

✧ RESEARCH PAPER ✧

# *The effects of aromatherapy in relieving symptoms related to job stress among nurses*

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## **The effects of aromatherapy in relieving symptoms related to job stress among nurses**

Workplace-related stress has become today's most serious occupational hazard. Aromatherapy is a simple, convenient and non-invasive method of stress relief. There is little research regarding the efficacy of aromatherapy by means of inhaling essential oil in reducing workplace stress-related symptoms among nurses. Therefore, this study was to examine the effectiveness of lavender oil inhalation in reducing job stress-related symptoms among nurses. The 53 nurses in the experimental group pinned small bottles containing 3% lavender oil on the clothes of their right chests, whereas 57 participants in the control group pinned bottles with no lavender oil. Aromatherapy was shown to be effective in the reduction of the number of stress symptoms for 3 or 4 days. The stress symptoms of the experimental group decreased from 6.1 to 2.8 after aromatherapy was carried out ( $P = 0.126, 0.159, 0.035$  and  $0.026$ ). This represented a significant decrease in stress, whereas the stress symptoms in the control group increased from 5.6 to 5.8. Hospital staff managers are still encouraged to include aromatherapy concepts and techniques in the continuing education of nursing staff. Concurrently, future research should focus on the possible side effects of aromatherapy to assure safety.

**Key words:** aromatherapy, lavender, nurse.

Job stress can be conceptualized as an individual's reactions to work environment characteristics, indicating that a poor fit between the individual's abilities and the work environment causes lasting physiological strain that might result in stress-related disease or end-organ dysfunction.<sup>1</sup>

In recent years, corporate mergers, economic downturn and increased competitions have caused a steady increase in job stress. Job stress has become today's most serious occupational hazard. In the United States, the cost of stress and stress-related problems to organizations has been estimated to be in excess of \$150 billion annually.<sup>1</sup> Therefore, solving the stress-related problems of the nursing staff is an urgent issue.

High-stressed situations can affect people's mental, emotional and physical responses. At the same time, they

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can also affect the sympathetic nervous system, the hypothalamus, the adrenal cortex or the immune system.<sup>2</sup> Stress-related problems cause physical, mental and behavioural symptoms. Studies indicated that symptoms related to job stress included physical problems such as fatigue, headaches, high blood pressure, back pain, shoulder pain, sleep disorders, stomach aches, change in appetite and intestinal problems, and psychological symptoms, such as hyper-emotional sensitivity, forgetfulness, difficulty in concentrating, nervousness, phobias, depression, anger control problems, complaining about others, etc.<sup>3-5</sup>

Apart from pharmaceutical treatments, such as pain killers, gastrointestinal drugs, alternative techniques, such as acupuncture, hot and cold therapy, acupressure, therapeutic massage, relaxation, meditation, yoga and aromatherapy, are all common methods used to alleviate symptoms of stress. Furthermore, aromatherapy is a simple, convenient and non-invasive method of stress relief. When essential oils are inhaled, aromatic molecules enter the brain's limbic system through the lining of the nasal cavity. Aromatic molecules could affect the hypothalamus, autonomic nervous system and the endocrine system, and result in promoting peripheral blood circulation, and regulating respiration, heart rate and blood pressure which leads to stress relief.<sup>6,7</sup> The essential oils are extracted and refined from various plant parts which are used for massage, inhalation or ingestion. Essential oil is expelled through the kidneys, liver or exhalation. Therefore, aromatherapy should not be used in the clients with liver or kidney disorders.<sup>7,8</sup> The main components of lavender oil are linalyl acetate and linalool, and it might be used as anti-bacteria, analgesic and antispasmodic properties.<sup>8,9</sup>

Buckle's research showed that in regard to muscle relaxation, sleep and stress-related problems, aromatherapy produced positive results.<sup>8</sup> In recent years, Tseng, employed in the health-care field, had used aromatherapy to improve his patients' physiological and psychological states.<sup>9</sup> McCaffrey *et al.* found that the nursing graduate students, who breathed through the lavender essential oil inhaler before and during the test, could have their test-taking stress reduced, and this was proved by their decrease in anxiety through the self-report of the perceived stress and pulse rates.<sup>10</sup> Kuttu *et al.* studied the effects of lavender essential oil aromatherapy on alleviating anxiety in a group of 95 students.<sup>11</sup> Researchers placed the students consisting of the experimental group in a classroom. They closed the windows

and doors and were exposed to lavender oil for 60 min, whereas the students in the control group placed in another classroom were not exposed to lavender oil. The classrooms for the experimental and the control group were on the same floor. The room temperatures and the classroom sizes were kept at the same level. Researches found that the students exposed to the lavender oil had significantly lower levels of anxiety. Pemberton and Turpin found that topical applications of the essential oils, lavender and clary sage might decrease the perceived job-related stress levels in nurses working in the intensive care units.<sup>12</sup> Seo found that stress levels were significantly lower when students received aroma essential oil inhalation by using necklaces compared with those students receiving placebo treatment.<sup>13</sup>

Some studies have examined the effectiveness of essential oil inhalation, and essential oil massage, but currently there is little research regarding the efficacy of aroma essential oil inhalation by means of pinning a small bottle containing essential oil on the clothes of the right chest to reduce workplace stress-related symptoms. The available evidence regarding this topic is still inadequate.

## OBJECTIVE

This research aims to investigate the effectiveness of lavender essential oil inhalation on reducing the job stress symptoms.

## SAMPLES AND METHODS

### Operational definition

#### *Essential oils*

The essential oil used in this experimental study is pure 100% plant oil. The experimental group was treated with an essential oil formula. The main ingredient was pure lavender essential oil at a 3% concentration. The mixture was poured into small bottles hung in front of their right chests.

### Evaluation design, object and effect indicators

This study was divided into two phases. The first phase was a cross-sectional study. From 1 August to 15 August 2010, all nurses (259 nurses) at the regional teaching hospitals in south Taiwan apart from part-time nurses, clinical nurse specialists, head nurses, supervisors and directors, were recruited. The participants had to fill out the questionnaires during their shifts for over seven working days. The second phase of the study was carried

out between 16 August and 30 August 2010, during which aromatherapy treatment began, primarily examining the effectiveness of lavender essential oil in reducing the number of the nurses' job stress-related symptoms. Among the 259 nurses from the first phase, 110 were selected because they suffered from a higher number of job stress-related symptoms than the average people of 4.6. The nurses were put into pairs according to their different working years and departments, and then they were assigned into two groups, the experimental group and the control group. Fifty-three nurses were assigned in the experimental group and 57 in the control group. Concurrently, the participants filled out questionnaires during their shifts on the pretest day and the four posttest days.

The following formula was used to estimate sample size (World Health Organization, 1998)<sup>14</sup>:  $n = 2\rho^2(Z1 - \alpha + Z1 - \beta)^2 / (\mu1 - \mu2)^2$  (Type I error ( $\alpha$ ): 5%; Power ( $1 - \beta$ ): 85%; standard deviation ( $\rho$ ): 1.2; Variance ( $\rho^2$ ): 1.44; the average number of stress symptoms for the experimental group and the control group were 4.6 and 3.6 which were received from the pilot study between 1 July and 31 July 2010). Therefore, the expected sample size for this current study was 26 for each group.

The 53 nurses in the experimental group wore small bottles containing lavender essential oil at 3% concentration, whereas the control group wore small bottles without oil. The criteria possessed by the experimental group included: able to communicate with researchers, willing to participate in the project, not allergic to lavender, not suffering from any form of liver or kidney dysfunction, and with normal olfactory functions. Consequently, before the nurses in the experimental group wore the lavender bottle necklaces, researchers put drops of 3% lavender oil on their wrists to test for allergies. Only after this test was performed, the nurses were given lavender oil bottles hung in front of their right chests. The design of the study is shown in Figure 1:

Experimental Group:  $O^1 X1 O^1 O^2 O^3 O^4$

Control Group:  $O^1 X2 O^1 O^2 O^3 O^4$

X1: lavender bottle necklace  
 X2: bottle necklace without lavender essential oil  
 O##: number of stress-related symptoms on day #

Figure 1. Evaluation design diagram.

### Research framework

The intervention variables of this study are 'wearing a lavender essential oil bottle hung in front of nurses' right chests, or not wearing a lavender essential oil bottle'. Based on the reviews of the related research literature, the control variables to be considered when comparing the two groups of patients are as follows: ages, working years, durations of employment, levels of education and promotion potentials. The relationship between intervention variables, performance metrics and confounding variables is shown in Figure 2.

### Introduction of intervention

Nurses in the experimental group wore bottles of 3% lavender oil hung in front of their right chests. But the nurses in the control group wore bottles without lavender oil. On the first day of the study, the nurses in the experimental group began to wear the lavender oil bottle at the start of their shifts, and wore the necklaces at all times while working for their next four working days. Additionally, the nurses were required to rate their job stress-related symptoms before the end of their shift every day for one pre-test day and four posttest days. Concurrently, the nurses in the control group were still required to write down their job stress-related symptoms before the end of their shifts on the pretest day and each of the four posttest days.

### Research tool: reliability and validity

The research tool employed in this study was an amended version of the structured questionnaire that was

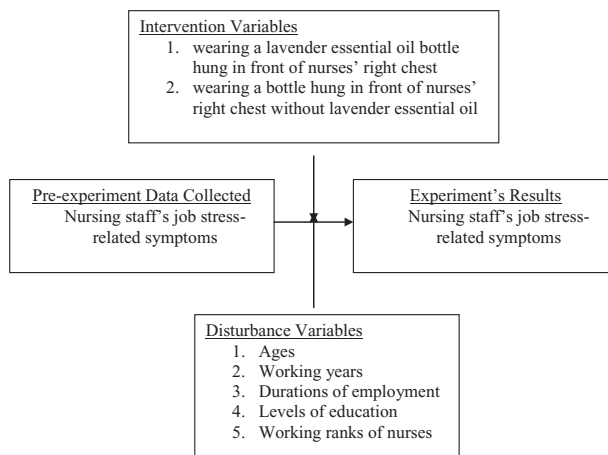


Figure 2. Research framework of using aromatherapy in treating nursing staff suffering from job stress-related symptoms.

developed by the author. The stress symptom scale was used for studying nursing staff at a regional teaching hospital and its content validity rating is 0.92, whereas Cronbach's  $\alpha$  when applied to stress symptoms had a content validity rating of 0.88. For this research, the forms used were separated into two sections: a scale for job stress-related symptoms, and personal data.

#### *Personal data*

Nurses that participated in this study provided the following personal data: name, gender, constituency, date of birth, duration of employment, working years, levels of education and working ranks of nurses.

#### *Job stress-related symptoms*

Job stress-related symptoms include: fatigue, shoulder pain, back pain, insomnia at night, anxious feeling, agitated feeling, lack of patience, headaches, forgetfulness, anger, distractions, upset stomach, palpitation, excessive restlessness, loss of appetite, work-related errors, increased appetite, dizziness, numbness on fingers or toes, diarrhoea, oral ulcer, crying, and simple herpes over lips or body, etc. All of the nurses participating in this study wrote down their job stress-related symptoms on each of the seven consecutive working days. Each day they finished writing down their symptoms before the end of their shifts.

### **Data collection procedure**

This study was divided into two phases. The first (the first year of research) was a cross-sectional study. By means of purposive sampling through questionnaires, 259 participants were selected to carry out a study of workplace stress-related symptoms shown by female nursing staff. The second phase was an examination of the effectiveness of aromatherapy intervention. Among the 259 nurses at stage one, 110 nurses were selected to participate in phase two. At phase two, participants were chosen by applying the following criteria: displaying more symptoms of stress than the average of 4.6, scheduled to work over seven consecutive days, ages and working years. Subsequently, the 110 nurses were randomly separated into two groups, one experimental group of 53 and one control group of 57. The stress symptom questionnaire was developed by the researchers. A focus group consisting of 10 nurses in various specialties was asked of the stress symptoms at nursing jobs. The validity of the original form of the questionnaire was validated by five reviewers: Four nurses and one statistic professor were asked to express their

opinions on the questionnaires in terms of its appropriateness. The content validity index value was 0.92. Cronbach's  $\alpha$  for stress symptoms was 0.88. The 23 stress symptoms included fatigue, shoulder pain, back pain, insomnia at night, anxious feeling, agitated feeling, lack of patience, headaches, forgetfulness, anger, dis-concentration, upset stomach, palpitation, excessive restlessness, loss of appetite, work-related errors, increased appetite, dizziness, numbness on fingers or toes, diarrhoea, oral ulcer, crying, and simple herpes over lips or body. All stress symptoms that they had experienced were circled on the stress symptom questionnaires by nurses at the end of each day duty.

### **Data collection and analysis**

The collected data were archived using Excel (Microsoft Corporation, Taipei, Taiwan), and SPSS 15.0 (SPSS, Chicago, IL, USA) software's ANOVA mean comparison was used for statistical analysis of variance by comparing the continuous dependant variables (age, work experience and working years) of the control and the experimental group, whereas the chi-square test was used to compare the categorical dependant variables (gender and promotional advancement potential). Finally, the data were analysed again by means of mixed model analysis of repeated measures.

## **RESULTS**

Below is a comparison of the control variables of the two groups, followed by a comparison of performance metrics.

### **Comparisons of the control variables**

Comparisons of control variables (ages, work experiences, working years, levels of education and promotion potentials) between the experimental and the control group showed no significant statistical distribution variance (Tables 1 and 2). Participants in the study had an average age of 33.18; average time employed in the field of nursing was 8.16 years; average working length in their given department was 4.343 years; nurses with specialist education accounted for 54.4–54.7%; nurses comprising N0 and N1 were the majority, and accounted for 64.2–64.9% in regard to working ranks of nurses.

### **Comparisons of the intervention effects**

As shown in Table 3, a bottle containing 3% lavender essential oil aromatherapy hung in front of nurses' right

**Table 1** Control variables between the two groups compared by continuous variables

Variable	Number of cases	Average	Standard deviation	F value	P value
Age					
Control group	57	33.297	6.449	0.035	0.852
Experimental group	53	33.060	6.794		
Years of nursing					
Control group	57	8.355	6.408	0.112	0.739
Experimental group	53	7.961	5.907		
Years of work in current department					
Control group	57	4.537	5.076	0.205	0.652
Experimental group	53	4.149	3.762		

**Table 2** Control variables between the two groups compared variables by category

Variable	Groups		$\chi^2$ value	P value
	Control group	Experimental group		
Education				
College	Number	26	24	1.00 <sup>‡</sup>
	Rate	45.6%	45.3%	
University or above	Number	31	29	
	Rate	54.4%	54.7%	
Promotional advancement potential				
N0	Number	19	11	2.638
	Rate	33.3%	20.8%	
N1	Number	18	23	0.620 <sup>†</sup>
	Rate	31.6%	43.4%	
N2	Number	14	13	
	Rate	24.6%	24.5%	
N3	Number	4	4	
	Rate	7.0%	7.5%	
N4	Number	2	2	
	Rate	3.5%	3.8%	

\*  $P < 0.05$ . Note: <sup>†</sup> Pearson chi-square  $\chi^2$ ; <sup>‡</sup> Fisher's exact test.

chests was effective in decreasing the number of the stress symptoms. In other words, the decrease of the number of the stress symptoms in the experimental group was greater than that in the control group. Differences in the number of the stress symptoms on the pre-test day between the experimental group and the control group did not have a statistical significance ( $t = 0.431$ ;

$P = 0.692$ ). This indicated that the levels of the stress symptoms in the two groups were almost the same at the beginning. As shown in Figure 3 and Table 3, after the application of aromatherapy, there were no effects shown on the 1st, 2nd, 3rd and 4th test days in the control group. Therefore, compared with the number of the stress symptoms at pre-test day (Mean of pain scores = 5.6), the number of the stress symptoms in the control group on the 1st, 2nd, 3rd and 4th test days (Mean of the number of the stress symptoms = 5.6, 5.5, 5.7 and 5.8), no significant differences were shown ( $t = -0.039, -0.124, 0.043$  and  $0.138$ ;  $P = 0.969, 0.902, 0.965$  and  $0.900$ ). No significant interactions between the two groups (experimental group/control group) on the 1st test day and the 2nd test day were found ( $t = -1.536$  and  $-1.411$ ,  $P = 0.126$  and  $0.159$ ), which means that the reduction slope of the number of stress symptoms in the experimental group was not significantly greater than that of the control group. However, the significant interactions of the groups (experimental group/control group) on the 3rd test day and 4th test day were found. The reduction slope of the number of the stress symptoms on the 3rd and 4th test days in the experimental group was significantly greater than that of the control group ( $t = -2.106$  and  $-2.227$ ,  $P = 0.035$  and  $0.026$ ). The pain ratings of the experimental group that was treated with aromatherapy decreased from 5.6 to 2.8, whereas the pain ratings of the control group increased to 5.8 from 5.6.

## DISCUSSION

Table 3 and Figure 3 show that aromatherapy via lavender essential oil bottle hanging in front of nurses' right chests was not effective in reducing the number of stress-related

**Table 3** Group comparison between the effects of variables

Variable	Regression coefficient	Standard error	<i>t</i> Value	<i>P</i> value
Control group pre-test	5.640	0.790	7.143	< 0.0001**
Pre-test (Experimental group / control group)	0.431	1.086	0.397	0.692
Control group (1st test day / pre-test day)	-0.040	1.034	-0.039	0.969
Control group (2nd test day / pre-test day)	-0.126	1.022	-0.124	0.902
Control group (3rd test day / pre-test day)	0.044	1.017	0.043	0.965
Control group (4th test day / pre-test day)	0.138	1.096	0.126	0.900
Interaction of 1st test day and group	-2.185	1.423	-1.536	0.126
Interaction of 2nd test day and group	-2.039	1.445	-1.411	0.159
Interaction of 3rd test day and group	-3.025	1.436	-2.106	0.035*
Interaction of 4th test day and group	-3.388	1.521	-2.227	0.026*

Dependent variable: the number of stress symptoms.

Interaction of 1st test day and group: difference between the experimental group and the control group in change pre-test day—1st test day.

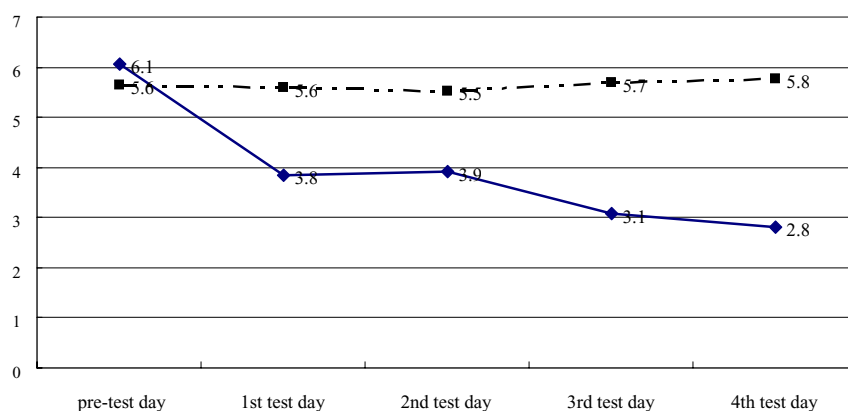
Interaction of 2nd test day and group: difference between the experimental group and the control group in change pre-test day—2nd test day.

Interaction of 3rd test day and group: difference between the experimental group and the control group in change pre-test day—3rd test day.

\*  $P < 0.05$ ; \*\*  $P < 0.001$ .

Equation used:  $Y = 5.64 + 0.431 \times (\text{Group}) - 0.040 \times (\text{1st test day / pre-test day}) - 0.126 \times (\text{2nd test day / pre-test}) + 0.044 \times (\text{3rd test day / pre-test}) + 0.138 \times (\text{4th test day / pre-test}) - 2.185 \times (\text{Interaction of 1st test day and group}) - 2.039 \times (\text{Interaction of 2nd test day and group}) - 3.025 \times (\text{Interaction of 3rd test day and group}) - 3.388 \times (\text{Interaction of 4th test day and group})$ .

the number of the job stress symptoms



**Figure 3.** Comparison of the number of the job stress symptoms on the pre-test day and the 1st to the 4th test day. (—◆—) experimental group; (---■---) comparison group.

symptoms among nursing staff on the 1st and 2nd test day as there was no relevant difference in the rate of decline when comparing the control and the experimental groups on the 1st and 2nd test days. In other words, lavender essential oil aromatherapy via the wearing of a lavender essential oil necklace hung in front of the chest was able to

effectively decrease the number of the stress symptoms for 4 days (use for 3 and 4 days). However, there was no significant effect for shorter than the 2-day length. The results of this experiment regarding the effectiveness of aromatherapy via wearing of a lavender essential oil bottle hung in front of nurses' right chests were the same as



those shown by the research of McCaffrey *et al.*. The results of their study showed that the inhalation of lavender essential oil successfully eased the stress level.<sup>10</sup> The results of this current study were also consistent with a study done by Kuttu *et al.* on the effects of lavender essential oil aromatherapy for alleviating anxiety in a group of 95 students. The aroma treatment was found effective in reducing anxiety levels. Anxiety is one of the stress symptoms in our study.<sup>11</sup>

### CONCLUSIONS AND RECOMMENDATIONS

This study proved that this method of lavender essential oil aromatherapy was ineffective in reducing the number of job stress-related symptoms suffered by nurses for 2 days only. The main recommendation of this research is to use lavender inhalation to alleviate symptoms of stress for more than 3 days.

Most of studies were to investigate the effectiveness of essential oils, through frequent use of self-administered questionnaires or through researchers questioning the participants about their thoughts and feelings. They were the most frequently used evaluation indicators. Both of the aforementioned methods tend to be very subjective. Participants of the control group pinned small empty bottles on their clothes on the right chest. Some participants of the control group might note that the small bottle would not decrease stress because it had no odour. When participants in the experimental group received small bottles containing lavender oil and experienced the smells, they might know there was something in the bottle that might make differences. The degrees of differences in smell sensibility among the participants will be the limitation of this study. Future studies should use more objective physiological indices, such as blood pressure, heart rate or salivary cortisol concentration. Moreover, most studies have focused on the effectiveness of essential oils, but few on their side effects. Therefore, we recommended that future researches should explore the possible side effects on aromatherapy to assure safety.

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