demands of nursing curricula and the struggle to balance multiple work and family responsibilities with the long hours of studying that are required for success [4].

There are numerous pharmacological and non-pharmacological therapies for TA management. Non-pharmacological therapies include, but not limited to, aromatherapy, massage, and music therapy. These therapies are inexpensive, simple-to-use, and non-invasive [6]. One of the non-pharmacological therapies for alleviating stress and anxiety is aromatherapy. Aromatherapy affects sensory system through odor and can produce the same effects as medications on the brain and the nervous system [7].

Previous studies have shown the effectiveness of lavender aroma in alleviating behavioral problems, anxiety, and psychological stress [8, 9]. Lavender essential oil is a non-toxic tranquilizer. It is the most reliable and the safest essential oil which neither has contraindications nor produces hypersensitivity [10]. There are different varieties of lavender around the world from which, *lavandula angustifoila* is commonly used for medical purposes [8].

Several studies have been conducted so far to assess the effects of lavender essential oil on different types of anxiety. Some studies showed the ineffectiveness of lavender aromatherapy in alleviating pre-colonoscopy anxiety [11] and radiotherapy-induced anxiety [12] while some other studies revealed that it significantly alleviated the state anxiety of dental clients [13] and patients with myocardial infarction [14].

The process of taking and giving exam is inevitable in educational settings and hence, effective strategies are needed for alleviating TA. The findings of studies conducted by Koca Kutlu et al. (2008) and Kavurmac et al. (2015) indicated that the level of TA among the students who received lavender aromatherapy was significantly lower than the students in the control group [15, 16]. However, these two studies were conducted by using a posttest-only design without any between-group comparison at baseline.

The findings of a systematic review to determine whether lavender is an anxiolytic agent showed that there are limited numbers of clinical trials regarding the effects of lavender essential oil on stress and anxiety. This study also highlighted the necessity to conduct further studies for evaluating the effectiveness of lavender aromatherapy in alleviating stress and anxiety [17].

Given the dearth of studies and the conflicting findings of previous studies regarding the effects of lavender aromatherapy on anxiety and In addition, studies that tested the effect of aromatherapy with lavender essential oil on the test anxiety of students was very low; we designed and conducted the present study. The objective of this study was to examine the impacts of inhalation aromatherapy with lavender essential oil on nursing students' TA.

2. Materials and Methods

2.1. Design and Participants

The study design was a quasi-experimental study using convenient sampling method.

The study population was all 33 nursing students who were in the third semester of their four-year nursing education at Qom University of Medical Sciences. Given the potential confounding effects of variables such as field of study, educational level, type of exam, and different teachers on the level of students' TA,

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we included only the students who had taken the Community Health Nursing II course in 2013 and were going to take its final exam. In other words, study population was confined only to these students in order to eliminate the confounding effects of the aforementioned variables. The course had been taught by a same instructor. Finally, 33 students were recruited and randomly allocated either to the aromatherapy (16 students) or the control groups (17 students) (Fig. 1).

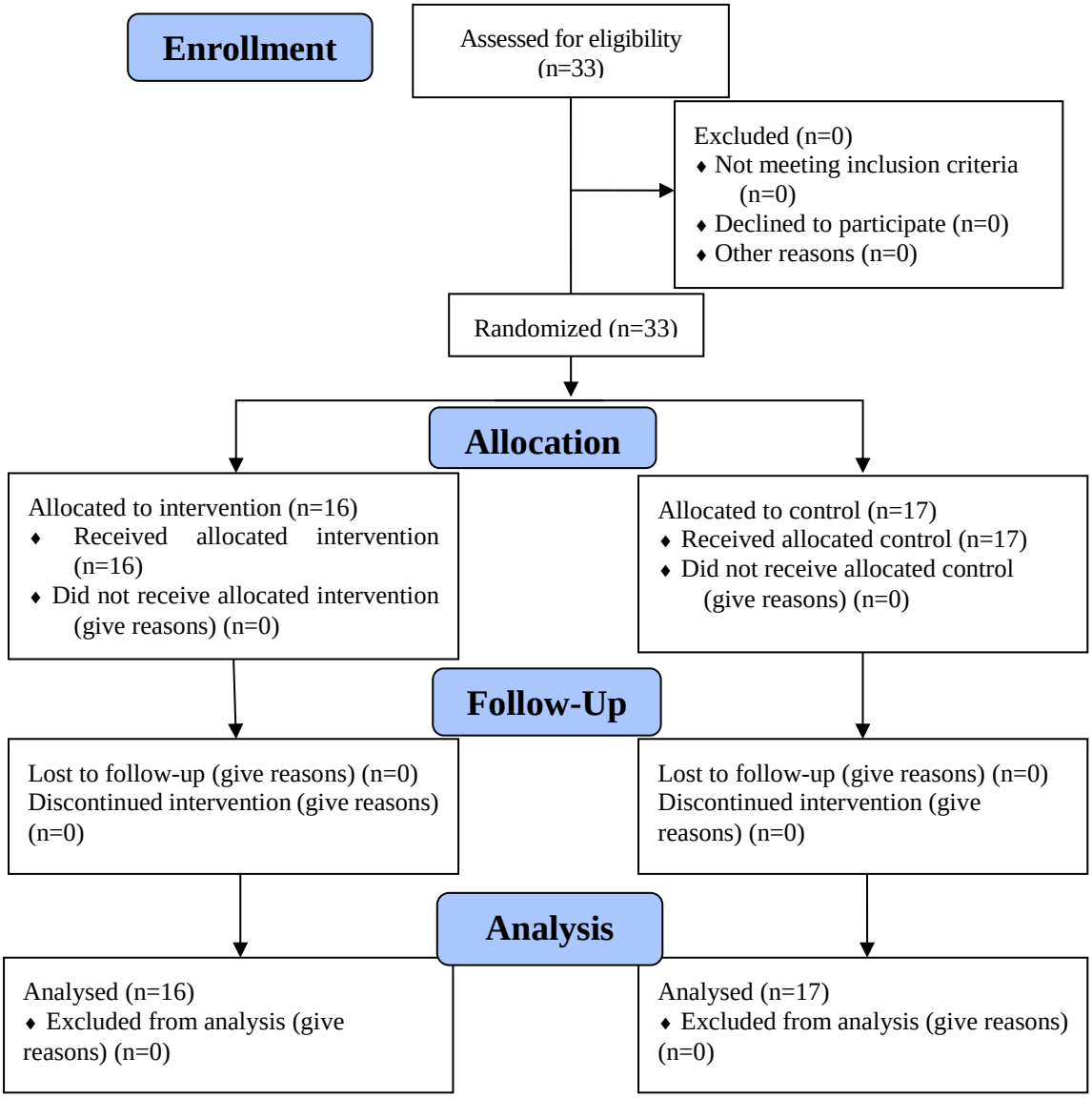

Fig. 1. Consort flow diagram

2.2. Ethical Considerations

The research followed the tenets of the Declaration of Helsinki. The Ethics Committee of Qom University of Medical Sciences, Qom, Iran, approved the study. Informed consent was obtained from participating students. Moreover, this study was registered in the Iranian Registry of Clinical trials with the code of IRCT138811142558N2.

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2.3. Randomization

Random allocation of the students to the study groups was performed as follows. Primarily, sixteen tiny cards entitled 'A' and seventeen tiny cards entitled 'B' were placed in a container. Each student picked up a card from the container randomly at the time of her/his entrance to the examination room. Students who picked up the 'A' and the 'B' cards were allocated to the aromatherapy and the control groups respectively. The inclusion criteria were having no history of allergy, having no active nasal congestion of any origin (like common cold), absence of psychiatric disorders such as anxiety disorders, non-use of anxiolytic drugs, lack of history of pulmonary problems such as asthma and being non-pregnant. The exclusion criterion was experiencing discomfort once inhaling lavender aroma.

2.4. Blinding

At the day of their exam, the students were allocated into two different examination rooms which were identical in terms of size and physical features. There was a humidifier in each room. The students were blind to the type of aroma which had been added to the humidifier.

2.5. Interventions

Participants in the aromatherapy and the control groups were tested in the same types of classrooms that have the same size and physical features. The doors and the windows of both rooms were closed fifteen minutes before aromatherapy. For the students in the aromatherapy group, ten drops of lavender essential oil (produced by Barij Essence Company, Kashan, Iran) was added to one liter of water and the solution was distributed in the room space by the humidifier for fifteen minutes. However, the humidifier in the control room contained only pure water without any essential oil. Therefore, no competing odors were present in the room when the tests were administered. Students were asked not to wear perfume or other hygiene products with scent on the day of the examinations. The doors and windows of the classroom were not opened until the end of the aromatherapy [15-16]. Students were blind to the type of aromas used for them. Study intervention and data collection were performed before the students' exam.

2.6. Measures

A six-item demographic questionnaire and the Test Anxiety Inventory (TAI; Abolghasemi et al., 1996) [18] were completed by the participating students both before and after the intervention. The TAI contained 25 items to which the students responded based on a four-point Likert scale. The scoring of the scale are as follows: Never: 0; Seldom: 1; Sometimes: 2; and Often: 3. Therefore, the minimum and the maximum scores are 0 and 75. A higher score shows higher anxiety. Abolghasemi reported a Cronbach's alpha of 0.94 for the inventory [18]. He also compared male and female students' TAI scores by conducting the independent-sample t test and found that the inventory is suitable for assessing TA among school anduniversity students. This questionnaire has been used in numerous studies [19, 20, 21].

2.7. Outcomes

The expected outcome in this study was TA which was assessed both before and after the study intervention, i.e. before the students' exam. The students in the aromatherapy group were also asked whether the aroma was pleasant or not by asking a Yes/No question.

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2.8. Statistical methods

The distribution of the response variable was normal by Kolmogorov-smirnov test in both groups, because of that we used paired and the independent-samples t-test to compare two groups. Study data were analyzed by using the SPSS v. 18.0 (SPSS, Inc., Chicago, USA) at the significance level of 5%.

3. Results

All 33 students taking the exam of the Community Health Nursing II course participated in this study. Demographic information is shown in Table 1.

Table 1. Demographic characteristic of the participants in aromatherapy and control groups

Demographic information	Aromatherapy group (mean±SD OR percent)	Control group (mean±SD OR percent)	P-value
Age	20.66±2.38	20.76±0.86	0.406
grade point average (GPA) of previous semester	15.81±1.81	16.25±1.4	0.582
Duration of sleep in the last 24 hours	7.8±1.8	7.6±1.5	0.814
Gender			
Female	50%	45%	0.432
Male	50%	55%	
Marital status			
Married	0%	8%	0.261
Single	100%	92%	

Table 2. Between- and within-group comparisons of TA

Time \ Groups	Aromatherapy Mean±SD	Control Mean±SD	P value (between-group comparisons)
Before	38.8±14.73	37.14±15.9	0.77
P value (within-group comparisons)	0.03		---
After	32.3±15.38	31.7±16.6	0.93
P value (within-group comparisons)	0.15		---

The results of between-group comparisons revealed that there was no significant difference between the groups in terms of the pretest and the posttest values of the students' TA ($P > 0.05$; Table 2). However, within-group comparisons indicated that in the aromatherapy group, the posttest value of TA was significantly lower than the pretest value ($P = 0.03$) while in the control group, there was no significant difference between the pretest and the posttest values of TA ($P = 0.15$) (Table 2).

The study findings revealed that 92% of the students in the experimental group found aromatherapy pleasant.

4. Discussion

Examination is a state which causes great stress for students [22]. Recently, researchers

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have paid special attention to the anxiolytic effects of lavender. Although many studies have reported the anxiolytic effects of lavender, our findings revealed that after the aromatherapy intervention with lavender, there was no significant difference between the study groups regarding the students' TA (P value = 0.93). However, the posttest value of TA in the experimental group was significantly lower than the pretest value in the same group (P value = 0.03). Koca Kutlu et al. (2008) also examined the effects of lavender aroma inhalation on the level of TA among 95 nursing, midwifery, and health students taking the exam of the Surgical Diseases course. They allocated 50 students to the aromatherapy group and 45 students to the control group and measured their TA by using the State-Trait Anxiety Inventory (STAI). Finally, they found that the level of TA in the aromatherapy group was significantly lower than the control group [15]. Kavurmac et al. (2015) also reported the effectiveness of lavender aromatherapy in alleviating nursing students' TA [16]. However, these two studies were done with a posttest-only design and hence, it is unclear whether the significant difference between the aromatherapy and the control groups was related to the intervention or to the significant difference between the groups at baseline. McCaffrey et al. (2009) also made a study to evaluate the effects of lavender and rosemary essential oils on nursing students' TA and found that in both groups, the posttest values of students' TA were significantly lower than the pretest values. However, they did not perform between-group comparisons regarding students' TA [23].

Our literature review revealed that there were only a few studies regarding the effects of lavender aromatherapy on TA. Therefore, we compared our findings with the findings of studies which had been conducted to evaluate the effects of lavender aromatherapy on other types of anxiety. For instance, Cho et al. (2013) found that combined aromatherapy by using lavender, roman chamomile, and neroli essential oils was effective in alleviating anxiety and improving sleep quality among patients undergoing percutaneous coronary intervention [24]. Conrad and Adams (2012) also reported the positive effects of rose and lavender essential oils at 2% dilution on the anxiety and the depression of high-risk postpartum women [25]. In addition, Lemon (2004) found that combined aromatherapy by using lavender, lemon, clary sage, bergamot, and chamomile aromas was effective in alleviating depression and anxiety [7].

Studies which reported the effectiveness of lavender aroma in alleviating anxiety had used it in combination with other essential oils [7, 24, 25 while studies which reported its ineffectiveness had used it alone [11, 13, 26]. We also used lavender aroma alone and found that it was not effective in alleviating TA. These findings can denote that single-agent aromatherapy by using lavender essential oils is probably not as much effective as combined aromatherapy in alleviating anxiety.

Muzzarelli et al. (2006) assessed the effects of aromatherapy on colonoscopy-related anxiety and found that inhalation therapy with lavender essential oil was not effective in reducing pre-colonoscopy anxiety [11]. In addition, Graham et al. (2003) reported the ineffectiveness of inhalation aromatherapy in alleviating anxiety and depression among patients receiving radiotherapy [12]. Kritsimida et al. (2010) also found that lavender aroma significantly reduced state anxiety while it had no significant effect on anxiety among patients receiving dental care services [13]. The results of a study by Bikmoradi et al. (2015) also illustrated that lavender aroma was ineffective in reducing mental stress of patients undergoing coronary

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artery bypass graft surgery [26]. These four studies show that lavender aroma has no significant effect on state anxiety. State anxiety is a type of anxiety which arises at a certain time and due to the presence of a certain situation such as colonoscopy, radiotherapy, examination, or dental procedures and hence, it is considered as an acute anxiety. Consequently, our findings are in line with the aforementioned four studies in that lavender aromatherapy is ineffective in alleviating acute or state anxieties. Sgoutas-Emch et al. (2001) also reported that lavender aromatherapy had no significant effect on acute stress [27]. All these findings denote that lavender aroma is effective in reducing only chronic anxieties [7, 26] and has no significant effects on acute anxieties such as anxieties related to radiotherapy, colonoscopy, and dental care services [11–13]. The insignificant effect of aromatherapy on TA in our study can also be attributed to the fact that TA is an acute anxiety. Moreover, the aforementioned studies revealed that the anxiolytic effect of lavender essential oil is stronger when it is combined with other essential oils.

Environmental conditions can affect people's psychological state. For instance, pleasant odors in learning environments have been reported as a concentration booster [15]. Compared with other alternative therapies, aromatherapy is easy-to-apply and fast-acting. Moreover, lavender aromatherapy is a simple, safe, and cost-effective intervention [10]. Most of our participants in the experimental group also reported that aromatherapy was pleasant to them. Therefore, aromatherapy can be used before examinations in order to alleviate TA.

4.1. Limitations

This study was conducted on limited number of students of a single course. Future studies are recommended to investigate the effects of lavender aromatherapy on TA among larger samples of students.

5. Conclusion

The findings of the present study indicated that inhalation aromatherapy with lavender essential oil had no positive effects on students' TA. Once used alone, lavender aroma probably exerts less anxiolytic effects. Consequently, the effectiveness of lavender aroma can be enhanced through combining it with other essential oils. Moreover, it is not effective in alleviating acute anxieties.

Author contributions

Study concept and design: Jafarbegloo. Analysis and interpretation of data: Jafarbegloo and Ahmari. Drafting of the manuscript: Jafarbegloo. Critical revision of the manuscript for important intellectual content: Jafarbegloo and Ahmari. Statistical analysis: Jafarbegloo and Ahmari.

Conflict of interest

The authors declare that they have no competing interests.

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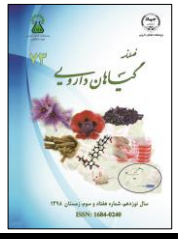

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اضطراب امتحان

چکیده

مقدمه: گاهی اوقات اضطراب امتحان، موفقیت تحصیلی دانشجویان را کم می‌کند و می‌تواند باعث افت تحصیلی و مشکلات روحی روانی در دانشجویان شود. **هدف:** هدف از این مطالعه بررسی اثر رایحه اسطوخودوس بر کاهش اضطراب امتحان دانشجویان بود. **روش بررسی:** مطالعه حاضر از نوع نیمه تجربی بر روی ۳۳ نفر از دانشجویان پرستاری متقاضی امتحان پایان ترم درس نظری بهداشت جامعه ۲ انجام شد. قبل از برگزاری امتحان، دانشجویان در دو گروه رایحه درمانی (۱۶ نفر) و کنترل (۱۷ نفر) قرار گرفتند. در گروه رایحه درمانی ۱۰ قطره اسانس اسطوخودوس در یک لیتر آب اضافه شد و این محلول توسط دستگاه بخور به مدت ۱۵ دقیقه در فضا پخش شد؛ در حالی که در گروه کنترل فقط بخار آب (بدون اسانس) توسط دستگاه بخور در فضا پخش شد. اضطراب امتحان دانشجویان قبل و پس از مداخله با استفاده از پرسشنامه اضطراب امتحان (Test Anxiety Inventory) در هر دو گروه مورد استفاده قرار گرفت. **نتایج:** هیچ اختلاف معنی داری بین مشخصات دموگرافیک دو گروه وجود نداشت؛ همچنین اختلاف معنی‌داری بین دوگروه قبل و پس از مداخله از نظر اضطراب امتحان وجود نداشت. در حالی که در گروه رایحه درمانی، اضطراب امتحان پس از مداخله کمتر از اضطراب قبل از مداخله بوده است. **نتیجه‌گیری:** یافته‌ها نشان داد رایحه درمانی با اسانس اسطوخودوس اضطراب امتحان دانشجویان را کم نمی‌کند؛ اما در گروه رایحه درمانی، اضطراب امتحان به طور معنی‌داری پس از مداخله کاهش یافت و این دانشجویان ذکر کردند استشمام رایحه اسطوخودوس برای آنها خوشایند بود. این امکان وجود دارد که رایحه درمانی بر روی اضطراب‌های موقعیتی یا حاد مؤثر نباشد.

مخففها: (TA) Test Anxiety

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