

## Anti-stress effects of simplified aroma hand massage

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### Abstract

In order to be able to use the aroma hand massage as a skill that can be done by a nurse who does not have a special aromatherapy technique, we examine anti-stress effects of simplified aroma hand massage for healthy subjects. We evaluated the anti-stress action of aroma hand massage and the different components of the procedure in 20 healthy women in their twenties. We used autonomic nervous function measured via electrocardiogram as an index of stress. After conducting a baseline electrocardiogram, we induced stress in the participants by asking them to spend 30 minutes completing Kraepelin's arithmetic test. We then administered various treatments and examined the anti-stress effects. Kraepelin's test significantly increased sympathetic nervous function and significantly reduced parasympathetic nervous function. Compared with massage without essential oil or aroma inhalation, aroma hand massage significantly increased parasympathetic nervous function and significantly decreased sympathetic nervous function. The effect of the aroma hand massage persisted when the procedure was simplified. The anti-stress action of the aroma hand massage indicates that it might have beneficial application as a nursing technique. There are several limitations in this study; ambiguities of low component/high component ratio of heart rate variability and bias by small subjects groups of the same women.

### Introduction

As interest in aromatherapy has increased in recent years, many attempts have been made to characterize the effects of this treatment. Studies have reported predominantly anxiolytic and anti-stress

effects, although some reports have produced conflicting findings.<sup>1-3</sup> Variations in the number of subjects, procedures, and evaluation methods among studies may contribute to such discrepancies.

Aromatherapy is generally administered via two main methods: simple inhalation of an aroma and massage with essential oil. A meta-analysis of five RCTs<sup>1</sup> indicated that aroma inhalation is effective for relieving stress, although problems with the study protocols impeded the generation of definite conclusions. Inhalation of lavender, which is often used for aroma inhalation, has been reported to be effective in improving 1) anxiety and the quality of sleep in an intensive care unit,<sup>4</sup> 2) sleep quality and fatigue in subjects undergoing hemodialysis in combination with sweet orange,<sup>5</sup> 3) mood before menstruation,<sup>6</sup> 4) conditions such as pain, depression, and anxiety in elderly people in combination with bergamot,<sup>7</sup> and 5) conditions such as pain, anxiety, and nausea in combination with ginger, sweet marjoram, and mandarin.<sup>8</sup> Inhalation of lavender has also been found to reduce stress in nurses, thereby improving the quality of treatment that patients receive.<sup>9</sup> Lavender inhalation<sup>10</sup> and 10 minutes of yuzu inhalation<sup>11</sup> have been found to increase parasympathetic function. Previously, we reported that the fragrance of lemon can have anti-stress action<sup>12,13</sup> and an antidepressant effect,<sup>12</sup> yielding positive results in depressed patients.<sup>14</sup>

The effect of massage with essential oil is difficult to evaluate due to the combined effects of the massage and essential oil. However, we previously found that inhaling lemon and valerian essential oil<sup>15</sup> and receiving a massage with essential oil,<sup>16</sup> elicited similar sympathetic and parasympathetic effects. Lavender is often used for massage, and it produces an effect that is similar to that of inhalation. Massage with lavender has been reported to reduce pain<sup>17</sup> and irritability in people with dementia.<sup>18,19</sup> However, another report indicated that aroma massage had no effect on cancer pain,<sup>20</sup> indicating that the effects of aroma massage may vary depending on the condition of the recipient. A review that examined six studies reported that aromatherapy massage had a mild, transient anxiolytic effect.<sup>2</sup> However, another review that examined 10 studies concluded that there were no clear differences between the effects of aromatherapy with vs. without massage.<sup>3</sup> Indeed, the effects of aroma massage may be somewhat subtle and transient. For that reason, attempts are often made to utilize aroma massage in a quiet and calm environment in conjunction with color and sound to maximize anxiety and stress

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reduction.<sup>21</sup>

It is difficult to examine the effect of the aroma component of aromatherapy massage because the effect of the massage is present.<sup>22</sup> Thus, it is helpful to also consider the effect of simple aroma inhalation in the absence of massage. Our team has studied the effect of simple aroma inhalation therapy without massage for approximately 25 years. Based on the results of animal experiments,<sup>12,13,23-25</sup> we have examined clinical applications of aroma in the treatment of depression<sup>14</sup> and insomnia.<sup>26</sup> We found that the clinical application of aroma produced a positive treatment effect, although this did not match the effect of pharmaceutical drug treatments.

Given the positive effects of aromatherapy, it has potential as a treatment that could be provided by nurses. Because massage has been found to be helpful in inducing empathy in patients,<sup>27</sup> aroma hand

massage may be effective in relieving anxiety and stress in a clinical setting. Aroma massage is generally administered by people who have received specialized training. However, if a simple and convenient treatment, such as simplified aroma hand massage, is found to be effective, it may be a helpful tool for nurses. Here, we sought to confirm the anti-stress effects of aroma hand massage and evaluated a simplification of the procedure. Analysis of heart rate variability (HRV) is used to provide non-invasive indirect insight into autonomic nervous system activity.<sup>27</sup> Almost all of high frequency (HF) component reflects parasympathetic nervous function.<sup>28</sup> Low frequency (LF) component reflects the mixed modulation of parasympathetic and sympathetic activities.<sup>28</sup> LF/HF ratio is thought to represent sympatho-vagal balance and high value is considered to reflect a sympathetic predominance.<sup>28</sup>

## Materials and Methods

### Participant recruitment and ethical considerations

This experiment was conducted with the approval of the ethics committee of Mie University Graduate School of Medicine. Subjects were recruited within the university and informed consent was obtained from 20 healthy women aged 20 to 26 years.

### Essential oil

We used two compounds for massage: 1) jojoba oil (almost odorless), and 2) a mixture of 15 mL jojoba oil, 0.1 mL lemon, 0.05 mL tuberose, and 0.05 mL labdanum essential oils. The second compound was also used for aroma inhalation. We conducted patch tests with the essential oils in advance and

confirmed that they were safe for each participant. We massaged on the right arm of all subjects.

### Laboratory environment

The room in which the experiment took place was quiet with a room temperature of 22 degrees Celsius. The illuminance was 300 lux. The subjects sat on a soft chair and placed his right arm on the table.

### Electrocardiogram measurement

Electrocardiograms were measured using CheckMyheart (TRYTECH Co., Ltd.). Measurements were conducted for 5-minute periods. During the measurement period, the participants were asked to keep their eyes closed. The electrocardiogram data were analyzed using the associated software to obtain the values.

### Study procedure

Each participant completed the experiment five times at intervals of one week. After a 5-minute electrocardiogram, we administered Uchida-Kraepelin Performance Test (Institute For Psychological Testing, Inc.) for 30 minutes to induce psychological stress. We then conducted another electrocardiogram for 5 minutes immediately after the end of the stress loading procedure. Five groups were formed by the same participants, as follows: 1) control group, in which participants sat in the experimental room for ten minutes without any treatment; 2) massage with jojoba oil group, in which the palm, fingers, and back of the hand were massaged for 10 minutes with jojoba oil only; 3), whole massage group, in which the palm, fingers, and back of the hand were massaged for 10 minutes using the essential oil mixture; 4) simplified massage group, in which only the palm and back of the hand were massaged

using the essential oil mixture; and 5) inhalation group, in which the participants inhaled the smell of the essential oil mixture for 10 minutes. Figure 1 shows the procedure of massage. In whole massage, the practitioner massaged the subject's palm, fingers, back of the hand about 3 minutes each, and repeats them. Simplified massage eliminated finger massage. The essential oil mixture used for inhalation was placed in a container with a diameter of 5 cm and the center of the container was placed 10 cm in front and 5 cm below the nostrils of the participant. Another electrocardiogram was conducted immediately after the end of the treatments. Thereafter, the subjects spent 15 minutes sitting with their eyes closed, and we conducted a final electrocardiogram 20 minutes after treatment.

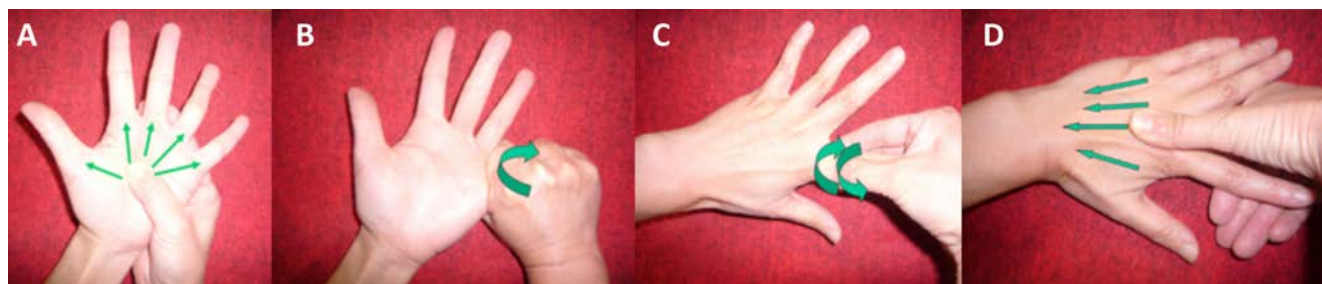
### Statistical procedure

For statistical analysis, we used a Turkey-Kramer multiple comparison test. *P* values less than 0.05 were considered to be significant.

Comparisons within each group and comparisons between groups were made before stress loading, immediately after stress loading, immediately after the treatment, and 15 minutes after the treatment.

## Results

The HF values are shown in Table 1. We found no difference in the HF values before stress loading among the different groups. After stress loading, the HF value in each group significantly decreased. The HF values after stress loading did not differ among the groups, indicating that the different participant groups did not vary in terms of their reaction to stress. In the



**Figure 1.** Whole hand massage and simplified hand massage technique. A) Palm: The practitioner applies pressure to slide from the center of the palm towards the bases of the fingers using the thumb. B) Finger: the practitioner grasps each finger by hand and turns it in order from the little finger to the thumb. C) The practitioner twists each finger of the subject from the root toward the fingertip. D) The practitioner applies pressure to slide between the tendons of the back of the hand toward the subject's chest using the thumb. We did all in whole massage. In simplified massage we abbreviated finger massage.

control group, which received no treatment, HF values were still low after the duration of time corresponding to treatment had elapsed. However, HF values had recovered to baseline levels by 15 minutes after the end of the treatment period. Massage with jojoba oil, full hand massage with essential oil mixture, and simplified massage with essential oil mixture all significantly increased HF values from those observed immediately after stress loading in each group, compared with the control group. Although inhalation showed an upward trend, it did not reach significance. Fifteen minutes after the treatment, HF values in all groups were higher than those observed immediately after stress loading. In the full massage and simplified massage groups, HF values were significantly higher than those in the control group. In the simplified massage group, HF values were significantly higher than those in the jojoba oil massage and inhalation groups.

The LF/HF values are shown in Table 2. We found no differences in the LF/HF values observed before stress loading in each group. Stress loading significantly increased LF/HF values in all groups compared with baseline, and were similar among groups, indicating that the participants had similar responses to stress. Immediately after the treatment, we observed a significant decrease in LF/HF values in the groups that received a whole hand massage with essential oil or simplified massage with essential oil, compared with values recorded immediately after stress loading. LF/HF values in these groups were also significantly decreased compared with those in the control and inhalation groups. No significant changes were seen in the

group that received a massage with jojoba oil or the inhalation group. Fifteen minutes after the treatment period, LF/HF values in the control group were significantly lower than those measured immediately after the treatment period. In the whole massage group, LF/HF values were significantly lower than those in the control and jojoba oil massage groups. In the simplified massage group, LF/HF values were predominantly lower than those in the jojoba oil massage group.

## Discussion

In this study, we sought to confirm the efficacy of aroma massage and to study the possibility of simplifying the procedure. We found that massage using only jojoba oil produced a stress-reduction effect. Massage stimulates baroreceptors, activates the vagus nerve, and lowers cortisol levels.<sup>29</sup> Our data indicate that adding essential oil to massage increases this effect. Additionally, we report that during a massage with essential oil, massage of the palm and back of the hand is sufficient. We found that both essential oil inhalation and massage with essential oil had stress-reduction effects.

The beneficial effects of a hand massage may include factors such as a sense of intimacy and warmth produced by directly touching the hands of another person. Massage is thought to induce feelings of empathy in the recipient without the use of words.<sup>30</sup> Such feelings of empathy may go a long way in helping patients obtain peace of mind during stressful and painful illnesses.

Our findings indicate that aroma hand massage, even when simplified, may be effectively utilized by nurses in a clinical setting. This is meaningful because treatments that are simple and do not require special skills are more likely to be widely applied. Based on the results of this experiment, we plan to examine the effects of simplified aroma hand massage in a clinical setting.

There are several limitations in this study. Recently, there have been reports that LF/HF value calculated by HRV cannot accurately measure sympatho-vagal balance and that the correspondence with psychological and physiological conditions is not unique.<sup>30,31</sup> Also, in this study, since each group is small and each group is composed of the same female subjects, we cannot deny the possibility that bias was occurring. Further research is necessary by improving the research methods.

## Conclusions

Using autonomic nerve function as an index of stress, we found that hand massage with a mixture of lemon, tuberose, and labdanum essential oils had an anti-stress effect. This effect was stronger than that elicited by massage without essential oil and by aroma inhalation without massage. Aroma massage was effective even when a simplified method was used, indicating that aroma massage may be a useful technique for nurses working in a clinical setting. Further research is necessary by improving the research methods.

**Table 1. Changes of HF values by various treatments against stress load.**

	No treatment	Massage by jojoba oil only	Full massage by aroma	Simplified massage by aroma	Inhalation of aroma
Before stress load	48.24±2.41	46.37±1.63	44.90±2.29	45.36±2.06	46.90±2.26
Immediately after stress load	31.65±3.27*	34.92±2.70*	33.56±2.92*	34.59±2.66*	35.92±2.55*
Immediately after treatment	37.53±2.64*	45.88±1.54 <sup>o</sup> a	49.51±3.07 <sup>a,b</sup>	47.90±1.91 <sup>a</sup>	42.07±2.55
15 min after treatment	46.62±1.74 <sup>#</sup>	49.60±1.93 <sup>o</sup>	54.00±2.44 <sup>*o</sup> c	57.36±2.57 <sup>#a,d,e</sup>	49.07±2.09 <sup>#</sup>

\*vs. before stress load (P<0.01); <sup>o</sup>vs. after stress load (P<0.01); <sup>#</sup>vs. after treatment (P<0.01). <sup>av</sup>vs. no treatment P<0.01; <sup>bv</sup>vs. inhalation P<0.05; <sup>cv</sup>vs. no treatment P<0.05; <sup>dv</sup>vs. jojoba oil P<0.05; <sup>ev</sup>vs. inhalation P<0.01.

**Table 2. Changes of LF/HF values by various treatments against stress load.**

	No treatment	Massage by jojoba oil only	Full massage by aroma	Simplified massage by aroma	Inhalation of aroma
Before stress load	1.6±0.18	1.80±0.16	1.69±0.20	1.65±0.18	1.85±0.27
Immediately after stress load	2.61±0.23*	2.77±0.30 <sup>o</sup>	2.81±0.24*	2.91±0.19*	2.68±0.27*
Immediately after treatment	2.72±0.32*	2.32±0.22	1.73±0.21 <sup>#a,b</sup>	1.71±0.23 <sup>#a,b</sup>	2.45±0.23
15 min after treatment	1.83±0.20 <sup>#^</sup>	1.96±0.19	1.25±0.10 <sup>#c,d</sup>	1.33±0.13 <sup>*e</sup>	1.78±0.19 <sup>#</sup>

\*vs. before stress load (P<0.01); <sup>o</sup>vs. before stress load (P<0.05); <sup>#</sup>vs. after stress load (P<0.01); <sup>^</sup>vs. after treatment (P<0.01). <sup>av</sup>vs. no treatment P<0.01; <sup>bv</sup>vs. inhalation P<0.05; <sup>cv</sup>vs. no treatment P<0.05; <sup>dv</sup>vs. jojoba oil P<0.01; <sup>ev</sup>vs. jojoba oil P<0.05.



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