PHYSIOLOGICAL AND PSYCHOLOGICAL EFFECTS OF LEMONGRASS AND SWEET ALMOND MASSAGE OIL

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ABSTRACT:

The aim of this study was to evaluate the physiological effects of lemongrass massage oil on human vital signs. The study design was a controlled trial with a cross-over study. Twenty nine volunteers participated in this study. Blood pressure and pulse rate were measured by the auscultatory method with a contact electrode secured over the left brachial artery. The parameters of assessment were measured before and after using the paired t-test statistical procedure. The results showed that each subject who received one of the three forms of massage once a week for 3 weeks showed a greater reduction in diastolic blood pressure (DBP) than those in the control group. However, there were no significant differences in systolic blood pressure (SBP) or pulse rate. These results suggest that lemongrass oil has harmonizing effects on the function of nervous system. Interestingly, it could be inferred from this study that massage with lemongrass essential oil might also affect emotional and sensation states.

Keywords: Lemongrass oil, Sweet almond oil, Blood pressure, Pulse rate, Harmonizing effect

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INTRODUCTION

Aromatherapy is the therapeutic use of essential oil from plants. Essential oils can be absorbed into the body via the skin or the olfactory system. Commercially available essential oils have been used for several hundred years and are regularly used for stress management and minor ailments. Many studies have found that olfactory stimulation produces immediate changes in physiological parameters such as blood pressure, muscle tension, pupil dilation, blink magnitude, skin temperature, skin blood flow, electrodermal activity, pulse rate, and brain activity. However, the therapeutic effects of aromatherapy are not well supported by clinical studies. A recent study was conducted to investigate if lavender, chamomile, rosemary, and lemon applied with massage would reduce anxiety and improve self-esteem in elderly women in Korean [1].

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Lemongrass, *Cymbopogon citratus* (DC) Stapf., a tall perennial grass, is native to warm regions and grows in almost all tropical and subtropical countries [2]. It is widely used as an ingredient in Asian cuisines because of its sharp lemon flavor. The biologically active constituent of lemongrass is citral, which constitutes more than 75% w/w, of its essential oil. Lemongrass essential oil is used to cure acne, oily skin, and scabies. It has also been used to combat flatulence, as a carminative, stimulant, emmenagogue and diuretic, for the treatment of headaches, and for blood circulation problems and excessive perspiration due to its antimicrobial, antibacterial and antifungal activities.

Almond oil is an excellent moisturizer and lubricant, which prevents the skin from drying and prevents chapped and peeling skin [3]. For centuries, almond oil had been used, as a soothing remedy for skin allergies, and to treat minor cuts and wounds. Another common use of almond oil is in massages because it is an excellent skin

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Table 1 Interventional clinical protocol

Group	First week	Second week	Third week
A (n = 10)	Treatment 1	Treatment 2	Treatment 3
B (n = 10)	Treatment 2	Treatment 3	Treatment 1
D (n = 10)	Treatment 3	Treatment 1	Treatment 2

Remark; Treatment 1 = Massage alone (60 min); Treatment 2 = Massage with lemongrass oil (60 min); Treatment 3 = Massage with sweet almond oil (60 min); Clinical Assessment before and after treatment: 1. Blood pressure 2. Pulse rate

lubricant. Its properties make it popular with massage therapists' worldwide. It does not have a greasy effect and will take a little bit of time before it is absorbed by the skin. A massage with almond oil makes the body feel relaxed and the skin look healthy. It will definitely relieve the stress from a hard day's work. Newly pressed sweet almond oil is a mitigator of pain and all manner of aches; therefore it is useful in pleurisy and colic, and to calm the brain.

In Thailand, there are only a few recent studies on the effects of essential oils on physiological and emotional states. In addition, massage techniques have been often used in many researches to evaluate the effect of essential oils, e.g. rosemary, orange, ylang-ylang, jasmine and lemongrass oils [4]. A review of the literature suggests that this study is the first experimental research in Thailand to evaluate the physiological and psychological effects of essential oils on the vital signs including blood pressure and pulse rate. Thus, the purpose of this study was to determine the physiological and psychological effects of massage with lemongrass oil compared with sweet almond oil.

MATERIAL AND METHODS

Essential oil analysis

Sweet almond oil and lemongrass oil were purchased from the Diora Management Company, Thailand. The lemongrass oil was analyzed by gas chromatography/mass spectrometry (GC/MS) equipped with Finnigan DSQ MS detector, Thermo Finnigan model Trace GC Ultra. The oil's constituents were identified by matching their mass spectra and retention times, as indicated in NIST05 MS library; the percentage compositions also were computed from GC the peak area [5].

Participants

The subjects were recruited through advertisements to participate in a three-week aromatherapy program as subjects for the present study. An individual was eligible to participate in the program if he/she (a) was able to read and complete study questionnaires, (b) could attend group sessions over three weeks, (c) exhibited no impairment of cognitive ability, and (d) agreed to the use of aromatherapy. A total of 30 subjects volunteered to participate in the study. They were assigned to start with either an aroma massage group (n = 10), an oil massage group (n = 10), or a massage alone group (n = 10) by purposive sampling. The experimental treatment involved providing massage to the experimental group in a treatment room in 60-min sessions once a week for three-week periods separated by a one-week break, giving a total of three treatments (Table 1). The study received institutional approval from the Ethical Review Committee for Research Involving Human Research Subjects, Faculty of Pharmacy, Srinakharinwirot University (Permissions No.001/2014) before the subjects were approached and their written consent was obtained.

Measurement of blood pressure and pulse rate

After a 10-min pre intervention rest, blood pressure and pulse rate were measured by the auscultatory method with a contact electrode secured over the left brachial artery. The researcher measured the BP twice in each subject, and the values were averaged.

Intervention

The first treatment was aromatherapy provided to subjects in the form of oil massage with diluted lemongrass essential oil in carrier oil. The second treatment was provided as massage with sweet almond oil. The third treatment was provided as massage without any oils as the control group. The room for massage received no natural light and was equipped with a special bed. Each 60-min massage began with the foot, leg, and knee, followed by the abdomen, neck, face and head.

Statistical analysis

Data were analyzed using analytical software. Chi-squared and *t*-tests were used to compare the homogeneity of general characteristics and categorical variables between the control and aromatherapy groups. Paired *t*-tests were used to analyze the differences between the baseline and 3-week values.

Table 2 Demographic data of twenty nine subjects

Number	Gender	Age	Height (cm)	Weight (kg)	Body Mass Index (kg/m^2)
1	female	42	162	75	28.58
2	male	18	168	65	23.03
3	male	18	182	75	22.64
4	female	34	160	51	19.92
5	female	30	158	55	22.03
6	female	55	153	59	25.20
7	female	65	158	56	22.43
8	female	26	170	86	29.76
9	female	57	155	56	23.31
10	male	60	171	81.5	27.87
11	male	25	171	63	21.55
12	female	60	155	65	27.06
13	female	82	150	48.5	21.56
14	female	62	155	78	32.47
15	male	62	172	75	25.35
16	female	65	165	74	27.18
17	female	65	155	65	27.06
18	male	63	167	75	26.89
19	female	75	158	74	29.64
20	female	48	162	70	26.67
21	female	42	160	75	29.30
22	female	47	154	63	26.56
23	male	48	178	80	25.25
24	female	45	160	50	19.53
25	male	46	175	90	29.39
26	male	46	157	47	19.07
27	female	49	160	52	20.31
28	female	54	160	49	19.14
29	female	75	158	74	29.64
Mean		**50.48**	**162.38**	**66.45**	**25.12**
SD		**16.69**	**8.04**	**12.23**	**3.78**

Table 3 Percent changes in blood pressure and pulse rate after massage with lemongrass oil

Number	%Change		
	Systolic pressure	Diastolic pressure	Pulse rate
1	-4.80	-37.82	1.35
2	-16.13	-32.69	-8.57
3	-11.02	-40.95	14.52
4	-0.81	-36.89	-7.79
5	0.82	-26.83	-11.11
6	-11.64	-43.41	-4.11
7	15.11	-53.75	12.16
8	11.97	-48.85	4.48
9	6.72	-41.73	-2.70
10	6.78	-49.21	21.88
11	-9.38	-44.83	1.56
12	-16.05	-41.18	11.25
13	-1.43	-47.83	-11.11
14	0.00	-27.27	-8.75
15	-1.34	-41.50	-10.47
16	34.26	-37.24	-12.09
17	1.50	-51.85	-4.62
18	12.24	-47.27	6.90
19	23.15	-54.89	15.00
20	3.60	-43.75	7.41
21	19.05	-40.67	-20.22
22	-31.62	-3.23	-12.22

Table 3 Percent changes in blood pressure and pulse rate after massage with lemongrass oil (Cont.)

Number	%Change		
	Systolic pressure	Diastolic pressure	Pulse rate
23	-1.44	-29.93	-11.46
24	5.56	-43.86	1.56
25	6.56	-40.00	6.41
26	18.18	-45.38	4.23
27	-11.61	-33.33	-6.06
28	-9.02	-41.44	12.31
29	8.91	-46.36	-3.39
Mean	**1.66**	**-40.48**	**-0.47**
SD	**13.64**	**10.13**	**10.38**

Table 4 Percent changes in blood pressure and pulse rate after massage with sweet almond oil

Number	%Change		
	Systolic pressure	Diastolic pressure	Pulse rate
1	10.62	-44.80	4.35
2	-13.79	-38.00	0.00
3	0.89	-41.59	-1.52
4	5.22	-38.02	-6.67
5	3.48	-38.66	1.37
6	0.62	-45.40	-17.98
7	8.40	-46.48	1.32
8	1.35	-48.67	53.25
9	-7.81	-38.98	-12.50
10	-1.74	-36.28	-2.78
11	1.63	-48.80	1.56
12	2.70	-50.66	5.33
13	-2.13	-46.38	-9.46
14	-3.52	-44.53	-1.32
15	-3.45	-44.29	-10.26
16	-11.56	-43.85	-4.11
17	0.81	-57.26	22.64
18	17.65	-48.33	8.06
19	10.19	-52.10	8.77
20	-2.54	-33.91	1.32
21	-11.54	-23.48	5.68
22	14.68	-35.20	0.00
23	3.05	-33.33	-4.44
24	3.00	-39.81	0.00
25	9.01	-34.71	8.86
26	0.89	-38.05	8.57
27	-1.00	-36.36	-1.59
28	-7.96	-27.88	-17.33
29	1.82	-39.29	7.35
Mean	**1.00**	**-41.21**	**1.67**
SD	**7.47**	**7.37**	**13.05**

RESULTS

Essential oil analysis

Five major constituents were identified in lemongrass oil: *E*-citral (44.6%), *Z*-citral (33.7%), β-myrcene 5.2%), selina-6-en-4-ol (1.4%) and *cis*-ocimene (0.7%) as shown as the previous report [5].

Participants

The twenty nine subjects completed three intervention of clinical protocol. Three groups did not differ significantly in the demographic characteristics of age, height, weight and body mass index (Table 2). A total of 8 males and 21 females subjects aged between 18 to 82 years (mean age 50.60 ± 16.41 years) with a body mass index ranging 19.14 to 32.47 kg/m^2 (mean BMI 25.12 ± 3.78) were enrolled for this study.

DISCUSSION

In the present study, each subject who received

Table 5 Percent changes in blood pressure and pulse rate after massage without oil

Number	%Change		
	Systolic pressure	**Diastolic pressure**	**Pulse rate**
1	-11.28	-41.53	4.35
2	7.92	-33.94	-5.56
3	-20.33	-3.06	2.11
4	8.04	-35.54	-8.97
5	-5.45	-27.88	-21.33
6	-15.94	-45.69	-3.17
7	12.68	-49.38	-4.94
8	12.12	-50.68	10.96
9	14.41	-50.39	-1.59
10	7.32	-31.82	-10.00
11	-0.85	-43.97	4.62
12	-6.10	-45.45	0.00
13	19.58	-63.74	27.42
14	38.54	-47.37	5.71
15	5.88	-46.53	-3.90
16	22.43	-45.04	-8.33
17	-15.28	-43.44	-11.59
18	-16.80	-37.50	-7.69
19	-7.32	-46.49	-4.92
20	2.63	-34.19	-1.30
21	20.69	-39.29	3.53
22	0.81	-37.90	5.19
23	-9.27	-27.74	-1.01
24	-4.80	-44.54	9.09
25	4.84	-42.31	13.33
26	8.26	-41.53	7.25
27	23.08	-50.89	20.00
28	-7.96	-27.88	-17.33
29	10.68	-50.88	0.00
Mean	**3.40**	**-40.92**	**0.07**
SD	**14.07**	**10.93**	**10.37**

Table 6 Consumer satisfaction with aromatherapy massage (n = 29)

	Mean	**SD**	**Meaning**
The properties of essential oil			
1. Has a pleasant smell	4.33	0.55	Satisfied
2. Has a long lasting scent	4.19	0.74	Satisfied
3. Provides a relaxing and stress-free feeling	4.70	0.47	Completely satisfied
4. Leaves skin with a pleasant feeling	4.56	0.58	Completely satisfied
5. Provides a refreshing feeling	4.63	0.63	Completely satisfied
6. Does not cause any adverse effect	4.59	0.57	Completely satisfied
The performances of therapist			
1. Personality	4.37	0.63	Satisfied
2. Technical competence	4.56	0.58	Completely satisfied
3. Politeness	4.59	0.50	Completely satisfied
4. Friendliness	3.96	1.32	Satisfied
5. The ability to answer the questions	4.70	0.47	Completely satisfied
The overall service			
1. The quality of the essential oil	4.52	0.51	Completely satisfied
2. The quality of the service provided by the therapist	4.63	0.84	Completely satisfied

one of the three forms of massage once a week for three weeks showed a greater reduction in diastolic blood pressure (DBP) than those of no treatment in the control group. However, there were no significant differences in systolic blood pressure (SBP) or pulse rate (Table 3-5). Consumer satisfaction with aromatherapy massage including the properties of essential oil, the performances of

therapist, and the overall service were mostly completely satisfied (Table 6).

In previous studies, the aromatherapy group reported feeling less depressed (as assessed using the Profile of Mood States) and more relaxed after each session [6, 7]. Aromatherapy also reportedly reduces anxiety in young and middle-aged women [8, 9]. Aromatherapy may affect health behavior by helping subjects to maintain self-care. There have been discrepancies in the reported effects of aromatherapy on blood pressure (BP). Oh et al. found that aromatherapy reduced the pulse rate and respiratory rate in normal healthy subjects, although it had no effect on BP [10]. Another study found that aromatherapy modulates the systolic BP (SBP), but not the diastolic BP (DBP), pulse rate, or respiratory rate in the healthy women [11]. Yi reported that SBP, DBP, and pulse rate differed significantly between aromatherapy and control group in presurgery patients [12]. Rho et al. reported that the different results for physiological modulation may be attributable to the type of odors, regions massaged, and duration of application [1]. In the present study, although the BP and pulse rate did not change significantly over time, they did tend to improve compared to baseline. The results from a recent study suggested that aromatherapy massage may reduce anxiety levels and improve self-esteem in Korean elderly women. Sayowan et al. investigated the effects of inhaled citronella oil on emotional states and physiological parameters of the nervous system [4]. Twenty healthy volunteers participated in this experiment. All subjects underwent autonomic nervous system recordings. These recordings included: body temperature, heart rate, respiratory rate, and blood pressure; mood states were also evaluated as was electroencephalography (EEG) recording in pre-, during, and post-citronella inhalation. The results were compared with control conditions. These assessments were measured before and after using a paired t-test statistical procedure. The results indicated that citronella oil might be characterized using the concept of "harmonization". Citronella significantly decreased blood pressure, heart rate, and respiratory rate after inhalation. Subjectively, participants reported feeling in a better mood and fresher [4]. Moreover, the power of alpha and beta brain activities was increased. These results were then confirmed the stimulating effects harmonized together with the relaxing effect of citronella oil. Various studies have shown that monoterpenes and their derivative compounds also exhibit several types of pharmacological properties, such as antinociception, antidepressant and sedative effects [13]. Previous studies found mice treated with citronellal presented behavioral alterations such as a decrease of spontaneous activity, ataxia and sedation [14, 15]. Furthermore, Azarmi et al. found that geraniol, another main component of citronella oil, had vascular effects. Geraniol was able to reduce the contractile response to noradrenaline in vascular walls and heart, leading to relaxation of the aorta, lower blood pressure and a lower heart rate [16].

However, it is acknowledged that this was a preliminary study with several limitations, such as a small sample size and the lack of an equivalent placebo control group to estimate an expectation effect. It cannot be definitely stated whether the positive effects were due to the aromatherapy, massage, or both. Future randomized studies that include more objective measures, larger samples, measurements after multiple sessions, and long-term follow-up are needed to determine unequivocally the effects of aromatherapy on well-being and other psychological variables in healthy volunteers.

CONCLUSIONS

In conclusion, this study showed a harmonizing effect of lemongrass massage oil which was similar to sweet almond oil. The findings suggested that diastolic pressure was decreased significantly after the three forms of massage with and without massage oil. The results confirmed scientific evidence for including lemongrass oil in the group of harmonizing essential oils. Psychoactive medications for treating mood disorders have a range of unpleasant and undesirable side-effects. Studies on the effects on mood from aromatic oils may assist in the development of medications with fewer adverse effects.

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