Effect of Inhalation Aromatherapy on Pain, Anxiety, Comfort, and Cortisol Levels During Trigger Point Injection

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The objective of this study was to examine the effects of inhaler aromatherapy on the level of pain, comfort, anxiety, and cortisol during trigger point injection in individuals with myofascial pain syndrome. Lavender oil inhalation was found to reduce pain and anxiety during trigger point injection and to improve patient comfort, but it did not affect the saliva cortisol level. **KEY WORDS:** *anxiety*, *aromatherapy*, *comfort*, *cortisol*, *pain* *Holist Nurs Pract* 2020;34(1):57–64

INTRODUCTION

Myofascial pain syndrome (MPS) is one that is characterized by pain, sensitivity, and autonomic events reflecting in a specific region through a trigger point, the palpable point where the sensitive area of a tense muscle band is involved.[1,2] Today, many treatment methods are used in MPS treatment, but trigger injection, including local anesthetic injections and dry needling techniques, is commonly used.[3,4] However, it is thought that this method can negatively affect the comfort and the quality of life of patients because the patients experience pain during the treatment, and experience anxiety and stress due to fear.[5]

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Improving the physical and psychological health of patients is an important goal in holistic nursing practice, and aromatherapy is widely used in relieving pain, anxiety, and stress.[6-8] Relevant publications in the literature report that lavender essential oils have shown promising effects on pain,[6,7] comfort,[8-10] stress, and anxiety.[11-16] The aim of this study was to evaluate the efficacy of inhaler aromatherapy on pain, comfort, anxiety, and cortisol levels when it was applied during trigger point injection in individuals with MPS.

Theoretical framework

Katharine Kolcaba's comfort theory is a midrange nursing theory. The holistic framework of this theory used to guide comfort care interventions is an ideal theory to investigate the use of complementary techniques and to search for evidence in the integrative therapy literature. Comfort is defined as more than a lack of negative physical sensation or emotional distress.[17] In comfort theory, specific concepts are organized into 3 forms and 4 comfort contexts. The 3 forms of comfort are relief, ease, and transcendence and the 4 contexts in which comfort is experienced are physical, psychospiritual, environmental, and sociocultural.[18] While physical comfort is defined as relaxation and freedom from pain, psychospiritual comfort is related to an internal feeling of satisfaction with an individual's life and success. Sociocultural comfort is related to interpersonal, family, and societal relations. Environmental comfort is related to feelings of satisfaction

with the physical environment, such as temperature, noise, light, and physical environment.[17,19]

MATERIAL AND METHODS

Study design

This study was designed as a randomized placebo-controlled trial.

Population and sampling

The research sample consisted of 66 patients who were admitted to the Algology Polyclinic of a university hospital in Turkey between September 2017 and March 2018, who were having trigger point injections for the first time, and who met the inclusion criteria. Patients were excluded from the study who had an allergy to lavender, perfume or cosmetics, asthma or chronic obstructive pulmonary disease, chronic sinusitis, severe upper respiratory tract infection, unregulated blood pressure, corticosteroid drug consumption 3 months before the study, any substance or drug addiction, or a known history of psychiatric disease.

Sample selection was determined by the simple and layered randomization method. The patients included in the research were randomly divided into 3 groups: Tuesday aromatherapy group, Wednesday placebo group, and Thursday control group (Figure). G-Power statistical analysis was performed to determine the sample size. In accordance with this, a total of 66 patients, or 22 in each group, were studied with 95% confidence and 80% theoretical power. Piloting was performed with 6 patients, 2 of whom were from each group.

Data collection tools

Data collection forms were completed by a single researcher by face-to-face interview. The data were obtained with a visual analog scale (VAS), General Comfort Questionnaire (GCQ), State Anxiety Index (STAI), and a saliva sample.

Patient information form

The individual identification form was created by the researchers in the light of information collected

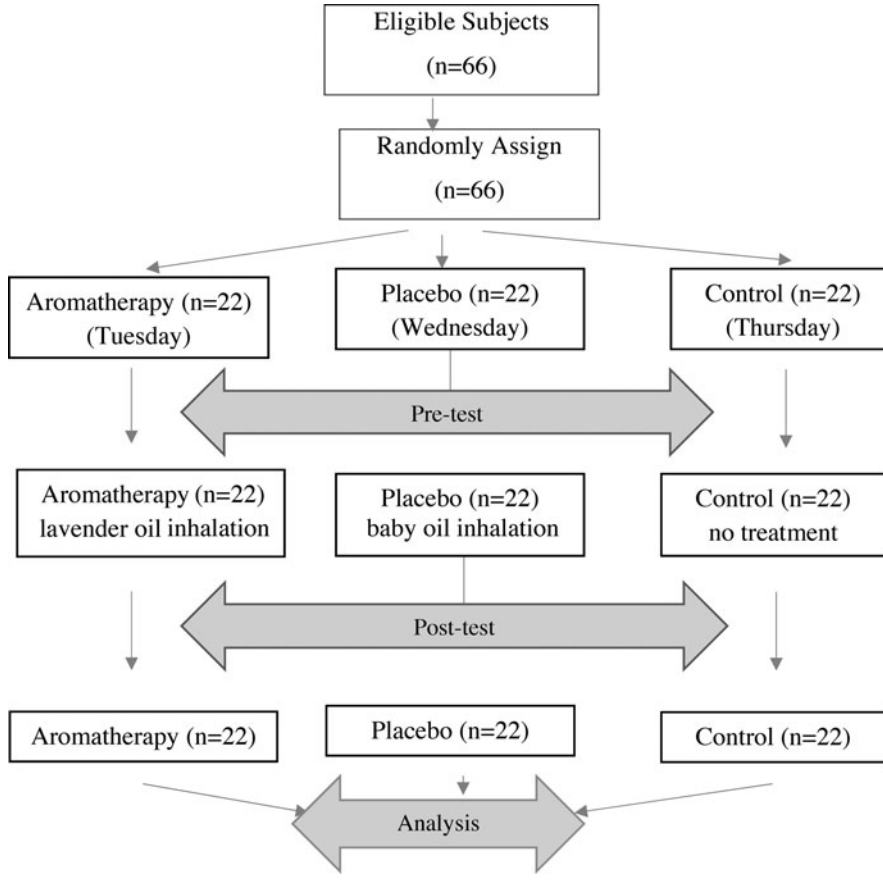

FIGURE. Flowchart for participant recruitment

from the literature. This form consisted of 2 parts. The first part concerned sociodemographic characteristics such as age, gender, height, weight, body mass index (BMI), education status, occupation, social security, income level, marital status, and number of children, and the second part gathered information on health-related characteristics such as time since diagnosis, previous MPS diagnosis and whether or not it had been treated, what treatment modality was applied, how long the pain complaint had lasted, the presence of any allergies, the presence of other accompanying illnesses, medications used, and general state of health.[20-24]

Visual analog scale

The visual analogue scale (VAS) consists of a straight line with the end points defining extreme limits: "no pain at all" and "pain as bad as it could be." The patient is asked to mark his or her pain level on the line between the 2 end points and the distance between "no pain at all" and the mark and then defines the subject's pain.[25]

General Comfort Questionnaire

The instrument used in this study was the General Comfort Questionnaire (GCQ). The GCQ was developed by Katharine Kolcaba from her taxonomic structure of comfort to measure patients' comfort levels.[26] The adaptation of the scale to Turkish was performed by Kuğuoğlu and Karabacak.[27] The scale is a 4-point likert-type scale and contains a total of 48 items.[27]

State Anxiety Index

The State-Trait Anxiety Index (STAI) is a commonly used scale to measure anxiety level. The internal consistency (Cronbach α coefficient) for this study is 0.91. Oner and Le Compte[28] designed the Turkish adaptation and confirmed the reliability and validation of the inventory. The STAI, which describes how individuals feel at a given moment and under certain conditions, consists of 20 items. A lower total score indicates a low level of anxiety and a high score indicates a high level of anxiety.

Interventions

Aromatherapy group

Data collection forms were applied before trigger point injection. Participants were then prepared for trigger point injection. The diffuser and 100% pure lavender oil (*Lavandula angustifolia*) were applied during the trigger point process in accordance with the Aromatherapy Practice Guide and recommendations from the literature.[29,30] The diffuser was placed 30 cm away from the participants and 5 drops of volatile lavender oil (diluted with 100 cc distilled water) were placed in the reservoir. Within 10 to 15 minutes of completion of the procedure and completion of the inhalation, re-data collection forms were applied. In addition, VAS evaluation was performed again in the middle of the process (10 minutes).

Placebo group

Subjects in the placebo groups were treated in precisely the same way as those in the aromatherapy group, except that an odorless organic baby oil (Urtekram) was used in place of lavender oil.

Control group

For the individuals in the control group, no application was performed during the trigger point processing. Data collection process forms were applied before the pre-trigger point injection was given. Participants were then prepared for the trigger point injection. No intervention was made during the trigger point process and it was applied routinely. Within 10 to 15 minutes of the end of the process, data collection forms were applied again. In addition, VAS evaluation was performed again in the middle of the process (10 minutes).

Saliva sampling

Before and after the trigger point injection, an average of 2 mL of saliva was collected from the participants into the falcon tube and immediately placed on ice. Immediately after the application, the samples were taken to the laboratory. The saliva samples were centrifuged for 5 minutes at $+4^{\circ}$C, 1000 gauge. Each sample was gently and carefully placed in 2 different Cryo tubes to be backed up. Samples were stored in Cryo tubes at -80°C until analysis. The samples were gradually dissolved on the same day and analyzed at the same time. Cortisol levels were evaluated using an enzyme-linked immunosorbent assay (ELISA) kit (Cortisol ELISA kit, CUSABIO, Diagnostics).

Data analysis

The data obtained from the research were analyzed using the program SPSS 22.0. Kolmogorov-Smirnov test was used to check whether the numerical variables had normal distribution. Normally distributed

variables were shown as mean ± standard deviation (SD) and non-normal distributed variables as median values. Statistical significance was accepted as $P < .05$. In the analysis of the data, descriptive statistics were shown as numbers and percentages, means, and standard deviation values of the measurement data. The *t* test, one-way analysis of variance, Pearson correlation analysis, and χ^2, Kruskal-Wallis, Wilcoxon, Friedman, and Mann-Whitney *U* tests were used in independent samples.

Ethical consideration

Ethics committee approval (17-7.2/13) was obtained from the Ege University Faculty of Medicine Clinical Research Ethics Committee to conduct the research, and written permission was obtained from the Algology Department where the research was to be carried out. Permission was obtained to use the General Comfort Questionnaire (GCQ). The researcher explained the purpose of the study to the patients included in the study, and their verbal and written informed consent was obtained.

RESULTS

The mean age of participants in the aromatherapy, placebo, and control groups was 48.6 ± 12.0, 48.1 ± 11.9, and 49.7 ± 10.6 years, respectively. It was found that 27.2% of participants were illiterate: 22.7% in the aromatherapy group, 31.8% in the placebo group, and 27.3% in the control group (Table 1). No statistically significant difference was found ($P > .05$, Table 1) between the aromatherapy, placebo, and control groups in terms of age, gender, marital status, educational status, time since diagnosis, cigarette consumption, BMI, and economic situation.

In the aromatherapy group, there was a statistically significant difference between the pain intensity medians before and after the treatment ($P = .005$) and the pain intensity medians during and after the treatment ($P < .001$). The median values of pain severity of individuals during and after the procedure decreased statistically significantly with time (Table 2). After treatment the anxiety levels were 33.05 ± 4.58 in the aromatherapy group, in the placebo control 57.82 ± 5.57 and 60.36 ± 9.09 in the control group. Further, the postprocedure mean of the aromatherapy group was significantly lower than the preprocedure average (Table 3).

The mean of the total score of the GCQ postprocedural was 146.32 ± 8.11, 111.91 ± 10.90, and 104.45 ± 8.16 for the aromatherapy, placebo, and control group, respectively, and the difference between groups was statistically significant ($P = .001$). The mean postprocedural measurements of the placebo and control groups were significantly lower than the pretreatment measurement averages (Table 3)

There was no significant difference between the levels of preprocedure and postprocedure salivary cortisol levels in the aromatherapy, placebo, or control groups ($P > .05$) (Table 3).

DISCUSSION

Aromatherapy, which is a complementary and integrative approach widely used in many countries, is a part of holistic nursing practice. In individuals with MPS, the excessive use of trigger points stems from excessive loading, emotional stress, or pain traumas.[31] During trigger point injections, which are widely used in individuals with MPS, anxiety and stress are felt.[5] Although a study on the use of aromatherapy during trigger point injection could not be found in the literature, there are studies showing the efficacy during invasive interventions such as arteriovenous fistula,[32,33] venous port catheter,[34] intravenous catheter,[6,35] and colonoscopy.[36,37] In a study by Bagheri-Nesami et al[32] examining the effect of lavender inhalation on pain in hemodialysis patients during fistula needle penetration, 10% lavender extract was applied for 5 minutes to the aromatherapy group during the hemodialysis session, and lavender extract-free aromatherapy was applied to the control group. At the end of the study, the average pain severity score of the patients in the aromatherapy group had decreased significantly. In another similar study, it was reported that inhaler lavender aromatherapy applied during arteriovenous fistula (AVF) intervention in hemodialysis patients was effective in reducing AVF intervention pain.[33] In a study examining the effect of inhaler aromatherapy on venous port catheter procedure pain intensity and anxiety levels by Yayla and Özdemir,[34] the mean pain intensity of the lavender group was significantly lower than that of the control group, but there was no significant difference between the pain intensity scores of the eucalyptus and control groups.

In a study, by Bikmoradi et al,[6] of the effect of lavender inhalation on the severity of intravenous

TABLE 1. Homogeneity Test of Baseline for Participants (n = 66)

Features	Aromatherapy Group n = 22 $\bar{X} \pm SD$	Placebo Group n = 22 $\bar{X} \pm SD$	Control Group n = 22 $\bar{X} \pm SD$	Total n = 66 $\bar{X} \pm SD$	*P*
Age	48.6 ± 12.0	48.1 ± 11.9	49.7 ± 10.6	48.8 ± 11.3	.693
MPS duration, y	5.09 ± 5.70	6.59 ± 6.65	6.41 ± 5.87	6.03 ± 6.07	.336
BMI	24.6 ± 3.1	25.5 ± 4.4	24.7 ± 2.1	24.9 ± 3.2	.718
	n (%)	n (%)	n (%)	n (%)	
Gender					
Female	16 (72.7)	19 (86.4)	17 (77.3)	52 (78.8)	.530
Male	6 (27.3)	3 (13.6)	5 (22.7)	14 (21.2)	
Marital status					
Married	16 (81.8)	17 (77.3)	18 (81.8)	51 (77.3)	.772
Single	6 (18.2)	5 (22.7)	4 (18.2)	15 (22.7)	
Education status					
Literate but not finished school	5 (22.7)	7 (31.8)	6 (27.3)	18 (27.2)	.742
Primary or secondary school	5 (22.7)	6 (27.3)	8 (36.4)	19 (28.8)	
College graduate	12 (54.5)	9 (40.9)	8 (36.4)	29 (43.9)	
Profession					
Office worker	7 (31.8)	4 (18.2)	4 (18.2)	15 (22.7)	.788
Retired	8 (36.4)	6 (27.3)	7 (31.8)	21 (31.8)	
Self-employed	2 (9.1)	3 (13.6)	2 (9.1)	7 (10.6)	
Not working	5 (22.7)	9 (40.9)	9 (40.9)	23 (34.8)	
Children					
None	6 (27.3)	5 (22.7)	4 (18.2)	15 (22.7)	.772
At least one	16 (72.7)	17 (77.3)	18 (81.8)	51 (77.5)	
Smoking					
Yes	5 (22.7)	5 (22.7)	3 (13.6)	13 (19.7)	.682
No	17 (77.3)	17 (77.3)	19 (86.4)	53 (80.3)	
Economic situation					
Expenditure = income	20 (90.9)	21 (95.5)	20 (90.9)	61 (92.4)	.805
Expenditure > income	2 (9.1)	1 (4.5)	2 (9.1)	5 (7.6)	
Social security					
Yes	22 (100)	22 (100)	22 (100)	66 (100)	. . .

Abbreviations: BMI, body mass index; MPS, myofascial pain syndrome.

catheter placement in preschool children in hospital, 5 drops of lavender essence were applied to the children in the aromatherapy group, and 5 drops of distilled water were applied to the children in the control group 20 minutes before venipuncture. At the end of the study, it was found that the average pain intensity of the aromatherapy group was lower, with a statistically significant difference between the mean of

TABLE 2. Changes in Pain Severity According to Time in Aromatherapy, Placebo, and Control Groups

Pain (VAS)	Aromatherapy $\bar{X}$ (SD)	Aromatherapy $\bar{X}$' (Min – Max)	Placebo $\bar{X}$ (SD)	Placebo $\bar{X}$' (Min – Max)	Control $\bar{X}$ (SD)	Control $\bar{X}$' (Min – Max)	*z*	P
Preprocedural	6.05 (1.70)	6 (3 – 10)	6.68 (1.49)	7 (4 – 9)	6.09 (1.54)	6.5 (2 – 8)	– 0.093	.926
Midprocedural	5.23 (2.02)	5 (2 – 8)	8.05 (1.29)	8 (5 – 10)	8.27 (0.88)	8.5 (6 – 9)	– 6.474	.000
Postprocedural	3.86 (1.61)	4 (1 – 7)	7.41 (1.62)	7 (5 – 10)	7.64 (1.33)	8 (5 – 9)	– 8.469	.000
P	$\chi^2 = 18.918$, $P < .001$		$\chi^2 = 22.447$, $P < .001$		$\chi^2 = 26.337$, $P < .001$			
	Pre-post $P = .005$		Pre-post $P = .025$		Pre-post $P = .004$			
	Mid-post $P < .001$		Pre-mid $P < .001$		Pre-mid $P < .001$			

Abbreviation: VAS, visual analog scale.

TABLE 3. Comparison of STAI, GCQ, and Salivary Cortisol Levels in Aromatherapy, Placebo, and Control Groups

	Aromatherapy (n = 22)	Placebo (n = 22)	Control (n = 22)	*P*
STAI				
Preprocedural	40.14 ± 4.83	56.86 ± 4.38	58.73 ± 7.15	<.001
Postprocedural	33.05 ± 4.58	57.82 ± 5.57	60.36 ± 9.09	
GCQ				
Preprocedural	119.68 ± 8.55	116.41 ± 8.73	113.09 ± 9.32	<.001
Postprocedural	146.32 ± 8.11	111.91 ± 10.90	104.45 ± 8.16	
Salivary cortisol				
Preprocedural	57.61 ± 61.20	75.58 ± 72.97	75.93 ± 55.91	.760
Postprocedural	68.13 ± 46.31	89.15 ± 72.52	76.80 ± 54.72	

Abbreviations: GCQ, General Comfort Questionnaire; STAI, State Anxiety Index.

pain intensity at the 5th and 10th minutes after the treatment between the aromatherapy and control groups.[6] In another study, the effect of aromatherapy on pain and anxiety level during peripheral venous catheterization procedure was evaluated and found to have positive results.[35]

Comfort is defined as the expected outcome of a complex structure in physical, psychosocial, social, and environmental integrity related to help, peace of mind, and overcoming problems related to the needs of the individual.[8] In a study in which Cenkci and Nazik[8] investigated the effect of lavender aromatherapy on the level of pain, comfort, and satisfaction during labor, the perception of pain was significantly lowered, the level of comfort and satisfaction increased significantly in the first stage of birth, and the perception of pain decreased significantly in the aromatherapy group. Another study of the effects of biofeedback and aromatherapy on maternal satisfaction and opinions on primigravida mothers during delivery suggested that aromatherapy provides more comfort and relief than biofeedback therapy, and most mothers indicated that they wanted these interventions to be applied to friends and relatives.[9] In a study of the effectiveness of essential oils on children's comfort in a perianesthetic setting, lavender and ginger essential oil aromatherapy was given to the children in the intervention group, and jojoba oil as a placebo to the control group. Unlike our study results however, although the mean distress level at the end of the study was lower in the children in the essential oil group, the difference was not statistically significant. It was also reported that, although the parents had more positive opinions on aromatherapy practice in open-ended comments on the questionnaire, there was no difference in aromatherapy satisfaction between the groups.[10] In this context, it is thought that the application of aromatherapy will increase the comfort level of the patients, and it is considered important to provide physical and environmental interventions for patients to increase their comfort level.

The results showed that patients in the aromatherapy group had lower anxiety levels than those in the placebo and control groups after the intervention. In the literature, studies investigating the effects of aromatherapy on stress and anxiety in different patient groups have been conducted and several other studies have established the positive impact of aromatherapy on the level of anxiety.[15,16,38] Although these results are consistent with our study, a few studies did not show the same effect.[39,40]

In this study, inhalation of lavender oil essence had no effect on the saliva cortisol levels of the patients. Cortisol is a corticosteroid produced by the adrenal cortex and is a sensitive indicator of the body's stress response.[41] This finding is consistent with the results of Toda and Morimoto[14] and Seol et al.[42] No change in cortisol level was reported in these studies. However, since all studies have a high risk of bias, the evidence of current studies demonstrates the limited efficacy of aromatherapy in reducing stress, and it is recommended that studies be conducted with larger and different sample groups.

CONCLUSION

It is recommended that aromatherapy, which is low cost, noninvasive, and easily applicable, be applied to

individuals with MPS during trigger point injection because of its anxiety and stress-reducing effects.

Similar studies using complementary and integrative methods should be conducted with larger samples and different disease groups, and nurses should use aromatherapy in all appropriate interventions.

IMPLICATIONS FOR CLINICAL PRACTICE

Patients experience generalized anxiety and stress during medical interventions. Various complementary interventions are used to relieve patients' anxiety and stress. Aromatherapy is a widely used method and it is important that nurses have awareness and education concerning this holistic modality. Evidence-based research is needed in this area.

REFERENCES

1. Lugo H, García HI, Rogers HL, Plata JA. Treatment of myofascial pain syndrome with lidocaine injection and physical therapy, alone or in combination: a single blind, randomized, controlled clinical trial. *BMC Musculoskelet Disord*. 2016;17:101. doi:10.1186/s12891-016-0949-3.
2. Desai MJ, Saini V, Saini S. Myofascial pain syndrome: a treatment review. *Pain Ther*. 2013;2:21-36. doi:10.1007/s40122-013-0006-y.
3. Tekin L, Akarsu S, Durmuş O, Çakar E, Dinçer U, Kıralp MZ. The effect of dry needling in the treatment of myofascial pain syndrome: a randomized double-blinded placebo-controlled trial. *Clin Rheumatol*. 2013;32(3):309-315. doi:10.1007/s10067-012-2112-3.
4. Ga H, Choi JH, Park CH, Yoon HJ. Acupuncture needling versus lidocaine injection of trigger points in myofascial pain syndrome in elderly patients—a randomised trial. *Acupunct Med*. 2007;25:130-136.
5. Yigit S. *Comparison of the Effectiveness of Dry Needling and Laser Therapy in Myofascial Pain Syndrome* [dissertation]. Isparta, Turkey: Süleyman Demirel University; 2015.
6. Bikmoradi A, Khaleghverdi M, Seddighi I, Moradkhani S, Soltanian A, Cheraghi F. Effect of inhalation aromatherapy with lavender essence on pain associated with intravenous catheter insertion in preschool children: a quasi-experimental study. *Complement Ther Clin Pract*. 2017;28:85-91. doi:10.1016/j.ctcp.2017.05.008.
7. Sheikhan F, Jahdi F, Khoei EM, Shamsalizadeh N, Sheikhan M, Haghani H. Episiotomy pain relief: use of lavender oil essence in primiparous Iranian women. *Complement Ther Clin Pract*. 2012;18(1):66-70. doi:10.1016/j.ctcp.2011.02.003.
8. Cenkci Z, Nazik E. The effect of aromatherapy on pain, comfort and satisfaction during childbirth. *New Trends Issues Proc Humanit Soc Sci*. 2017;4(2):11-19. www.prosoc.eu.
9. Janula R, Singh M. An individual review on maternal satisfaction and views about biofeedback and aromatherapy during childbirth among primigravida mothers. *Sch J Appl Med Sci*. 2014;2(1A):38-41.
10. Nord D, Belew J. Effectiveness of the essential oils lavender and ginger in promoting children's comfort in a perianesthesia setting. *J Perianesth Nurs*. 2009;24(5):307-312. doi:10.1016/j.jopan.2009.07.001.
11. Buckle J. *Clinical Aromatherapy: Essential Oils in Practice*. Philadelphia, PA: Elsevier Health Sciences; 2014. https://www.amazon.in/Clinical-Aromatherapy-Book-Essential-Practice-ebook/dp/B0148JSEPQ. Accessed April 19, 2016.
12. Rajai N, Sajadi SA, Teymouri F, Zareiyan A, Siavoshi S, Malmir M. The effect of aromatherapy with lavender essential oil on anxiety and stress in patients undergoing coronary artery bypass graft surgery. *Jundishapur J Chronic Dis Care*. 2016;5(4).
13. Takatsuji K, Sugimoto Y, Ishizaki S, Ozaki Y, Matsuyama E, Yamaguchi Y. The effects of examination stress on salivary cortisol, immunoglobulin A, and chromogranin A in nursing students. *Biomed Res*. 2008;29(4):221-224.
14. Toda M, Morimoto K. Effect of lavender aroma on salivary endocrinological stress markers. *Arch Oral Biol*. 2008;53(10):964-968. doi:10.1016/j.archoralbio.2008.04.002.
15. Kritsidima M, Newton T, Asimakopoulou K. The effects of lavender scent on dental patient anxiety levels: a cluster randomised-controlled trial. *Community Dent Oral Epidemiol*. 2010;38(1):83-87. doi:10.1111/J.1600-0528.2009.00511.X.
16. Motomura N, Sakurai A, Yotsuya Y. Reduction of mental stress with lavender odorant. *Percept Mot Skills*. 2001;93(3):713-718.
17. Townsend CS, Bonham E, Chase L, Dunscomb J, McAlister S. A comparison of still point induction to massage therapy in reducing pain and increasing comfortin chronic pain. *Holist Nurs Pract*. 2014;28(2):78-84. doi:10.1097/HNP.0000000000000012.
18. Krinsky R, Murillo I, Johnson J. A practical application of Katharine Kolcaba's comfort theory to cardiac patients. *Appl Nurs Res*. 2014;27(2):147-150.
19. Kolcaba K. Evolution of the mid range theory of comfort for outcomes research. *Nurs Outlook*. 2001;49(2):86-92.
20. Choi SY, Park K. Effect of inhalation of aromatherapy oil on patients with perennial allergic rhinitis: a randomized controlled trial. *J Evid Based Complement Altern Med*. 2016:1-8. doi:10.1155/2016/7896081.
21. Lillehei AS, Halcon LL, Savik K, Reis R. Effect of inhaled lavender and sleep hygiene on self-reported sleep ıssues: a randomized controlled trial. *J Altern Complement Med*. 2015;21(7):430-438. doi:10.1089/acm.2014.0327.
22. Ndao DH, Ladas EJ, Cheng B, et al. Inhalation aromatherapy in children and adolescents undergoing stem cell infusion: results of a placebocontrolled double-blind trial. *Psychooncology*. 2012;21:247-254. doi:10.1002/pon.1898.
23. Najafi Z, Taghadosi M, Sharifi K, Farrokhian A, Tagharrobi Z. The effects of inhalation aromatherapy on anxiety in patients with myocardial infarction: a randomized clinical trial. *Iran Red Crescent Med J*. 2014;16(8):1-7. doi:10.5812/ircmj.15485.
24. Watanabe E, Kuchta K, Kimura M, Rauwald HW, Kamei T, Imanishi J. Effects of bergamot (citrus bergamia (risso) wright & arn.) Essential oil aromatherapy on mood states, parasympathetic nervous system activity, and salivary cortisol levels in 41 healthy females. *Forsch Komplementmed*. 2015;22:43-49. doi:10.1159/000380989.
25. Haefeli M, Elfering A. Pain assessment. *Eur Spine J*. 2006;15:17-24. doi:10.1007/s00586-005-1044-x.
26. Kolcaba K. *Comfort Theory and Practice: A Vision for Holistic Care and Research.* New York, NY: Springer Publishing Company; 2003.
27. Kuğuoğlu S, Karabacak U. Turkish version of the general comfort questionnaire. *Florence Nightingale J Nurs*. 2008:16(61):16-23.
28. Oner N, Le Compte A. *State-Trait Anxiety Inventory Hand Book*. Istanbul, Turkey: Bogazici University; 1985.
29. Lis-Balchin M. *Aromatherapy Science: A Guide for Healthcare Professionals*. London, England: Pharmaceutical Press; 2006:7-89. https://books.google.com.tr/books?id=rGQps9fQX1YC&printsec=frontcover&hl=tr&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false. Accessed September 11, 2016.

30. Maddocks-Jennings W, Wilkinson JM. Aromatherapy practice in nursing: literature review. *J Adv Nurs*. 2004;48(1):93-103. doi:10.1111/j.1365-2648.2004.03172.x.
31. Kim SA, Oh KY, Choi WH, Kim IK. Ischemic compression after trigger point injection affect the treatment of myofascial trigger points. *Ann Rehabil Med*. 2013;37(4):541-546. doi:10.5535/arm.2013.37.4.541.
32. Bagheri-Nesami M, Espahbodi F, Nikkhah A, Shorofi SA, Charati JY. The effects of lavender aromatherapy on pain following needle insertion into a fistula in hemodialysis patients. *Complement Ther Clin Pract*. 2014;20(1):1-4. doi:10.1016/j.ctcp.2013.11.005.
33. Aliasgharpour M, Abbaszadeh R, Mohammadi N, Kazemnejad A. Effect of lavender aromatherapy on the pain of arteriovenous fistula puncture in patients on hemodialysis. *Nurs Pract Today*. 2016;3(1):26-30.
34. Yayla EM, Özdemir L. Effect of inhalation aromatherapy on procedural pain and anxiety after needle insertion into an implantable central venous port catheter: a quasi-randomized controlled pilot study. *Cancer Nurs*. 2019;42(1):35-41. doi:10.1097/NCC.0000000000000551.
35. Karaman T, Karaman S, Dogru S, Tapar H, Sahin A, Suren M, et al. Evaluating the efficacy of lavender aromatherapy on peripheral venous cannulation pain and anxiety: a prospective, randomized study. *Complement Ther Clin Pract*. 2016;23:64-68. doi:10.1016/j.ctcp.2016.03.008.
36. Mogharab M, Ayoubzadeh K, Hosseini SMR, Sharifzadeh G. The effects of inhalation of aromatherapy with lavender on anxiety amongst patients undergoing colonoscopy. *Mod Care J*. 2016;13(1):e9457. doi:10.17795/modernc.9457.
37. Lee YM, Ahn HY. Effects of aromatherapy on anxiety and discomfort in patients having colonoscopy. *J Korean Acad Nurs*. 2010;17(4):539-547.
38. Saritaş S, Kavak F, Savaş B. The effect of lavender oil on anxiety levels of patients before laparoscopic cholecystectomy. *Complement Ther Clin Pract*. 2018;32:51-54. doi:10.1016/j.ctcp.2018.05.003.
39. Hu PH, Peng YC, Lin YT, Chang CS, Ou MC. Aromatherapy for reducing colonoscopy related procedural anxiety and physiological parameters: a randomized controlled study. *Hepatogastroenterology*. 2010;57(102):1082.
40. Muzzarelli L, Force M, Sebold M. Aromatherapy and reducing preprocedural anxiety: a controlled prospective study. *Gastroenterol Nurs*. 2006;29(6):466-471. doi:10.1097/00001610-200611000-00005.
41. Schneider R. There is something in the air: testing the efficacy of anew olfactory stress relief method (Aromastick®). *Stress Health*. 2016;32(4):411-426. doi:10.1002/smi.2636.
42. Seol GH, Lee YH, Kang P, You JH, Park M, Min SS. Randomized controlled trial for *Salvia sclarea* or *Lavandula angustifolia*: differential effects on blood pressure in female patients with urinary incontinence undergoing urodynamic examination. *J Altern Complement Med*. 2013;19(7):664-670. doi:10.1089/acm.2012.0148.