Winter 2020

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Mikyoung Lee
Eulji University

Ji-Ah Song
Konyang University

Mina Ahn
Shinsung University

Ahra Jo
Songho University

Jeongah Park
Eulji University

See next page for additional authors

Annual Bulletin of The Bum-Suk Academic Scholarship Foundation
Vol. 24, 151~168, 2020

A Systematic Review and Meta-Analysis on the Antihypertensive Effect of Aromatherapy Essential Oils

이미경[1] · 송지아[2] · 안미나[3] · 조아라[4] · 박정아[1] · 김원종[1] · Claudia M. Davis[5] · Yeon Sook Kim[5] · 허명행[1]†

[1]을지대학교 간호대학, [2]건양대학교 간호대학, [3]신성대학교 간호학과, [4]송호대학교 간호학과
[5]Department of Nursing, California State University San Bernardino, US

아로마테라피가 혈압에 미치는 효과: 체계적 문헌고찰 및 메타분석

Mikyoung Lee[1] · Ji-Ah Song[2] · Mina Ahn[3] · Ahra Jo[4] · Jeongah Park[1] · Wonjong Kim[1]
Claudia M. Davis[5] · Yeon Sook Kim[5] · Myung-Haeng Hur[1]†

[1]College of Nursing, Eulji University, Daejeon, South Korea
[2]College of Nursing, Konyang University, Daejeon, South Korea
[3]Department of Nursing, Shinsung University, Dangjin, South Korea
[4]Department of Nursing, Songho University, Gangwondo, South Korea
[5]Department of Nursing, California State University, San Bernardino, US

국문요약

목적 : 본 연구는 아로마테라피가 혈압에 미치는 효과를 보고한 실험연구들에 대한 체계적 문헌고찰이다.

대상 및 방법 : 2017년 12월 1일까지 12개의 데이터베이스를 이용하여 출판된 학술지 논문을 검색하였다. 문헌 선택, 자료추출과 검증은 3명의 연구자가 독립적으로 수행하였으며 정상 성인과 고혈압 환자에게 아로마테라피를 이용하여 혈압을 측정한 무작위 대조군 연구(randomized controlled trial)를 선정하였다. 비뚤림 위험은 Cochrane 그룹의 Risk of bias(RoB) 도구를 사용하여 평가하였다. 또한 정량적 합성(quantitative synthesis)이 가능한 자료에 대해서는 메타분석을 수행하였다.

결과 : 전자 데이터베이스로부터 2545개의 문헌이 검색되었고 중복된 문헌 580개, 핵심질문(PICO)와 관계가 없거나 선정기준을 충족하지 않는 문헌 1892개를 제외하고 1차로 74개를 선정하였다. 이후 2명의 연구자가 74개의 원문을 읽고 선정기준을 충족시키는 15개의 연구를 최종 선정하였고 이 중 11개는 RevMan을 이용하여 메타분석을 실시하였다. 메타분석 결과, 아로마 오일 흡입과 마사지법은 수축기 혈압(n=379, MD=-4.72; 95% CI -8.38 to -1.07)과 이완기 혈압(n=379, MD=-2.42; 95% CI -4.46 to -0.38)을 낮추는데 효과적인 것으로 나타났다.

결론 : 아로마 오일 흡입과 마사지법은 정상 성인과 고혈압 환자의 수축기 혈압과 이완기 혈압을 낮추는데 효과적으로 사용될 수 있다.

색인단어 : 아로마테라피, 체계적 고찰, 고혈압, 혈압

†Corresponding author : Myung-Haeng Hur RN, PhD. College of Nursing, Eulji university, 77 Gyeryong-ro 771 beon-gil Jung-gu, Daejeon 34824, Korea
TEL: +82-42-259-1714, FAX: +82-42-259-1709, E-Mail: wowmhhur@nate.com

INTRODUCTION

1.1. Purposes

Blood pressure is defined as the pressure applied on the walls of blood vessels by the contraction of the heart. Hypertension and hypotension are defined as abnormally high and low blood pressure, respectively (Blood Pressure Association UK, 2016). Hypertension, by itself, is a disorder and also a major risk factor for cerebrovascular diseases (Korean Statistical Information Service, 2016a; Nah & Kim, 2007). Next to cancer, cerebrovascular diseases are the most common causes of death among Korean adults. The risk for cerebrovascular diseases doubles for every 20-mmHg increase in systolic or diastolic pressure from 155 or 75 mmHg or above, respectively (Prospective Studies Collaboration, 2002). According to the 6th Korean National Nutrition Examination Survey III (2015), the prevalence of hypertension among adults ≥ 30 years of age is 27.9%, which corresponds to one in every three adults; hypertension also occurs in one in every two adults ≥ 60 years of age, which indicates that the risk of hypertension increases with age (Kim & Son, 2012; Korean Statistical Information Service, 2016b). Despite the use of antihypertensive drugs, the rate of control of hypertension is still below 50%. Consistent treatment and management of hypertension is an important issue in health care.

Aside from pharmacotherapy, other methods of treatment such as aromatherapy, Qigong exercise, Tai Chi, and food reflexology massage have been used to treat hypertension, and some of these methods have been reported to decrease blood pressure (So & Lee, 2010). Aromatherapy is administered with the aim of improving mood and perception and bringing psychological or physical peace to a patient by means of assimilation of essential oils, aromatic compounds, and plant oils (Wikipedia, 2016) through massage, inhalation, or ingestion (Buckle, 2003). The initial aim of aromatherapy was to bring physical and psychological relaxation. However, an increasing number of studies in various medical fields have evaluated the therapeutic effects of aromatherapy on generally healthy people with a few health issues (Youn, You, & Youn, 2015).

Studies have reported that changes in blood pressure are accompanied by physical symptoms such as stress and anxiety (Kim & Kwon, 2010; Louis & Kowalski, 2002; Seol et al., 2013), which are caused by the effect of essential oils on sympathetic nerves in the autonomic nervous system (Cha, Lee, & Yoo, 2010). Studies on the effects of essential oils on blood pressure have reported diverse results, with the effects varying depending on the type of oil used in an intervention (Dunn, Sleep, & Collett, 1995; Hongratanaworakit, 2009a, 2009b, 2010; Kim & Kwon, 2010). Aromatherapy is advantageous in that it is easy to administer; it can be administered by an individual at any time and place; and it has a rapid onset of effects and very few side effects (Buckle, 1997). With regard to its mechanism of action, aromatic molecules are transported through the skin, respiratory, and vascular systems to the nerv-

ous system, where they control psychological and physiological stress reactions and immune functions (Robins, 1999).

A previous literature review has reported contradictory results regarding the effects of aromatherapy on hypertension among clinical trials retrieved from various domestic and foreign databases (Hur, Lee, Kim, & Ernst, 2012). We performed an up-to-date systematic review of studies on the effects of aromatherapy on blood pressure with the aim of contributing to the execution of evidence-based aromatherapy interventions in nursing services.

1.2. Objectives

This study was conducted with the aim of performing a systematic review of domestic and foreign studies about the effects of aromatherapy on healthy adults and patients with hypertension. The detailed objectives are as follows.

a. Verify the effects of aromatherapy on blood pressure through a systematic review of studies involving healthy adults and patients with hypertension treated by aromatherapy.

b. Identify essential oils that were found to have an effect on blood pressure in healthy adults and patients with hypertension.

c. Identify aromatherapy procedures that were found to have an effect on blood pressure in healthy adults and patients with hypertension.

MATERIALS & METHODS

2.1. Study design

The present study is a systematic review of experimental results on the effects of aromatherapy on blood pressure in patients with hypertension.

2.2. Populations, intervention, comparison, outcomes (PICO)

Details of the PICO elements in our systematic review are as follows.

a. Populations

This study included asymptomatic adults and patients diagnosed with hypertension, all of age ≥ 18 years.

b. Intervention

Interventions involving the assimilation of essential oils through inhalation or massage were selected.

c. Comparison

The experimental group was compared with the control group, which did not receive aromatherapy, and the placebo group, which received treatment with placebo oils.

d. Outcome

Studies that measured systolic and diastolic blood pressure were selected to investigate the effects of aromatherapy on blood pressure.

2.3. Data search, collection, and selection

2.3.1. Data search

Domestic databases, including the Research Information Sharing Service, National Digital Science Library, KoreaMed, Korean Medical

database, DBpia, National Central Library, National Assembly Library, and National Research Foundation of Korea databases, and foreign databases, including PubMed, Cochrane Central Register of Controlled Trials, EMBASE, and Cumulative Index to Nursing and Allied Health Literature, were searched for journal articles published from inception to December 1, 2016. Articles were retrieved using Medical Subject Headings (MeSH) terms, the 'and/or' operator, and truncation. Articles that used terms such as 'Aromatherapy' [MeSH], 'Aroma oil', and 'Aroma', all of which are related to aromatherapy, were included. To include patients with hypertension among our study subjects, articles containing the term 'Blood Pressure' [MeSH], which is an intervention outcome, were included. In addition, 'hypertension' was also used as a search term (Table 1). Both domestic and foreign databases were searched using the same search technique (Table 1).

Table 1. Protocol of the Telephone Counseling

No.	Search term
1	Aromatherapy [MeSH]
2	Aroma oil
3	Aroma'
4	#1 OR #2 OR #3
5	Hypertension
6	Blood Pressure [MeSH]
7	#5 OR #6
8	#4 AND #7

2.3.2. Data collection and selection

Articles for this systematic review were selected using the following inclusion criteria: (1) Studies investigating changes in blood pressure following aromatherapy in normal adults and patients with hypertension; and (2) randomized controlled trials (RCTs). The exclusion criteria were: (1) Studies involving patients who were pregnant or had particular disorders; (2) animal experiments or preclinical trials; (3) studies published in languages other than Korean or English; (4) comparative studies; (5) unpublished studies; and (6) observational or non-experimental studies and literature reviews.

Data were selected on the basis of the inclusion criteria and PICO elements. The initial data search retrieved 2545 articles. After exclusion of 580 duplicate articles, four researchers reviewed the titles, abstracts, and contents of the remaining 1965 articles. A total of 1891 articles that were unrelated to the PICO elements or did not have appropriate research design or subjects were excluded. The remaining 74 articles were screened for the second time in accordance with the same criteria and procedure. After exclusion of 59 studies (31, not RCTs; 13, not relevant to healthy adults; 2, inappropriate outcome variables; 5, neither massage nor inhalation; 4, employed a variety of interventions; 3, reviews/conference papers; 1, employed chemically composed aroma oils), the remaining 15 studies were selected for further analysis. Among the 15 studies, 3 studies that did not indicate the mean values and standard deviation and another that used aroma oils that increase blood pressure were excluded. Thus, 11 articles were finally selected for quantitative synthesis (Figure 1).

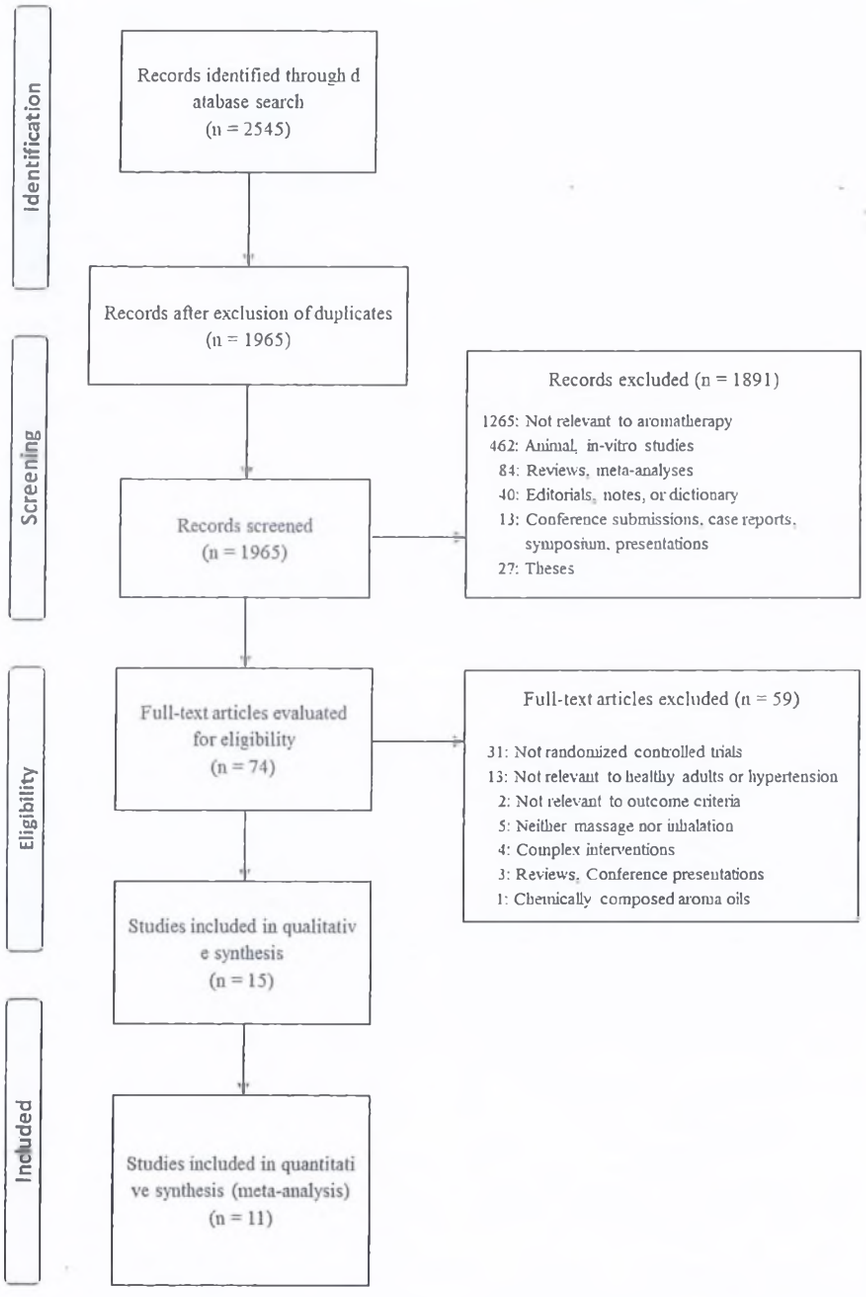


Figure 1. Flow diagram of the study.

2.4. Qualitative assessment

Critical literature review was performed using the 'Risk of Bias' tool developed by the Cochrane Collaboration(Higgins et al., 2011). This tool, used for qualitative assessment of RCTs, consists of seven domains — sequence generation, allocation concealment, blinding of participants and personnel, blinding of outcome assessors, incomplete outcome data, selective outcome reporting, and other sources of bias. The risk of bias in each domain was identified as low, high, or unclear. Qualitative assessment was performed independently by four researchers, who reviewed the full texts of the final 11 articles. Disagreement among the researchers was resolved through discussion. The results of qualitative assessment are presented graphs generated using Review Manager (RevMan Version 5.3., Copenhagen) (Figure 2).

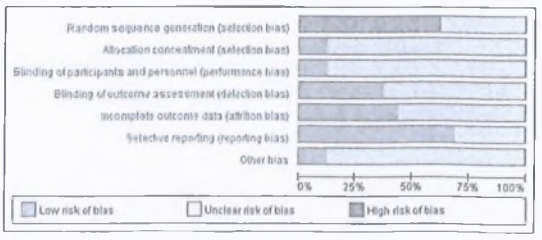


Figure 2. Flow diagram of the study.

2.5. Data analysis

Systematic verification and synthesis, statistical merging, and outcome reporting were analysed in accordance with the Cochrane guidelines (Higgins & Green, 2011).

2.5.1. Data extraction

The characteristics of the 15 studies included in the systematic review were analysed and coded using a coding table that listed the following: author, publication year, research design, number of samples, method of intervention for the control and experimental groups, outcome variables, intergroup differences, and authors' conclusions (Table 2.).

2.5.2. Analytical model selection

Since there was heterogeneity among the studies in terms of intervention method, time, or duration, analysis was performed using a random effects model.

Table 2. Summary of randomized clinical trials on aromatherapy for hypertension in healthy adults.

First author (year)	Study design, sample size	Intervention group(regimen)	Aroma oils	Control group (regimen)	Main outcome measures	Intergroup difference	Authors' conclusion
Inhalation							
Kim (2003)	Randomized control group pre and post treatment (49–59years of age)	(A)Aroma inhalation (n=6); 2min, three times/day, 2weeks	Bergamot,geranium, lavender, clary sage (2:2:2:1)	(B)No treatment (n=6)	(1)SBP (2)DBP	(1)p=.026 (2)p=.041	'The aromatherapy was supported as an effective nursing intervention to reduce psychological and physiological responses...'
Cha (2010)	Randomized control group pre and post treatment 42 patients with Hypertension (20–65years of age)	(A)Aroma inhalation (n=22); 2min, two times/day, 3weeks; 2*2 gauze	Lemon, lavender, ylang-ylang (2:2:1)	(B)Artificial lemon fragrance inhalation (n=20)	(1)SBP (2)DBP	(1)p<.001 (2)NS	'Aromatherapy is effective in lowering systolic blood pressure and sympathetic nerve system activity'
Hu (2010)	Randomized controlled trial 27 patients receiving Colonoscopy (average 52.3years)	(A)Aroma inhalation (n=14); 5min; Mask	1 drop neroli oil	(B)Sunflower oil inhalation (n=13)	(1)SBP (2)DBP	(1)p=.003 (2)p=.043	'Aromatic care for colono- scopy effective and safe preprocedural technique that could decrease systolic blood pressure.'
Choi (2012)	Randomized control group pre and post treatment 44 patients with essential hypertension	(A)Aroma inhalation (n=20); 3min, three times/day, 2weeks; Gauze	Lavender,majoram, ylangylang (4:3:3)	(B)No treatment (n=16)	(1)SBP (2)DBP	(1)NS (2)NS	'Blood pressure, pulse, stress, and anxiety were not significantly different between the two groups.'

First author (year)	Study design, sample size	Intervention group(regimen)	Aroma oils
Kang (2012)	Randomized controlled trial 60 patients with chronic low back pain treatment before spine surgery	(A)Aroma inhalation (n=15); 5min, one time (B)Aroma inhalation (n=15); 5min, one time (C)Aroma inhalation (n=15); 5min, one time	(A)0.1% basil essential oil(BEO) (B)1% BEO (C)5% BEO
Seol (2013)	Double-blind, randomized controlled trial; 34 female patients with urinary incontinence (33–75years of age)	(A)Aroma inhalation (n=12); (B) Aroma inhalation (n=12); 60min, one time; Aroma pads	(A)5% lavender (B)5%clary sage
Choi (2014)	Randomized controlled trial; 63healthy postmenopausal women (25–65years of age)	(A)Aroma inhalation (n=22); 5min, two times/day, 5days; Fragrance pad (B)Aroma inhalation (n=19); 5min, two times/day, 5days; Fragrance pad	(A)0.1% neroli (B)0.5% neroli
Kim (2014)	Randomized controlled trial; 62 participants (average 53.7years)	(A)Aroma inhalation (n=15) (B)Aroma inhalation (n=16) (C)Aroma inhalation (n=16)	(A)1% limonene (B)1%1,8-cineol (C)1% eucalyptus

Control group (regimen)	Main outcome measures	Intergroup difference	Authors' conclusion
(D)Almond oil inhalation (n=15)	(1)SBP (2)DBP	(1)p=.055 (2)p=.010	'BEO-inhalation at specific concentrations can be useful method for the relief of pain and blood pressure control for patients with chronic low back pain before spine surgery.'
(C)Almond oil (n=10)	(1)SBP (2)DBP	(1)B and C p=.048 B and A p=.026 (2)B and A p =.034	'Inhalation of clary oil vapors resulted in significantly reduced systolic blood pressure compared with inhalation of lavender oil vapors...'
(C)No treatment (n=22)	(1)SBP (2)DBP	(1)B and C p=.03 (2)A and C B and C p=.001	'These findings indicate that inhalation of neroli oil helps... reduce blood pressure in postmenopausal women.'
(D)No treatment (n=15)	(1)SBP (2)DBP	(1)A and B C and D p=.173 (2) A and B C and D p=.229	'We found that inhalation of 1,8-cineole and eucalyptus significantly decreased SBP due to the anxiolytic effect of 1,8-cineole, but the differences between groups were not significant.'

First author (years)	Study design Sample size	Intervention group(regime)	Aroma oils	Control group (regime)	Main outcome measures	Intergroup difference	Authors conclusion
Massage							
Hongratanaworakit (2006)	Randomized controlled trial; 40 healthy volunteers (19–48years of age)	(A)Lower abdomen aroma massage (n=20) 5min, massage area covered with plastic film	1ml of a 20% solution of ylangylang oil in sweet almond oil	(B)1ml pure sweet almond oil massage (n=20)	(1)SBP (2)DBP	(1)p=.012 (2)p=.033	'The ylangylang oil caused a significant decrease of blood pressure...'
Hongratanaworakit (2007)	Randomized controlled trial; 39 healthy volunteers (18–48years of age)	(A)Lower abdomen aroma massage (n=19) 5min, massage area covered with plastic film	1ml of a 20% solution of sweet orange oil in sweet almond oil	(B)1ml pure sweet almond oil massage (n=20)	(1)SBP (2)DBP	(1)p≥.05 (2)p≥.05	'No significant effects of the sweet orange oil on systolic blood pressure, diastolic blood pressure and...'
Hongratanaworakit (2009a)	Randomized controlled trial; 35 healthy volunteers (18–48years of age)	(A)Lower abdomen aroma massage (n=15) 5min, massage area covered with plastic film	1ml of a 20% solution of rosemary oil in sweet almond oil	(B)1ml pure sweet almond oil massage (n=20)	(1)SBP (2)DBP	(1)p≤.05 (2)p≤.05	'Therosemary oil caused a significant increase of blood pressure.'
Hongratanaworakit (2009b)	Randomized controlled trial; 40 healthy volunteers (18–21years of age)	(A)Lower abdomen aroma massage (n=20) 5min, massage area covered with plastic film	1ml of a 20% solution of rose oil in sweet almond oil	(B)1ml pure sweet almond oil massage (n=20)	(1)SBP (2)DBP	(1)p=.036 (2)NS	'Compared to placebo, rose oil caused significant decrease ... and systolic blood pressure ...'

First author (years)	Study design Sample size	Intervention group(regime)	Aroma oils	Control group (regime)	Main outcome measures	Intergroup difference	Authors conclusion
Hongratanaworakit (2010)	Randomized controlled trial; 40 healthy volunteers (18–21years of age)	(A)Lower abdomen aroma massage (n=20) 5min, massage area covered with plastic film	1ml of a 20% solution of jasmine oil in sweet almond oil	(B)1ml pure sweet almond oil massage (n=20)	(1)SBP (2)DBP	(1)p=.041 (2)p=.017	'The jasmine oil group show significant increase of systolic and diastolic blood pressure.'
Hongratanaworakit (2011)	Randomized controlled trial; 40 healthy volunteers (19–48years of age)	(A)Lower abdomen aroma massage (n=20); 5min, massage area covered with plastic film	1ml of 9.6% lavender oil and 0.4% bergamot oil in sweet almond oil	(B)1ml pure sweet almond oil massage (n=20)	(1)SBP (2)DBP	(1)p=.014 (2)p=.007	'Compared with placebo, blended essential oil caused significant decrease of... and systolic and diastolic blood pressure...'
Eguchi (2016)	Crossover randomized controlled trial; 52 healthy participants (27–72years of age)	(A)Aroma foot massage(n=27) (B)Aroma foot massage(n=25) 45min, three times/week, 4weeks	Lavender, chamomile, sandalwood, ylang-ylang, marjoram, jojoba	(A)→(B) (B)→(A) Crossover No treatment	(1)SBP (2)DBP	(1)p=.02 (2)p=.006	'The self-administered aroma aroma foot massage intervention significantly decreased the mean SBP and DBP...'

SBP, systolic blood pressure; DBP, diastolic blood pressure; NS, not significant; BEO, basil essential oil.

2.5.3. Effect size calculation

Since the outcome variables were continuous in nature, effect sizes were calculated as mean values and standard deviations of diastolic and systolic blood pressure measurements. Of the 15 studies included in the systematic review, 11 studies for which effect size calculation was possible were used to investigate the effects of aromatherapy on blood pressure in adults.

2.5.4. Heterogeneity test

Heterogeneity among the included studies was determined by meta-analysis. The heterogeneity test, performed using forest plots or statistical figures, was used to identify common characteristics among the studies in terms of confidence intervals (CIs) and effect estimates. Heterogeneity in effect size indicates the distribution and variation of effect sizes of the included studies. In this study, heterogeneity was assessed using the Higgins I^2 statistic. Heterogeneity was deemed low if $I^2 = 25\%$, moderate if $I^2 = 50\%$, and high if $I^2 \geq 75\%$.

2.5.5. Publication bias test

Publication bias, which demonstrates the correlation between sample and effect sizes, was visually identified by means of funnel plots. This scatter plot consists of a horizontal axis representing intervention effect estimates such as relative risk and a vertical axis representing the precision of study such as standard error. The area underneath the diagonal line indicates the 95% CI of each effect size. The likelihood of publication bias decreases and increases with the increase and decrease in symmetry, respectively, of the funnel plot.

RESULTS

3.1. General characteristics of the studies selected for systematic review

On the basis of the inclusion criteria, fifteen studies that investigated the effects of aromatherapy on blood pressure were included in the systematic review (Table 2). All fifteen of the studies were published after 2003 — eight before and seven after 2010. All fifteen of the studies were conducted in Asia — eight in Korea, six in Thailand, and one in Japan. The study subjects ranged in age from 18 to 72 years. With regard to the types of aromatherapy administered, eight studies applied the inhalation method, while seven applied massage. Lavender oil, used in six of fifteen (40%) studies, was the most commonly used essential oil. Eighteen other essential oils, including bergamot, geranium, lemon, chamomile, and jasmine oils, were used alone or in combination with other oils. Systolic and diastolic blood pressure measurements were used as dependent variables, and changes in these variables according to the type of essential oil used were investigated.

3.2. Effect size estimation

The effects of aromatherapy on blood pressure (diastolic and systolic) were investigated by calculating the effect size in 11 RCTs out of the 15 studies included in this systematic review (Figure 3), by means of random effects analysis (aromatherapy group vs. control group, Higgins

I^2 = 37%).

The difference in systolic blood pressure between the experimental group that received aromatherapy and the control group that did not was 4.72 points (mean difference [MD], −4.72; 95% CI, −8.38 to −1.07), which indicated a significant effect of aromatherapy on decreasing blood pressure. A significant difference in effect size, too, was observed between the experimental and control groups (Z = 2.53; p = .01). Systolic pressure was analysed separately for inhalation and massage aromatherapy. Among the elven RCTs included in the meta-analysis, six and five, respectively, employed inhalation and massage interventions. Inhalation aromatherapy resulted in a decrease in blood pressure by 7.32 points (MD, −7.32; 95% CI, −12.62 to −2.03), and a significant difference in effect size was observed between the experimental and control groups (Z = 2.71; p = .007). Although massage aromatherapy resulted in a decrease in systolic pressure by 2.13 points (MD, −2.13; 95% CI, −6.67 to 2.42), there was no significant difference in effect size between the experimental and control groups (Z = 0.92; p = .36).

The difference in diastolic pressure between the experimental and control groups was 2.42 points (MD, −2.42; 95% CI, −4.46 to −0.38), and the difference in effect size between the two groups was significant (Z = 2.32; p = .02). Inhalation aromatherapy resulted in decreases in diastolic and systolic pressure by 3.50 (MD, −3.50; 95% CI, −7.14 to 0.13) and 1.80 points (MD, −1.80; 95% CI, −4.32 to 0.71), respectively; however, there were no significant differences in effect size between the experimental and control groups in either intervention (inhalation: Z = 1.89, p = .06; massage: Z = 1.41, p = .16) (Figure 3).

3.3. Publication bias

Publication bias were detected with the use of a funnel plot. The funnel plot was symmetrical, suggesting that publication bias may not exist (Figure 4).

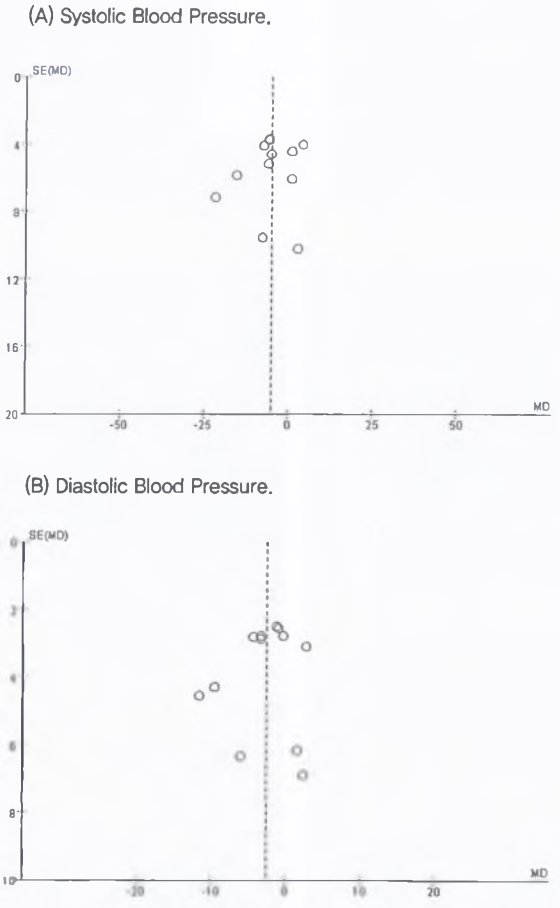
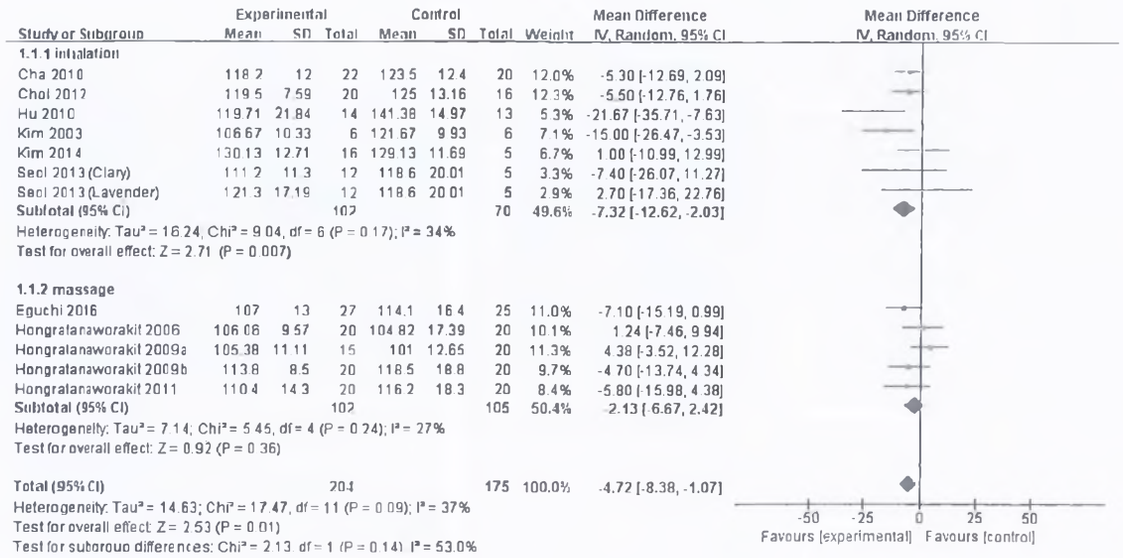


Figure 4. Funnel plot of the effect of aromatherapy.

(A) Systolic Blood Pressure.



(B) Diastolic Blood Pressure.

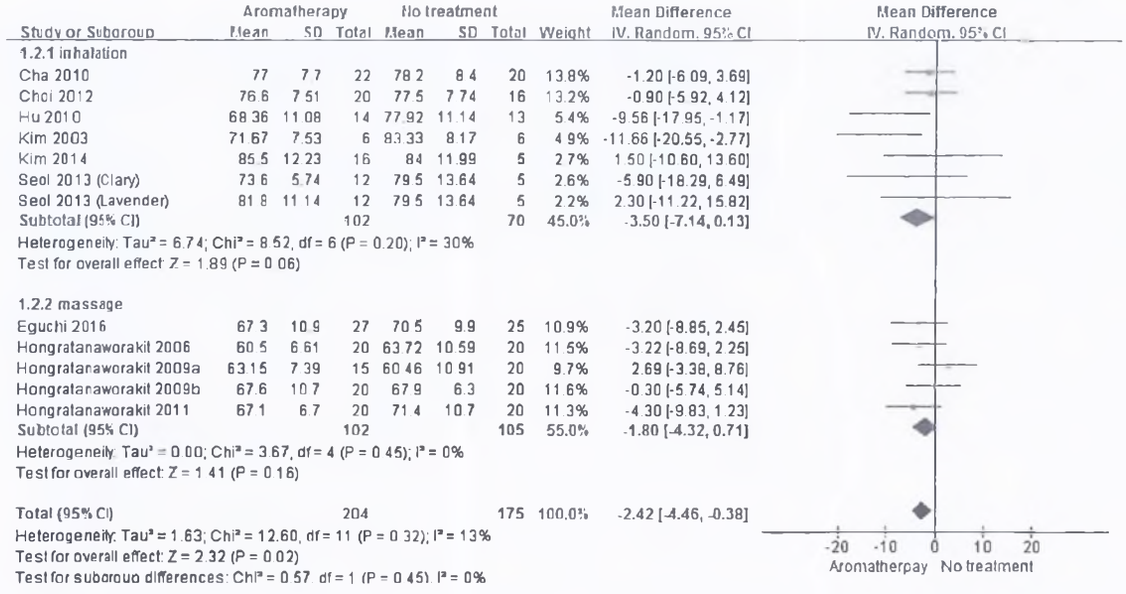


Figure 3. Forest plot of the effects of aromatherapy. (A) Systolic and (B) diastolic blood pressure.

DISCUSSION

We performed a systematic review of recent studies on the effects of aromatherapy on systolic and diastolic pressure in adults. Studies conducted over the last 15 years, starting from 2003, were included in this systematic review. The effects of aromatherapy were analysed on the basis of the findings of 15 studies—which together included 349 study subjects—by a careful review of the methods of intervention employed in these studies and the corresponding outcomes and by performing a meta-analysis.

The methods of aromatherapy employed in the 15 studies could be broadly categorized as inhalation (n = 8) or massage (n = 7) aromatherapy. The target area of massage was the abdomen in six studies and the feet in one study. Nineteen types of essential oils—including lavender, bergamot, geranium, lemon, chamomile, and jasmine—were used alone or in combination with other oils, with lavender oil being the most commonly used (40% of the studies). The results of the present review indicate that aromatherapy results in an overall decrease in systolic and diastolic pressure, which supports the findings of a previous study which claimed that aromatherapy has various positive effects on the body (Price & Price, 2011).

Hypertension, when not managed consistently, can cause complications in various organs, including the blood vessels in the brain, heart, and kidneys. The morbidity and mortality rates of various circulatory disorders, such as cerebral and myocardial infarction and cardiac and renal insufficiency, can be reduced by decreasing blood pressure. For this reason, consistent management of blood pressure is essential (Korea Centers for Disease Control and Prevention, 2014; Sheps & Roccella, 1999).

Of the 15 included studies, 11 RCTs that evaluated the effects of aromatherapy on systolic and diastolic pressure as outcome variables were subjected to meta-analysis. The studies were separated on the basis of the method of aromatherapy — inhalation or massage. The results of the meta-analysis revealed a significant decrease in systolic blood pressure in the experimental group that received inhalation aromatherapy, relative to the control group. While the experimental group that received massage aromatherapy experienced a decrease in systolic pressure, there was no significant difference in systolic pressure between the experimental and control groups.

In the meta-analysis that combined the findings of studies involving inhalation and massage aromatherapy, the experimental group exhibited a significant decrease in systolic pressure relative to the control group. The types of essential oils used included lavender, geranium, chamomile, and rose, all which have relaxing, soothing, and stabilizing effects on an individual. The experimental group that received inhalation aromatherapy exhibited a decrease in diastolic pressure, but not to a significant degree. Diastolic pressure was also observed to have decreases in the experimental group that received massage aromatherapy;

however, the difference in diastolic pressure between the experimental and control groups was not significant. However, in the meta-analysis that combined the findings of inhalation and massage aromatherapy, there was a significant difference in the effects of essential oils on diastolic pressure between the experimental and control groups.

While only a few studies have evaluated the effects of different types of essential oils on bodily functions, lavender oil has been reported to reduce mobility and stress and induce relaxation (Buchbauer, Jirovetz, Jager, Dietrich, & Plank, 1991), while geranium has been reported to bring peace to the mind and also exhibit antineuritic effects on the microglia (Elmann, Mordechay, Rindner, & Ravid, 2010) in animals. Chamomile oil decreases blood pressure and exhibits diuretic effects and positive cardiovascular effects (Srivastava, Shankar, & Gupta, 2010). In animals, rose oil exhibits anti-anxiety effects similar to those of diazepam (de Almeida, Motta, de Brito Faturi, Catallani, & Leite, 2004). Aromatherapy can be administered in the form of bath, diffusion, massage, foot massage, or inhalation. The inhalation method, in which essential oils are absorbed through the nasal cavity, has a faster onset of psychological and physical effects and is easier to administer than massage aromatherapy, which involves absorption of essential oils through the skin (Cho, 2000). Inhaled essential oils have an immediate effect on the central nervous system (Cho, 2000). In the studies included in this review, inhalation of essential oils resulted in an immediate decrease in blood pressure. We believe that aroma oils reduced systolic blood pressure through their aforementioned effects on blood pressure, and more importantly through the physiological mechanism of the sympathetic nervous system.

This study is meaningful in that it presents a comprehensive analysis—by means of systematic review and meta-analysis—of the results of studies involving administration of aromatherapy through inhalation or massage and, thus, verifies the effects of aromatherapy on blood pressure.

There are a few limitations that warrants further discussion. In our systematic meta-analysis study and review of empirical studies, we noted that various physiological locations were utilized which may affect the rate of systemic absorption during the massage therapy. In addition, the frequency of aroma and massage therapy among the RCT differed. Recommendations for future research include studies that have used only one form of aromatherapy and specific application of oil (e.g. lavender oil and the specific inhalation).

CONCLUSION

On the basis of the present findings, it can be concluded that inhalation and massage aromatherapy with essential oils can effectively decrease blood pressure. However, appropriate dosages and concentrations of essential oils have yet to be determined, and additional investigation in this regard are warranted. In addition, researchers must investigate the effects of essential oils only in more strictly controlled

environments.

Conflicts of interest: none.

ABSTRACT

Purpose : This study is a systematic review of experimental results on the effects of aromatherapy on blood pressure.

Materials and Methods : Journal articles published to December, 2017, were retrieved from twelve databases. Randomized controlled trials in which were evaluated for changes in blood pressure following aromatherapy were selected. Risk of bias were assessed using the risk-of-bias (ROB) tool of the Cochrane Collaboration. Meta-analysis was dine using RevMan.

Results : Of the 2545 articles retrieved from the electronic databases, 580 duplicate articles and 1891 articles that were unrelated to the PICO (patient/problem, intervention, comparison, outcomes) elements or did not satisfy the inclusion criteria excluded. Of the remaining 74 articles, 15 found to satisfy the inclusion criteria after full-text review and therefore selected for analysis. The findings of meta-analysis of 11 of these 15 articles revealed that essential oil inhalation and massage effectively decreased both systolic (n = 379; mean difference [MD], −4.72; 95% confidence interval [CI], −8.38 to −1.07) and diastolic (n = 379; MD, −2.42; 95% CI, −4.46 to −0.38) pressure.

Conclusions : Essential oil inhalation and massage therapy can effectively decrease systolic and diastolic pressure in healthy adults as well as in patients with hypertension.

Keywords : Aromatherapy, Systematic review, Hypertension, Blood pressure

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