# Research Terms

## Study Design

NOTE: Initial trials might require a total of around 20-80 patients. In phase II trials that investigate the treatment effects, seldom require more than 100-200 patients.

### Parallel-group randomized trial

A randomized controlled trial (RCT) is a type of scientific study. It tests the effects of a new drug or treatment. People who join the study are randomly put into different groups. One group gets the new drug being tested. Another group gets a placebo (fake drug) or standard treatment. Randomly assigning people helps make the groups similar. This allows for a fair comparison.

The researchers give every participant the same tests and exams. Then they compare the results between the groups. If the group that got the new drug improves much more than the placebo group, it suggests the drug works.

RCTs are careful tests that limit bias. Neither the participants nor researchers know who is in each group. This helps ensure objective results. Randomized controlled trials provide reliable evidence on the safety and effectiveness of new medicines. This information helps doctors decide whether to prescribe them. RCTs are required before health authorities like the FDA will approve a new medication. This protects patients by ensuring new drugs are properly evaluated.

### Placebo-controlled design:

In a placebo-controlled design, there is a group in the study that receives a placebo.

- A placebo is a fake treatment that looks just like the real treatment being tested, but contains no active ingredient.
- For example, if testing a new pill, the placebo would be an identical looking sugar pill with no medicine.

**The group that gets the placebo** is called the control group.
**The group that gets the real treatment** is called the treatment group.

- Researchers compare the results between these groups. If the treatment group improves more than the placebo group, it suggests the treatment works. The placebo control gives a baseline to account for the placebo effect. This is when someone improves just because they think they received a real treatment.
- By comparing to placebo results, researchers can be more sure the outcomes are from the real treatment and not just belief.
- Placebo-controlled designs allow separating the true effects of a treatment from the placebo effect. This helps provide reliable evidence on a treatment's efficacy.

**Double-blinded** - means that both the participants and the researchers don't know who is in the treatment or control groups.

*For example, in a drug trial:*

- The participants don't know whether they are taking the real drug or a placebo.
- The researchers giving out the drug don't know who is getting the real drug either.

- This blinding is done to prevent bias in the results. If participants knew which group they were in, it might change their perceptions or behaviors in ways that affect the outcome.
- Similarly, if researchers knew who got the real drug, they might unintentionally treat those participants differently in a way that skews the data.
- By keeping both parties "blind" to who got what treatment, the double-blinding helps ensure the results are objective and unbiased.
- The true groups are only revealed at the end of the study after the data has been collected and analyzed. *Double-blinding is a key feature of randomized controlled trials.*

**Parallel-group randomized trial**

In a parallel-group randomized trial, participants are randomly assigned to one of two or more treatment groups at the beginning of the study. For example, there may be a treatment group that receives the new drug being tested, and a control group that receives a placebo or standard treatment.

These groups then follow parallel paths - they receive their assigned treatment throughout the entire trial. Their outcomes are compared at the end to see if the new treatment is more effective than the control.

The key thing is that participants stay in the same group for the whole trial. This is different from a crossover trial, where participants switch between treatments during the study.

In a parallel-group trial, each participant only receives one treatment, rather than multiple treatments sequentially like in a crossover trial. This allows researchers to directly compare groups getting different treatments at the same time.

The parallel paths of the treatment and control groups, without any crossing over, help minimize confounding factors when analyzing the final results. This makes parallel-group randomized trials a robust way to test a new medication or intervention.

## Analysis Tools

**ANCOVA (analysis of covariance)** is a statistical technique that is used in research to compare the means of two or more groups while controlling for another continuous variable known as a covariate. The covariate is a variable that is known to affect the dependent variable and needs to be statistically controlled for.

For example, a researcher might want to compare test scores between two classrooms while controlling for the students' prior academic achievement. Academic achievement before the current test could influence the results, so the researcher uses ANCOVA to statistically adjust the test score means of the two classrooms to account for pre-existing differences in academic achievement. This allows the researcher to make a fairer comparison of the test score means.

By including the covariate in the analysis, ANCOVA can increase statistical power and reduce systematic bias. This allows the researcher to determine if there are true differences between the groups after accounting for the influence of the covariate. Using ANCOVA makes the results of the group comparison more valid and accurate.

### Chi-square tests

Chi-square tests are statistical tests used to analyze data from clinical trials. They allow researchers to compare observed results to expected results, to see if there is a statistically significant difference.

In a clinical trial, researchers may divide participants into different groups - for example, an experimental drug group and a placebo group. After the trial, they can use a chi-square test to see if the results observed in each group match what would be expected by chance.

For example, if 60% of the drug group improved but only 30% of the placebo group improved, researchers can use a chi-square test to calculate if this difference is statistically significant or likely just due to chance. A significant result indicates the drug had an actual effect beyond random chance.

Chi-square tests are useful for clinical trials because they are appropriate for analyzing categorical data, like whether a participant improved or not. They help determine if the results of a trial are meaningful and not just coincidence. Overall, chi-square tests allow researchers to make evidence-based conclusions about the effectiveness of medical treatments tested in clinical trials.

## Outcome Measures

### DASS-21

The DASS-21 stands for Depression Anxiety Stress Scales. It is a self-report questionnaire that measures a person's levels of depression, anxiety, and stress. It contains 21 questions in total - 7 questions for each emotional state.

Each question asks the person to rate how much a statement applied to them over the past week. For example, "I found it hard to wind down" or "I felt I had nothing to look forward to." The person responds using a scale from 0 to 3. 0 means the statement does not apply at all, and 3 means the statement applies very much or most of the time.

The score for each emotional state is calculated by adding up the scores for the 7 relevant questions. The higher the score, the higher the person's level of depression, anxiety, or stress. The scores can be compared to cutoff scores to indicate mild, moderate, severe, or extremely severe levels.

The DASS-21 provides a quantitative measure of negative emotional states. Researchers and clinicians often use it to measure changes in mental health over time or compare levels of depression, anxiety and stress between different groups. It is a simple, short questionnaire that is easy to understand and complete.

### Heart rate variability (HRV)

Heart rate variability (HRV) refers to the variation in the time between heartbeats. It is measured by looking at the time between each heartbeat.

A healthy heart does not beat at a perfectly regular rhythm. There is normal variation in the time between heartbeats. This fluctuation is controlled by the autonomic nervous system. HRV is a measure of the balance between the parasympathetic and sympathetic nervous systems.

Higher HRV is generally a sign of good health and fitness. It reflects a well-functioning autonomic system that can respond and adapt to changing situations appropriately. Lower HRV has been associated with stress, poor recovery from exercise, and various health conditions.

HRV can be measured by various devices using electrocardiography (ECG) or photoplethysmography sensors on the finger or ear. The data can be analyzed to quantify the HRV over different time periods.

Measuring HRV provides an indicator of overall health and fitness. It is a simple, non-invasive measure that may help detect potential health issues earlier on. Monitoring changes in HRV over time can also assist in evaluating responses to lifestyle interventions or training programs.

In summary, HRV reflects heart-brain communication and autonomic function. Assessing HRV allows clinicians and researchers to quantify adaptability, health, and fitness.

> Physiological indices, including heart rate variability (HRV) and brain wave activities, are measurable factors that reflect the ANS activity and emotional status.

### High frequency (HF) power vs Low frequency (LF) power

The autonomic nervous system has two main branches - the sympathetic and parasympathetic systems. These systems work together to maintain homeostasis.

In HRV, **high frequency (HF) power** is considered an indicator of **parasympathetic activity**. The parasympathetic system is responsible for "rest and digest" functions. HF reflects the HRV influenced by respiratory sinus arrhythmia - variations in heart rate that coincide with the breathing cycle. Higher HF power indicates higher parasympathetic tone.

**Low frequency (LF) power** is considered a marker of **sympathetic activity**. The sympathetic system controls "fight or flight" responses. However, LF power can also be influenced by parasympathetic activity. Therefore, the LF/(LF+HF) ratio is used as a more refined sympathetic indicator, reflecting the balance between sympathetic and parasympathetic systems.

A higher LF/(LF+HF) ratio indicates higher sympathetic dominance. This means the sympathetic system is more activated than the parasympathetic system. The ratio provides insight into sympathovagal balance.

So, in summary, HF reflects parasympathetic tone and the LF/(LF+HF) ratio provides an index of overall sympathetic activation. Looking at both provides a more complete picture of autonomic nervous system status.

### Spielberger State-Trait Anxiety Inventory (STAI)

The STAI is a questionnaire that measures both state and trait anxiety in adults.

**State anxiety** is how you feel right now - it's temporary anxiety in response to a specific situation. For example, feeling nervous before a job interview.

**Trait anxiety** refers to long-term, general feelings of stress, worry and discomfort. It's how anxious you generally feel on a day-to-day basis.

The STAI has 40 questions total. To measure state anxiety, respondents' rate how phrases like "I am tense" and "I feel nervous" describe how they currently feel on a scale of 1 (not at all) to 4 (very much so).

To measure trait anxiety, respondents' rate how often in general they experience things like "I lack self-confidence" and "I feel inadequate" on a scale of 1 (almost never) to 4 (almost always).

Higher scores indicate greater anxiety. The STAI provides a quantitative way for clinicians and researchers to measure both temporary and chronic anxiety levels in adults. It is one of the most widely used tools for assessing anxiety.

The STAI can help diagnose anxiety disorders, monitor treatment effectiveness, and screen for high anxiety in medical patients. It provides valuable insights into a person's mental health status related to both situational and persistent anxiety.

### Pittsburgh Sleep Quality Index

The Pittsburgh Sleep Quality Index, or PSQI, is a questionnaire that measures someone's sleep quality. It has 19 questions about sleep.

The questions ask about:

- How good your sleep feels
- How long it takes to fall asleep
- How many hours you sleep
- How restful your sleep is
- Problems sleeping through the night
- Using sleep medicine
- Lack of energy during the day

The answers to the questions give scores in each area. The scores are added up into one total number.  Higher scores mean worse sleep quality. Scores over 5 usually mean poor sleep.

The PSQI helps researchers measure sleep issues in different groups of people. For example, it can be useful to study sleep in older adults with anxiety disorders. The questionnaire has been tested a lot to show it is reliable. But more research is still needed on how well it works for older anxious adults specifically.

Overall, the PSQI gives an overall score from many questions to understand someone's sleep quality. Researchers use it as an effective tool to measure and study sleep problems.

### Profile of Mood States, or POMS

The Profile of Mood States, or POMS, is a questionnaire used by researchers. It measures someone's moods and feelings. The POMS has 65 questions about emotions like tension, depression, anger, fatigue, and confusion.  People taking the POMS respond to each question with how much they have felt that way recently. For example:

- How tense have you felt?

- How sad have you felt?
- How energetic have you felt?

Their answers are given scores. The scores are added up into different categories of moods.

Higher scores mean more negative moods overall. Lower scores indicate more positive moods.

Researchers use the POMS to compare moods between groups getting different treatments. For example, they can see if a new therapy improves people's moods. The POMS has been tested many times to show it reliably measures moods. But more research can still be done on how moods differ in various health conditions. Overall, the POMS uses many questions to provide a comprehensive assessment of someone's emotional state. It is a useful tool for mood research.

### Autonomic parameters

Autonomic parameters, i.e., systolic blood pressure (SBP), diastolic blood pressure (DBP), pulse rate (PR), blood oxygen saturation (BOS), breathing rate (BR), and skin temperature (ST), were recorded as indicators of the arousal level of the autonomic nervous system.

## Results

### P value

In clinical trials, researchers use statistics to analyze the results. One important statistic is the p-value. The p-value helps researchers determine if the results are due to chance, or if they are likely from the treatment itself. Let's say a new drug is being tested against a placebo in a trial. At the end, the drug group has far fewer symptoms than the placebo group.

Researchers calculate the p-value to see how likely these results would be if the drug did NOT work. A very low p-value like $p<0.001$ means there is only a 0.1% chance of getting these results by chance. Since the odds are so low, it suggests something other than chance is behind the benefit. Therefore, researchers can conclude the drug truly worked.

On the other hand, a higher p-value like $p=0.20$ would indicate a 20% chance of seeing these results randomly. This means researchers cannot confidently say the drug was effective.

The standard to demonstrate a real effect is usually $p<0.05$. This 5% threshold means results would only happen randomly 1 in 20 times. Anything lower indicates a significant effect from the treatment.

Here are a few more examples to illustrate what different p-values mean:

- $p=0.7$ - This high p-value means there is a 70% chance the results occurred randomly. It indicates the treatment likely had no real effect.

- p=0.2 - A 20% chance of random results. The treatment may have had an effect, but the evidence is still weak statistically.
- p=0.05 - The standard cutoff for statistical significance. There is only a 5% chance of random results, so the treatment is considered to have a real effect.
- p=0.01 - A 1% chance of random occurrence means the treatment almost certainly had a true effect. This provides strong evidence.
- p=0.001 - Only a 0.1% chance of randomness, which is quite unlikely. This very low p-value provides extremely strong evidence the treatment works.
- p<0.0001 - An infinitesimally small chance of randomness (less than 0.01%). The treatment is virtually guaranteed to have had a true effect.

The lower the p-value, the less likely the results occurred by chance. Smaller p-values give more statistical power to confidently determine if a treatment is effective based on clinical trial data.

In summary, the p-value helps researchers determine if results are coincidental, or if the treatment truly worked. It is a key statistic analyzed from clinical trial data.

## Other Terms

### Washout period

In medical research, volunteers are often given a period of no treatment called a washout. This washout time allows their bodies to clear out any prior medications or therapies before starting the experimental treatment being studied.

Requiring a washout prevents other treatments from interfering with the trial. It gives the experimental therapy the best chance to work and be judged on its own merits.

Washout periods may be necessary when someone first joins a clinical trial to remove the effects of their previous treatments. Or they can be used within a trial when switching between different study arms, to eliminate overlap between therapies.

The length of washout required depends on the treatments involved and how long they take to leave the body. Shorter washouts allow research to progress faster. But they need to be long enough to properly clear the prior therapy. Finding the right washout duration is a key part of designing robust clinical trials.

## Effects of lavender on anxiety: A systematic review and meta-analysis

Lavender (Lavandula angustifolia) is one of the most popular essential oils used in aromatherapy. Known for its fresh, floral scent and calming properties, lavender has been used for centuries to help relieve anxiety and promote relaxation. But does the research actually support these purported benefits?

A recent comprehensive review published in Phytomedicine sought to analyze all of the available scientific evidence on the effects of lavender essential oil on anxiety. The results provide an insightful look at how lavender may work to reduce anxiety levels and point to some promising applications of this aromatic oil.

### About the Review

The authors conducted an extensive literature search for clinical trials investigating the effects of lavender essential oil on anxiety in human subjects.

They ultimately analyzed 90 studies - 65 randomized controlled trials (the gold standard in research) involving almost 8000 participants, and 25 non-randomized trials with 1200 participants.

The lavender preparations used included inhalation of the essential oil, oral doses (like Silexan capsules containing lavender oil), massage with lavender oil, and aromatherapy diffusion.

The studies measured anxiety using psychological questionnaires like the State-Trait Anxiety Inventory and also looked at physiological measures like blood pressure and heart rate.

### Key Findings:

- 54 out of 65 randomized trials found that lavender led to a significant improvement in at least one anxiety measure compared to control groups.
- 44 trials showed a significant difference in anxiety levels between lavender and control groups after the intervention.
- Oral doses of a standardized lavender essential oil product (Silexan at 80 mg/day) significantly reduced anxiety compared to placebo over extended treatment periods (at least 6-8 weeks) in multiple randomized trials.
- Meta-analysis of 12 trials found inhaling lavender essential oil significantly decreased state anxiety compared to no treatment. Benefits were seen for both single and multiple doses.
- Meta-analysis of 24 trials found inhaling lavender significantly reduced anxiety levels overall compared to controls. Benefits were greatest in high anxiety-provoking situations like before surgery.
- Lavender massage showed significant anxiety-reducing effects compared to massage alone or standard care in a meta-analysis of 6 trials.

### Potential Mechanisms:

How might lavender essential oil provide anxiety relief? Although more research is needed, some potential mechanisms include:

- **Increasing gamma-aminobutyric acid (GABA)** - GABA is the brain's primary inhibitory neurotransmitter. Many anti-anxiety medications like benzodiazepines work by increasing GABA activity, which has a calming effect. Animal and lab studies indicate lavender may increase GABA levels in the amygdala, a brain region involved in regulating emotions like fear and anxiety.

- **Modulating glutamate** - Glutamate is the brain's main excitatory neurotransmitter and in excess can induce "excitotoxicity" damaging nerve cells. Lavender compounds like linalool may reduce glutamate activity. This calming action on "overexcited" nerve cells may underlie lavender's anti-anxiety effects.

- **Inhibiting voltage-dependent calcium channels** - These channels play a key role in neurotransmitter release when activated. Lavender essential oil has been shown to inhibit the opening of these channels in lab experiments, which may prevent excessive nerve cell excitation that can lead to anxiety states.

- **Interacting with serotonin receptors** - Lavender essential oil appears to reduce 5-HT1A receptor activity in brain areas involved in mood and emotion regulation like the cingulate cortex and hippocampus. This may mimic the effects of SSRIs and other antidepressant/anti-anxiety medications.

- **Enhancing parasympathetic activity** - The parasympathetic nervous system controls the body's "rest and digest" functions. Some studies of lavender inhalation have noted increased parasympathetic activity markers like heart rate variability, indicating relaxation of the autonomic nervous system.

### Implications of the Research

Given the overall evidence for modest anxiety-reducing effects, the use of lavender essential oil shows promise for these potential benefits:

**1. Complementary treatment for anxiety disorders**

The data suggests oral lavender supplements like Silexan may help reduce excessive anxiety as part of an integrative approach, in conjunction with psychotherapy and conventional medications as needed.

**2. Aromatherapy for situational anxiety**

Inhaling lavender essential oil seems particularly helpful for alleviating anxious feelings in stressful situations like before surgery, during medical procedures, or in high-anxiety healthcare settings. It may provide a simple way for patients to self-manage anxiety.

**3. Reducing anxiety associated with procedures**
Several studies found lavender aromatherapy reduced needle-related pain and anxiety during IV, venous catheter, and blood draw procedures. It may serve as a non-pharmacologic analgesic and anxiolytic for routine needle procedures.

**4. Improving preoperative and postoperative anxiety**
Multiple randomized trials have shown lavender aromatherapy can significantly reduce patients' anxiety levels preoperatively. A few studies also noted less postoperative anxiety. This may promote better surgical experiences and recoveries.

**5. Enhancing well-being in pregnancy & childbirth**
Studies of lavender aromatherapy during pregnancy, cesarean sections, and labor found reduced anxiety, improved sleep quality, and enhanced well-being. Lavender appears a safe, effective way to minimize anxiety and stress during the perinatal period.

**6. Relieving student test-taking anxiety**
Several studies demonstrated Lavender aromatherapy helped decrease testing anxiety among middle school, high school, undergraduate, and graduate students. It may serve as a practical stress management tool.

**7. Managing Anxiety in Dementia**
Preliminary evidence indicates lavender aromatherapy may alleviate agitation, restlessness and anxiety symptoms in older adults with dementia. It appeared well-tolerated and could provide an alternative to anti-anxiety medications in this population.

## Summary

Overall, this comprehensive review indicates lavender aromatherapy has significant potential as a non-pharmacologic approach for managing different anxiety states. Though more research is still needed, lavender essential oil appears reasonably safe and shows promise as an inexpensive, accessible option for relieving anxiety. The pleasant aroma makes it easy and enjoyable to integrate into daily life.

## Reference

Donelli, D., Antonelli, M., Bellinazzi, C., Gensini, G. F., & Firenzuoli, F. (2019). Effects of lavender on anxiety: A systematic review and meta-analysis. *Phytomedicine : international journal of phytotherapy and phytopharmacology*, *65*, 153099. https://doi.org/10.1016/j.phymed.2019.153099

## Lavender and Chamomile Aromatherapy for Depression, Anxiety, and Stress in Older Adults

### Main Objective

To investigate the effect of inhalation aromatherapy using lavender and chamomile essential oils on depression, anxiety, and stress of community-dwelling older people.

### Study Design

This was a randomized, controlled, parallel-group trial conducted in Iran.

### Participants

183 community-dwelling adults aged 60+ years were recruited from healthcare centers. Participants had no cognitive impairment, acute psychiatric disorders, respiratory disease, or allergies to essential oils. Those taking antidepressants, anxiolytics, or sedatives were excluded.

### Study Groups

Participants were randomly allocated to:

- Lavender group (n=61)
- Chamomile group (n=61)
- Control group (n=61)

The study was double-blinded - participants and data collectors did not know group assignments.

### Intervention

- **Lavender group:** Inhaled lavender essential oil nightly
- **Chamomile group:** Inhaled chamomile essential oil nightly
- **Control group:** Inhaled distilled water (placebo) nightly

All groups inhaled 3 drops of oil or water on a gauze pad placed 10cm (approx. 4 inches) from nose for 10-15 minutes before bed for 30 consecutive nights.

### Outcome Measures

- Depression, anxiety, stress was measured using the DASS-21 scale
- Assessed at baseline, after 30 days of intervention, and at 1-month follow-up

### Analysis

Changes in DASS-21 scores were compared between groups using ANCOVA, controlling for baseline values.

## Results

- After 30 days, depression, anxiety, and stress decreased significantly more in the lavender and chamomile groups compared to the control group ($p<0.001$)
- Improvements maintained at 1 month follow-up
- No significant differences between lavender and chamomile groups

## Conclusions

This randomized controlled trial found inhaling lavender or chamomile essential oil for 30 nights effectively reduced depression, anxiety, and stress levels compared to placebo in adults 60+ years old. Aromatherapy with lavender or chamomile appears beneficial as a complementary approach for mental health in older populations.

## Strengths & Limitations

### Strengths:

- Randomized, placebo-controlled design
- Double-blinded
- Assessed outcomes at multiple time points

### Limitations:

- Did not specify species of lavender and chamomile used
- Did not analyze the chemical composition of essential oils
- Small sample size
- Short duration

## Summary

In summary, inhaling lavender or chamomile essential oil for 30 nights significantly reduced depression, anxiety, and stress levels in community-dwelling older adults compared to control. The effects persisted 1 month after stopping the intervention. This provides evidence for aromatherapy with lavender and chamomile as an effective complementary approach to improve mental health in older populations.

## Reference

Ebrahimi, H., Mardani, A., Basirinezhad, M. H., Hamidzadeh, A., & Eskandari, F. (2022). The effects of Lavender and Chamomile essential oil inhalation aromatherapy on depression, anxiety and stress in older community-dwelling people: A randomized controlled trial. *Explore (New York, N.Y.)*, *18*(3), 272–278. https://doi.org/10.1016/j.explore.2020.12.012

## Rosa damascena aromatherapy for anxiety and sleep in operating room personnel during COVID-19

### Main Objective

To evaluate the effects of damask rose aromatherapy on state anxiety and sleep quality among a population of Iranian OR personnel during the COVID-19 pandemic

### Research Design

Randomized, controlled, parallel-group trial in Iran.

### Participants

80 operating room personnel from 3 hospitals during COVID-19 pandemic.

### Study Groups

Participants randomly allocated to:

- Rosa damascena (damask rose) group (n=40)
- Placebo group (n=40)

### Intervention

**Damask rose group:**

- Inhaled 2 drops damask rose oil for 10 mins at start of shift
- Placed oil-infused napkin by pillow nightly for 30 nights (Napkins placed 20cm, approx. 8 inches, from nose for 8 hours each night)

**Placebo group:**

- Inhaled 2 drops paraffin oil in same manner
- Scentless napkin by pillow at night (Napkins placed 20cm, approx. 8 inches, from nose for 8 hours each night)

### Outcome Measures

- State anxiety measured with State-Trait Anxiety Inventory
- Sleep quality measured with Pittsburgh Sleep Quality Index
- Assessed at baseline and after 30 days intervention

### Analysis

- Between-group differences analyzed using ANCOVA, controlling for baseline values

## Results

- Anxiety decreased significantly more in damask rose group compared to placebo after 30 days ($p<0.001$)
- Sleep quality improved significantly more with damask rose versus placebo ($p<0.001$)
- Damask rose reduced anxiety possibly by affecting limbic system and hypothalamic-pituitary-adrenal axis

## Conclusions

In operating room personnel during COVID-19, *inhaling Rosa damascena oil for 30 nights reduced anxiety and improved sleep quality compared to placebo*. Damask rose aromatherapy appears beneficial for managing anxiety and sleep issues in medical staff during stressful situations.

## Strengths & Limitations

**Strengths:**

- Randomized, placebo-controlled
- Assessed outcomes at multiple timepoints
- Evaluated mechanism of action

**Limitations:**

- Did not analyze chemical composition of oil
- Small sample size

## Summary

In summary, this study found inhaling *Rosa damascena* essential oil for 30 nights *significantly reduced anxiety levels and improved sleep quality* in operating room personnel during COVID-19 compared to placebo. The effects were seen after just one aromatherapy session and continued one month after stopping. The findings support using aromatherapy with *Rosa damascena* as a complementary approach to manage anxiety and sleep issues in medical staff during stressful situations.

## Reference

Mahdood, B., Imani, B., & Khazaei, S. (2022). Effects of inhalation aromatherapy With Rosa damascena (Damask rose) on the state anxiety and sleep quality of operating room personnel during the COVID-19 pandemic: A randomized controlled trial. *Journal of Perianesthesia Nursing: Official Journal of the American Society of PeriAnesthesia Nurses, 37*(4), 493–500. https://doi.org/10.1016/j.jopan.2021.09.011

# Relaxing Effect of Rose Oil on Humans

### Main Objective

To investigate the effects of rose oil (*Rosa damascena* Mill) on human autonomic parameters and emotional responses in healthy subjects after transdermal absorption.

### Research Design

This was an experimental, randomized, placebo-controlled study.

### Participants

40 healthy volunteers (20 males, 20 females) aged 18-21 years participated in the study.

### Study Groups

- Experimental group (n=20): Received rose oil
- Control group (n=20): Received placebo (sweet almond oil)

### Methodology

Both groups:

- Fitted with breathing masks to prevent olfactory stimulation
- 1 mL oil applied to lower abdomen and massaged in for 5 mins
- Area covered with plastic film

Randomly assigned to rose oil group (n=20) or control group (n=20)

- **Rose oil group:** Applied 1mL 20% rose oil solution to skin of lower abdomen, massaged for 5 mins. Applied 1mL 20% rose oil solution to skin of lower abdomen, massaged for 5 mins - Afterwards, the massage area was covered with a plastic film in order to prevent evaporation of the oil.
- **Control group:** Applied 1mL sweet almond oil

### Outcome Measures

Autonomic parameters:

- Systolic and diastolic blood pressure
- Pulse rate
- Breathing rate
- Blood oxygen saturation
- Skin temperature

Emotional parameters (measured by visual analog scale):

- Relaxation
- Vigor
- Calmness
- Attentiveness
- Mood
- Alertness

### Analysis

- Differences between baseline and post-intervention measurements were calculated for each outcome.
- Differences between groups were compared using Mann-Whitney U test.
- Correlations between emotional and autonomic parameters were assessed using Spearman correlation.

### Results

- Systolic blood pressure decreased significantly more in rose oil group compared to control.
- Skin temperature increased significantly more in rose oil group.
- Breathing rate decreased significantly more in rose oil group.
- Blood oxygen saturation decreased significantly more in rose oil group.
- Subjective alertness decreased significantly more in rose oil group.
- Subjective calmness increased significantly more in rose oil group.
- Subjective relaxation increased significantly more in rose oil group.

### Conclusions

- Rose oil caused significant decreases in breathing rate, blood oxygen saturation, and systolic blood pressure compared to placebo, indicating decreased autonomic arousal.
- Subjects in the rose oil group felt more calm, relaxed, and less alert, also indicating decreased arousal.
- Results suggest rose oil has a relaxing effect on humans.

#### Strengths

- Randomized, placebo-controlled study design
- Blinded participants and researchers by preventing olfactory stimulation
- Measured both objective physiological parameters and subjective ratings
- Performed chemical analysis to characterize rose oil components

#### Limitations

- Small sample size
- Limited age range of participants
- Lacked long-term follow up
- Did not investigate active components of rose oil responsible for effects

### Summary

In summary, this was a well-designed randomized controlled trial demonstrating the relaxing effects of rose oil on autonomic arousal and emotional parameters in healthy adults. Key strengths were the placebo-controlled design and use of both objective and subjective outcome measures. Limitations were the small sample size confined to a narrow age range and lack of follow-up. Overall, results support the use of rose oil aromatherapy for reducing anxiety and promoting relaxation.

**Results (p value)**

The standard to demonstrate a real effect is usually $p<0.05$. This 5% threshold means results would only happen randomly 1 in 20 times. Anything lower indicates a significant effect from the treatment.

- Rose oil group had significant decrease in systolic blood pressure compared to control ($p=0.036$)
- Indicates decreased sympathetic arousal
- Skin temperature increased more in rose oil group ($p=0.001$)
- Indicates decreased sympathetic arousal
- Breathing rate decreased more in rose oil group ($p=0.031$)
- Blood oxygen saturation decreased more in rose oil group ($p=0.029$)
- Rose oil group felt significantly calmer ($p=0.036$), relaxed ($p=0.027$) and less alert ($p=0.036$)
- No significant differences in diastolic pressure, pulse rate, attentiveness, mood, vigor

**Reference**

Hongratanaworakit T. (2009). Relaxing effect of rose oil on humans. *Natural Product Communications*, *4*(2), 291–296.

## A Randomized Controlled Trial Examining the Effect of Aromatherapy Using the Damask Rose Essential Oil on Pre-operative Anxiety Levels

### Main Objective

To determine the effect of aroma intervention on the severity of pre-operative anxiety

### Research / Study Design

This was a double-blind randomized controlled trial investigating the effects of damask rose (*Rosa damascena*) essential oil aromatherapy on preoperative anxiety in patients undergoing percutaneous nephrolithotomy (PCNL) surgery.

### Participants

38 PCNL surgery patients were randomized into an aromatherapy group (n=19) or control group (n=19). Patients were included if they did not have cancer, chronic pain, allergies to fragrances, olfactory problems, drug/alcohol addiction, or mental health disorders.

### Study Groups

- Aromatherapy group (n=19): received 30 minutes of damask rose essential oil by inhalation
- Control group (n=19): received 30 minutes of distilled water by inhalation

### Intervention

- On the morning of surgery, cotton balls were soaked with either:
  - 3 drops of Rosa damascena essential oil (aromatherapy group)
  - Distilled water (control group)
- Cotton balls were held 10cm from the nose and inhaled for 30 minutes prior to surgery while resting.

### Outcome Measures

- Anxiety was measured using the Spielberger State-Trait Anxiety Inventory (STAI) questionnaire the night before and 5 minutes after the aromatherapy intervention on the day of surgery.

### Analysis

- Independent t-tests compared STAI anxiety scores between groups before and after the intervention.
- A p-value $< 0.05$ was considered statistically significant.

### Results

- Pre-intervention STAI scores showed no significant difference in anxiety between groups the night before surgery.

- After the 30-minute *R. damascena* aromatherapy, STAI anxiety scores were significantly lower in the aromatherapy group compared to control group.
- This indicates the damask rose essential oil reduced patient anxiety before surgery.

## Conclusions

The authors concluded that aromatherapy with R. damascena is an effective complementary therapy to reduce preoperative anxiety.

## Strengths & Limitations

**Strengths:**

- Randomized, double-blind controlled trial
- Objective STAI questionnaires to assess anxiety
- Comparison to distilled water control
- Standardized 30-minute aromatherapy exposure

**Limitations:**

- Small sample size (n=19 per group)
- Limited details provided on the R. damascena essential oil - The study did not specify details on the source, composition, or quality analysis of the R. damascena oil.
- Measured anxiety immediately after intervention, unclear if effects persisted
- Possible psychological impact of aroma cues associating anxiety and surgery

## Summary

Overall, this double-blind randomized controlled trial demonstrates inhaling damask rose essential oil rapidly reduces subjective anxiety prior to surgery compared to odorless distilled water control. Details on the rose oil itself and testing if effects persisted would further strengthen the study.

## Reference

Farzaneh M, Zarean V, Abbasijahromi A, Mohit M, Amirkhani M, et al. (2022). A randomized controlled trial examining the effect of aromatherapy using the damask rose essential oil on pre-operative anxiety levels. *Nephro-Urology Monthly, 14*(2):e116696 https://doi.org/10.5812/numonthly.116696.

## Effects of geranium aroma on anxiety among patients with acute myocardial infarction: A triple-blind randomized clinical trial

### Main Objective

To examine the effects of geranium aroma on anxiety among patients with acute myocardial infarction (AMI)

### Research / Study Design

This was a randomized, triple-blind, placebo-controlled clinical trial conducted in Iran.

### Participants

- 80 patients with AMI were recruited through convenience sampling
- Inclusion criteria:
  - 18-60 years old
  - Diagnosed with AMI based on ECG
  - No cardiopulmonary resuscitation upon emergency admission
  - No allergies, respiratory issues, smell/taste issues
  - Oriented, no mental illness, no seizures/head trauma
  - No diseases causing sleep issues
  - No drug addiction
  - Stable vitals, no pain during study
  - No allergy to essential oils
  - No anti-anxiety meds for 10+ hours before study
  - No CAM therapy for 1 week before study
  - Scored >20 on State-Trait Anxiety Inventory
- Exclusion criteria:
  - Unwillingness to continue
  - Cardiac issues during study (shock, arrest, dysrhythmia)
  - Decreased consciousness
  - Allergic/respiratory disease
  - Hemodynamic instability or death

### Study Groups

Patients were Randomized into

- geranium group (n=40)
- placebo group (n=40)

*used stratified block randomization to ensure matching by sex and age

## Intervention

**Geranium group:**

- Received pure geranium essential oil diluted with primrose oil (10%) to 100% concentration
- The oil was administered via inhalation
- 3 drops of the diluted oil were placed on absorbing patches connected inside patients' oxygen masks
- Patients inhaled the aroma for 20 minutes
- This was done twice daily at 10-11am and 6-7pm (days 2 and 3 of hospital stay)
- 100% geranium essential oil was used on day 3 and 4.

**Placebo group:**

- Received inhaled sunflower oil
- 3 drops placed on absorbing patches inside oxygen masks
- Inhaled for 20 minutes twice daily at the same times
- Also done for 2 consecutive days

## Outcome Measures

State-Trait Anxiety Inventory

- 20 items
- 4-point Likert scale
- Total score 20-80
- Higher score indicates higher anxiety

- Assessed before and after intervention on days 1-2

## Analysis

- Chi-square tests compared qualitative variables
- t-tests and ANOVA analyzed continuous variables
- Repeated measures ANOVA examined changes in anxiety over time
- $p<0.05$ considered significant

## Results

- The geranium and placebo groups showed significant differences in anxiety scores at all timepoints ($p<0.001$)
- Geranium aroma caused significantly greater reductions in anxiety scores compared to placebo ($p<0.001$)
- Both groups had decreases in anxiety, but geranium had greater decreases
- The groups were not significantly different at baseline

## Conclusions

- Inhaled geranium aroma significantly reduced anxiety levels in AMI patients
- Aromatherapy with geranium oil is recommended as an easy, low-risk intervention to reduce anxiety in AMI patients

## Strengths & Limitations

**Strengths:**

- Triple-blinded randomized placebo-controlled trial
- Used validated scale to measure anxiety (State-Trait Anxiety Inventory)
- Matched groups on key demographics
- Clear inclusion/exclusion criteria
- Repeated measures analysis

**Limitations:**

- Small sample size
- Short duration
- Did not identify species of geranium oil
- Did not analyze chemical composition of oils
- Patients could be influenced by emotional support from staff/family

## Summary

The study demonstrated that inhaled geranium aroma significantly reduced anxiety in AMI patients compared to placebo, suggesting aromatherapy as an effective nursing intervention. However, limitations like small sample size and lack of chemical analysis of the essential oils used reduce the strength of the conclusions. Additional large-scale studies further evaluating geranium's effects on AMI patients would be beneficial.

## Reference

Shirzadegan, R., Gholami, M., Hasanvand, S., Birjandi, M., & Beiranvand, A. (2017). Effects of geranium aroma on anxiety among patients with acute myocardial infarction: A triple-blind randomized clinical trial. *Complementary Therapies in Clinical Practice*, 29, 201–206. https://doi.org/10.1016/j.ctcp.2017.10.005

## The Effects of Lavender and Citrus aurantium on Anxiety and Agitation of the Conscious Patients in Intensive Care Units: A Parallel Randomized Placebo-Controlled Trial

### Main Objective

To compare the effects of lavender and Citrus aurantium essential oils on anxiety and agitation of conscious patients admitted to ICUs

### Research Design

Parallel, randomized, placebo-controlled trial in Iran.

### Participants

150 conscious patients in intensive care units (ICUs) at 2 hospitals.

- Inclusion criteria: 18-60 years old, able to read/write, normal sense of smell, stable vitals, no sedatives for 3 hours before study
- Excluded if needed sedatives during study

### Study Groups

Randomly allocated to:

- Lavender aromatherapy group (n=57)
- Citrus aurantium aromatherapy group (n=56)
- Placebo group (n=56)

### Intervention

- Lavender group: Inhaled 5 drops lavender essential oil for 30 mins
- Citrus aurantium group: Inhaled 5 drops Citrus aurantium oil for 30 mins
- Placebo group: Inhaled 5 drops saline
- *Oils dropped onto 4 x 4 gauze 10cm (approx. 4 inches) from nose*

- The species of lavender was not reported. No oil analysis was done.

### Outcome Measures

- Anxiety measured with State-Trait Anxiety Inventory
- Agitation measured with Richmond Agitation-Sedation Scale
- Assessed before, immediately after, 1 hr. after, and 3 hrs. after intervention

### Analysis

- Anxiety scores compared between groups using repeated measures ANOVA
- Agitation compared using Friedman and chi-square tests

### Results

- Anxiety decreased significantly more in lavender and Citrus aurantium groups compared to placebo after intervention ($p<0.05$)
- No significant differences between lavender and Citrus aurantium groups
- Agitation decreased in all groups over time, but no significant differences between aromatherapy and placebo groups

### Conclusions

In conscious ICU patients, inhaling lavender or Citrus aurantium essential oil effectively reduced anxiety compared to placebo. However, the aromatherapy did not significantly impact agitation levels.

Aromatherapy appears beneficial for managing anxiety in ICUs. Further research with larger samples is needed.

### Strengths & Limitations

**Strengths:**

- Randomized, placebo-controlled trial
- Assessed multiple timepoints
- Evaluated two different essential oils

**Limitations:**

- No species reported for lavender
- Part of plant not specified for Citrus aurantium
- No chemical analysis of oils
- Small sample size
- Short duration

### Summary

In summary, this study found both lavender and Citrus aurantium aromatherapy effectively reduced anxiety in conscious ICU patients compared to placebo. The anxiolytic effects were seen immediately after inhalation and persisted 3 hours later. No significant differences were found in agitation levels between groups.

Findings support aromatherapy with lavender or Citrus aurantium essential oils as a safe, low-cost intervention to manage anxiety in conscious ICU patients. Limitations include small sample size and short-term follow up. Overall, results provide evidence for integrating aromatherapy into routine ICU care to improve patient anxiety.

**Reference** Karimzadeh, Z., Azizzadeh Forouzi, M., Rahiminezhad, E., Ahmadinejad, M., & Dehghan, M. (2021). The effects of lavender and Citrus aurantium on anxiety and agitation of the conscious patients in intensive care units: a parallel randomized placebo-controlled trial. *BioMed Research International*, *2021*, 5565956. https://doi.org/10.1155/2021/5565956

## Aromatherapy Oils of Lavender (Lavandula angustifolia) Inhalance Reduced Norepinephrine Levels of Woman with Postpartum Blues Based on Edinburgh Postpartum Depression Scale

### Main Objective

To determine the effect of aromatherapy oils of lavender inlahance on norepinephrine levels of mothers with postpartum blues

### Research Design

Quasi-experimental pretest-posttest control group study design
Conducted at 3 health centers in Polewali Mandar Regency, Indonesia between April-May 2019

### Participants

- 55 postpartum mothers screened using the Edinburgh Postnatal Depression Scale (EPDS)
- 33 mothers screened positive for postpartum blues based on EPDS cutoff
- 28 mothers selected for the study after applying inclusion/exclusion criteria
- Divided into treatment group (n=14) and control group (n=14) via purposive sampling
- Most were ages 20-35 years, high school/college educated, housewives, planned pregnancy

### Intervention

- Treatment group received standard care plus lavender aromatherapy
- 5 drops lavender oil on cotton pad, inhaled for 15 minutes twice per week for 4 weeks
- Control group received standard care only without aromatherapy

### Outcome Measures

- Norepinephrine levels from urine samples collected pre- and post-intervention
- Edinburgh Postnatal Depression Scale (EPDS) used to screen for postpartum blues

### Analysis

Wilcoxon signed-rank test used to compare pre/post norepinephrine levels between groups

### Results

- 60% of screened mothers had postpartum blues based on EPDS cutoff score
- Norepinephrine levels decreased significantly in treatment group after aromatherapy (p=0.001)
- No significant change in norepinephrine levels for control group (p=0.157)

## Conclusions

- Lavender aromatherapy effectively reduced norepinephrine levels in postpartum blues
- Suggests lavender essential oil inhalation could be a useful complementary therapy
- Non-invasive and inexpensive aromatherapy may help prevent progression to PPD

## Strengths & Limitations

### Strengths

- Strong experimental design with control group
- Objective biomarker measurement of norepinephrine

### Limitations

- Small sample size limits generalizability
- Short 4-week intervention period
- Lacked blinding of participants

## Reference

Erna Amin, Bambang Rahardjo, Kusworini. (2020). Aromatherapy oils of lavender (*Lavandula angustifolia*) inhalance reduced norepinephrine levels of woman with postpartum blues based on Edinburgh postpartum depression scale. *AIP Conf. Proc.*, 2231(1): 040065. https://doi.org/10.1063/5.0003654

## Effects of Olfactory Stimulation from the Fragrance of the Japanese Citrus Fruit Yuzu (Citrus junos Sieb. ex Tanaka) on Mood States and Salivary Chromogranin A as an Endocrinologic Stress Marker

### Main Objective

To investigate the effects of yuzu (*Citrus junos*) essential oil aroma on mood and stress levels in healthy young women.

### Research/Study Design

This randomized, controlled, crossover study. Used each participant as their own control.

- Research Design: Randomized, controlled, crossover study
  - **Controlled:** The study compared inhalation of yuzu essential oil to a control condition of inhaling water vapor. This allowed the researchers to isolate the effects of the yuzu aroma compared to a neutral control.
  - **Randomized:** The order of the yuzu and control conditions was randomized for each participant. This helped reduce potential order effects.
  - **Crossover:** Each participant experienced both the yuzu and control condition, with the order randomized. This within-subjects crossover design increased statistical power.
  - **Blinding:** The study does not mention blinding of the participants or researchers. It is likely this was an open-label study without blinding since participants would be able to smell if they received yuzu or water vapor.

### Participants

The participants were 20 healthy women in their 20s who were college students. They had regular menstrual cycles and did not smoke, were not obese, and did not have any health conditions.

### Study Groups

The study had two groups:

- Yuzu group: Participants inhaled yuzu essential oil
- Control group: Participants inhaled water vapor as a neutral control

The order of the groups was randomized and each participant experienced both in a crossover design.

### Intervention

- In the **yuzu aromatherapy intervention**, 10 µL of yuzu essential oil was pipetted onto a cotton pad which was placed in a diffuser. Participants inhaled from the diffuser for 10 minutes with airflow set at 1.3 m/min directed at their nostrils.

- The **control intervention** followed the same procedures, except 10 µL of water was pipetted onto the cotton pad instead of yuzu oil. *This controlled for the effects of inhalation itself.*

### Outcome Measures

The study measured the following outcomes:

- Salivary chromogranin A (CgA) levels - a marker of sympathetic nervous system activation. CgA was measured at baseline, 10 min post-inhalation, and 30 min post-inhalation.
- Profile of Mood States (POMS) questionnaire - assessed mood states before and 30 min after aroma exposure.
- Visual analog scale (VAS) - evaluated subjective perceptions of the aroma right after exposure.

### Analysis

- Two-way repeated measures ANOVA analyzed differences in CgA levels between groups and time points.
- Paired t-tests compared changes in POMS scores before/after inhalation between groups.
- Paired t-tests compared VAS aroma ratings between groups.

### Results

- Salivary chromogranin A (CgA) levels decreased significantly after yuzu aroma at 10 and 30 min compared to baseline and control.
- Total mood disturbance and tension, depression, anger, confusion POMS scores decreased significantly more after yuzu vs control.
- Visual analog scale (VAS) scores were significantly higher for yuzu aroma on pleasantness, refreshed feeling, and calmness.

### Conclusions

In summary, this randomized controlled crossover study found that inhaling yuzu essential oil aroma for just 10 minutes significantly decreased the stress hormone CgA and improved mood states compared to a water vapor control.

The results suggest short-term yuzu aroma inhalation may help alleviate negative emotional symptoms by modulating sympathetic nervous system activity. Yuzu aroma could be an effective, non-invasive option for reducing psychoemotional stress.

## Strengths & Limitations

**Strengths:**

- Rigorous crossover randomized controlled design
- Use of neutral control condition
- Measurement of both subjective mood and objective stress biomarker CgA
- Conducted in follicular phase to control for menstrual cycle effects

**Limitations:**

- Small sample size (n=20) limits generalizability
- Lack of participant and researcher blinding
- No comparison to pleasant control aroma
- Unclear if effects specific to yuzu or due to general aroma
- Did not compare groups with and without premenstrual disorders
- Did not examine potential sex differences

## Reference

Matsumoto, T., Asakura, H., & Hayashi, T. (2014). Effects of olfactory stimulation from the fragrance of the Japanese citrus fruit yuzu (Citrus junos Sieb. ex Tanaka) on mood states and salivary chromogranin A as an endocrinologic stress marker. *Journal of Alternative and Complementary Medicine, 20*(6), 500–506.

## 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

### Main Objective

The primary aim of the present study was to obtain clinical evidence for the psychological and physiological effects of bergamot. *A secondary aim* was to achieve some fundamental understanding of the relevant pharmacological processes.

### Research / Study Design

This was a randomized crossover clinical trial examining the effects of bergamot (Citrus bergamia) essential oil aromatherapy on psychological and physiological parameters in healthy women.

### Participants

The study included 41 healthy female undergraduate and graduate students between 20-23 years old, with an average age of 21.3 ± 1.02 years. Participants were screened and excluded if they had any physical or mental health conditions.

### Study Groups

The 41 participants were randomly divided into 6 groups with 6-7 people per group. Each group underwent one of the 6 possible sequences of 3 experimental conditions:

- Rest (R)
- Rest + water vapor diffusion (RW)
- Rest + water vapor + bergamot essential oil (RWB)

### Intervention (study procedures)

- In the R (rest) condition, participants rested for 15 minutes.
- In the RW (water vapor) condition, participants rested for 15 minutes while inhaling water vapor diffused into the air.
- In the RWB (bergamot essential oil) condition, participants rested for 15 minutes while inhaling 400µl bergamot essential oil diffused into the water vapor.

The bergamot essential oil was analyzed by gas chromatography and contained 45.45% limonene and 23.10% linalyl acetate as the main components.

Each participant experienced all 3 conditions on the same day in a randomized order, with rest and room ventilation between conditions to prevent carryover effects.

### Outcome Measures

- Salivary cortisol level - measured from saliva samples collected after each condition, analyzed by ELISA
- Heart rate variability (HRV) - measured continuously during each condition and 10 min rest period after, analyzed for parasympathetic/sympathetic activity
- Questionnaires - Profile of Mood States (POMS), State-Trait Anxiety Inventory (STAI), and Fatigue Self-Check List administered after each condition

### Analysis

Repeated measures ANOVA was used to compare differences between the 3 conditions (R, RW, RWB), followed by pairwise comparisons between conditions. Non-parametric Wilcoxon signed-rank tests were also used. A p-value < 0.05 was considered statistically significant.

### Results

- Salivary cortisol was significantly lower in RWB compared to R, and in RW compared to R, but no difference between RWB and RW.
- HRV showed increased parasympathetic activity (higher HF) and decreased sympathetic activity (lower LF/HF ratio) in RWB compared to RW during the 10 min rest period after, but not during the 15 min aromatherapy exposure.
- Self-reported mood, anxiety, fatigue, and vigor improved significantly in RWB compared to R and RW on the questionnaires.

### Conclusions

*The authors concluded that inhaling bergamot essential oil increased parasympathetic nervous system activity and decreased salivary cortisol, while also improving mood, anxiety, and fatigue scores*. This suggests aromatherapy with bergamot essential oil can induce relaxation effects rapidly.

### Strengths & Limitations

**Strengths:**

- Randomized crossover design
- Both subjective questionnaires and objective physiological measurements
- Analysis of the chemical composition of the bergamot essential oil

**Limitations:**

- Only included healthy young female students, limited generalizability

Overall, this rigorous randomized crossover trial provides evidence that bergamot essential oil aromatherapy can induce measurable psychophysiological relaxation and stress reduction after short term inhalation. Further research with longer exposures, more diverse populations, and placebo controls is warranted.

## Reference

Watanabe, E., Kuchta, K., Kimura, M., Rauwald, H. W., Kamei, T., & Imanishi, J. (2015). 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. *Forschende Komplementarmedizin, 22*(1), 43–49. https://doi.org/10.1159/000380989

## Aromatherapy Benefits Autonomic Nervous System Regulation for Elementary School Faculty in Taiwan

### Main Objective

To evaluate aromatherapy performance on stress reduction

### Research / Study Design

This was a controlled randomized trial examining the effects of bergamot essential oil aromatherapy on autonomic nervous system activity in elementary school teachers in Taiwan.

### Participants

The study included 54 elementary school teachers, including administrative staff, homeroom teachers, and substitute teachers. Ages and genders varied. Participants were excluded if they had asthma, hypertension, or heart disease.

### Study Groups

Participants were divided into subgroups based on position (admin/homeroom/substitute), gender, age, and anxiety levels assessed by the Beck Anxiety Inventory. However, data from males and females were pooled for analysis since differences between genders were insignificant.

### Intervention

- Aromatherapy was performed once per week for 10 minutes using an ultrasonic aromatherapy diffuser containing 2% diluted bergamot essential oil.
- The study did not specify the Latin name or chemical composition of the bergamot oil. This is a limitation.
- Physiological measurements were taken before and after the 10-minute aromatherapy session.

### Outcome Measures

- Blood pressure (systolic and diastolic)
- Heart rate
- Heart rate variability parameters including LF, HF, and LF/HF ratio to assess sympathetic and parasympathetic activity.

### Analysis

- Paired t-tests were used to compare physiological measurements before and after aromatherapy.
- ANCOVA was used to compare differences between subgroups.

### Results

- Blood pressure, heart rate, and LF/HF ratio decreased significantly while HF increased after bergamot aromatherapy when comparing all participants together.

- These changes indicated increased parasympathetic and decreased sympathetic nervous system activity.
- Similar significant effects were found when comparing subgroups by gender, age, anxiety level, and school positions.
- The only exception was substitute teachers showed no difference in HF or LF after aromatherapy.

## Conclusions

The authors concluded that bergamot essential oil aromatherapy elicits physiological relaxation via modulation of the autonomic nervous system after short 10-minute exposures in elementary school teachers.

## Strengths & Limitations

**Strengths:**

- Measurement of objective physiological indicators
- Inclusion of different school positions and anxiety levels
- Comparison of multiple subgroups

**Limitations:**

- Did not specify the species of bergamot used
- Did not analyze chemical composition of the essential oil
- Short 10-minute aromatherapy exposure time
- Lack of control group or placebo

Overall, this controlled randomized trial provides evidence that bergamot essential oil aromatherapy can rapidly shift autonomic balance towards parasympathetic activation, inducing a relaxation response. Additional rigor would be added by including a placebo control, analyzing the essential oil composition, and testing effects of longer exposures.

## Reference

Chang, K. M., & Shen, C. W. (2011). Aromatherapy benefits autonomic nervous system regulation for elementary school faculty in Taiwan. *Evidence-based Complementary and Alternative medicine: eCAM*, *2011*, 946537. https://doi.org/10.1155/2011/946537

## Relaxing Effects of Breathing Pseudotsuga menziesii and Lavandula angustifolia Essential Oils on Psychophysiological Status in Older Adults

### Main Objective

To evaluate effects of breathing Pseudotsuga menziesii (*P. menziesii*) and Lavandula angustifolia (*L. angustifolia*) essential oils (EOs) during a horticultural activity on older adult

### Research / Study Design

This was a randomized crossover trial investigating the effects of inhaling *Pseudotsuga menziesii* (Douglas fir) and *Lavandula angustifolia* (lavender) essential oils during an indoor horticultural activity on psychophysiological status in older adults.

### Participants

The study included 92 older adults aged 60-90 years, with a mean age of 71.2 ± 7.7 years. There were 81 females and 11 males included.

### Study Groups

No specific groups were assigned. The study used a within-subjects crossover design where all participants experienced each condition.

### Intervention

Participants engaged in a 60-minute leaf printing art project. Essential oils were diffused in the following protocol:

- 15 minutes baseline
- 15 minutes leaf printing with water vapor
- 15 minutes leaf printing with *P. menziesii* essential oil diffusion
- 15 minutes leaf printing with water vapor
- 15 minutes leaf printing with *L. angustifolia* essential oil diffusion

The concentration of essential oils was 2.5% in water diffused by an ultrasonic aromatherapy diffuser. The main chemical components of each oil were analyzed.

### Outcome Measures

- Heart rate variability (HRV) monitored continuously
- EEG brain waves monitored continuously
- State-Trait Anxiety Inventory (STAI) questionnaires before and after

### Analysis

- HRV, EEG waves, and STAI scores were compared between baseline, water vapor, and essential oil conditions using non-parametric Wilcoxon signed-rank tests.
- A p-value $<0.05$ was considered statistically significant.

### Results

- HRV changes showed increased parasympathetic and decreased sympathetic nervous system activity during *P. menziesii* and *L. angustifolia* exposure.
- Alpha waves increased while beta/gamma waves decreased with both oils, indicating relaxation.
- STAI scores decreased after the session compared to before, indicating reduced anxiety.
- *P. menziesii* effects were similar to *L. angustifolia* for all outcomes.

### Conclusions

The authors concluded that diffusing *P. menziesii* or *L. angustifolia* essential oils during an indoor nature-based activity elicits measurable physiological relaxation and anxiety reduction in older adults.

### Strengths & Limitations

**Strengths:**

- Within-subjects randomized crossover design
- Measurement of both objective psychophysiological outcomes and subjective anxiety
- Analysis of the chemical composition of the essential oils
- Comparison of P. menziesii to known relaxant L. angustifolia

**Limitations:**

- No placebo control
- Limited essential oil exposure duration
- Small number of male participants (n=11)
- Brain waves only measured from prefrontal cortex

Overall, this rigorous crossover trial provides good evidence that essential oil inhalation induces acute psychophysiological relaxation and anxiety relief in older adults. Longer studies incorporating blinding, placebo controls, and more brain wave measurement locations would further strengthen the methodology.

### Reference

Chung, Y. H., Chen, S. J., Lee, C. L., Wu, C. W., & Chang, Y. S. (2022). Relaxing effects of breathing Pseudotsuga menziesii and Lavandula angustifolia essential oils on psychophysiological status in older adults. *International Journal of Environmental Research and Public Health*, *19*(22), 15251. https://doi.org/10.3390/ijerph192215251

## Effects of Tangerine Essential Oil on Brain Waves, Moods, and Sleep Onset Latency

### Main Objective

To study the effect of tangerine essential oil on human brain waves, mood, and sleep activity

### Research / Study Design

This was an experimental study examining the effects of inhaling tangerine (*Citrus tangerina*) essential oil on brain wave activity, mood, and sleep onset latency in healthy young adults. The study had a within-subjects design, where participants served as their own controls.

> **Note:** In a within-subjects design, all participants in the sample are exposed to the same treatments. The goal is to measure changes over time or changes resulting from different treatments for outcomes such as attitudes, learning, or performance.

### Participants

20 healthy volunteers (10 males, 10 females) aged 19-25 years were recruited. All were right-handed and had no neurological disorders or olfactory impairment. Participants had adequate sleep the night before experiments. Females were not menstruating on experimental days. An additional 10 females participated in the sleep onset latency experiment.

### Study Groups

There were no distinct groups - all participants experienced inhalation with and without tangerine essential oil (in varying concentrations) and served as their own controls.

### Intervention

- Participants inhaled undiluted (neat) tangerine oil, as well as 1:1000 and 1:8000 dilutions from filter paper 3cm from the nose. For sleep experiments, females inhaled 1:1000 dilution from filter paper inserted in their pillowcase.

Tangerine essential oil was extracted by steam distillation. The major compounds were d-limonene (74.47%) and γ-terpinene (10.86%).

### Outcome Measures

- Electroencephalography (EEG): Brain waves in 5 frequency bands (theta, alpha, low beta, mid beta, high beta) were recorded from 32 scalp electrodes during inhalation.
- Sleep onset latency: Time from lights off to first sleep spindle or K-complex on EEG.
- Mood: Subjective ratings of feeling good, active, drowsy, fresh, and romantic on 10cm visual analog scales.

### Analysis

EEG data were analyzed using power spectral analysis to quantify power in each frequency band. Comparisons were made between inhalation and non-inhalation conditions. Changes in sleep latency and mood ratings with vs. without inhalation were analyzed.

### Results

- Undiluted tangerine oil decreased alpha waves and increased beta waves, indicating alertness/wakefulness.
- Diluted oil (1:1000) increased theta waves and decreased alpha and beta waves, indicating sedation.
- Females showed greater EEG changes than males with inhalation.
- 1:1000 dilution decreased sleep onset latency in females.
- Undiluted oil increased ratings of feeling fresh in both genders.

### Conclusions

Inhaling undiluted tangerine essential oil induced alertness, while diluted oil had sedative effects in females. Tangerine oil decreased sleep onset latency and increased feelings of freshness. Females exhibited greater sensitivity in brain wave and sleep changes to tangerine oil.

### Strengths & Limitations

**Strengths:**

- Within-subjects design controls for individual differences.
- Use of varying oil concentrations provides dose-response data.
- Inclusion of both genders, though small sample size.
- Combination of physiological (EEG), behavioral (sleep), and subjective (mood) measures.

**Limitations:**

- Small sample size limits generalization.
- Lack of randomization or blinding.
- No identification of chemical constituents of tangerine oil besides d-limonene and γ-terpinene.
- Effects only tested acutely - no long-term follow-up.
- Possible order/sequence effects not controlled for in within-subjects design.
- Possible confounding from menstrual cycle stage in females.

In summary, this was a carefully conducted within-subjects experimental study that found inhaling tangerine essential oil had concentration-dependent effects of inducing either alertness or sedation, with improved sleep latency and subjective mood. The results are limited by the small sample size and lack of blinding. Future research could explore effects in larger populations over longer treatment periods. Characterization of the active pharmacological constituents may further elucidate the mechanisms of action.

## Reference

Chandharakool, S., Koomhin, P., Sinlapasorn, J., Suanjan, S., Phungsai, J., Suttipromma, N., Songsamoe, S., Matan, N., & Sattayakhom, A. (2020). Effects of tangerine essential oil on brain waves, moods, and sleep onset latency. *Molecules (Basel, Switzerland)*, *25*(20), 4865. https://doi.org/10.3390/molecules25204865

## The effects of lavender essential oil aromatherapy on anxiety and depression in haemodialysis patients

### Main Objective

To examine the effects of lavender essential oil aromatherapy on anxiety and depression in haemodialysis patients

### Research Design

This was a randomized controlled trial examining the effects of lavender essential oil aromatherapy on anxiety and depression in hemodialysis patients. Participants were randomly allocated to an experimental group receiving lavender aromatherapy or a control group receiving routine care only. Outcomes were measured at baseline and 2 and 4 weeks.

### Participants

72 hemodialysis patients were recruited from two hospitals in Iran. Inclusion criteria were being on hemodialysis for at least 6 months, 3 sessions per week, age 18+, able to communicate verbally, and having an intact sense of smell. Exclusion criteria included allergy/respiratory disease history, transplant candidates, pregnancy, and intention to get pregnant.

### Study Groups

- Experimental group (n=35): Received lavender aromatherapy during hemodialysis sessions for 4 weeks.
- Control group (n=37): Received routine hemodialysis care only.

### Intervention

- The experimental group received aromatherapy with lavender (Lavandula angustifolia) essential oil diluted to 5% in sweet almond oil. Three drops were applied to a cotton ball on the patient's collar for inhalation during the first 10 minutes of each hemodialysis session for 4 weeks.
- The control group received standard hemodialysis care without aromatherapy.

### Outcome Measures

- Anxiety and depression were measured using the Hospital Anxiety and Depression Scale (HADS), a 14-item self-report questionnaire.
- Assessments occurred at baseline, 2 weeks, and 4 weeks during the first hour of a hemodialysis session.

### Analysis

- Anxiety and depression scores were compared between groups and over time using repeated measures ANOVA tests.
- Independent t-tests compared groups at baseline.
- Chi-square tests compared demographic characteristics.
- Significance was $p<0.05$.

### Results

- No significant differences existed between groups in baseline characteristics.
- Anxiety scores did not differ significantly between groups at any timepoint.
- The experimental group had significantly lower depression scores than controls at 2 and 4 weeks.
- Depression scores decreased from baseline in the experimental group but not controls.

### Conclusions

Aromatherapy with diluted lavender oil during hemodialysis did not reduce anxiety, but effectively decreased depression versus routine care alone over 4 weeks.

### Strengths & Limitations

**Strengths:**

- Randomized controlled trial design
- Use of validated Hospital Anxiety and Depression Scale
- Comparison of aromatherapy to standard care control group
- Assessment at multiple timepoints
- Replicates real-world implementation of aromatherapy during dialysis

**Limitations:**

- Small sample size
- Single center
- No blinding of participants/personnel
- No measurement of adherence/compliance
- Possible effects from medications/other therapies
- Did not target patients with confirmed anxiety/depression
- Lavender variety and constituents not characterized

Overall, this randomized controlled trial provides evidence that inhaled lavender aromatherapy can significantly reduce depression in hemodialysis patients. *However, the anxiety-reducing effects were less clear.* Dose-response studies should optimize the lavender oil concentration and frequency for anxiety relief. Assessing correlates like improved sleep, pain, and quality of life will further elucidate aromatherapy's benefits in this population. Characterization of the lavender constituents and standardization of the essential oil components could enhance reproducibility.

Larger multi-center trials with blinded participants would provide higher quality evidence to support integrating aromatherapy into routine hemodialysis care.

### Reference

Bagheri-Nesami M, Shorofi S A, Nikkhah A, Espahbodi F. (2017). The effects of lavender essential oil aromatherapy on anxiety and depression in haemodialysis patients.
*Pharmaceutical and Biomedical Research, 3* (1) :8-13 URL: http://pbr.mazums.ac.ir/article-1-138-en.html

## Effects of Juniper Essential Oil on the Activity of Autonomic Nervous System

### Main Objective

To clarify the effect of juniper essential oil on the autonomic nervous system

### Research Design

This was an experimental pre-post study examining the effects of inhaling juniper essential oil on autonomic nervous system activity in healthy adults.

### Participants

18 healthy adults aged 22-29 years participated. Those with nasal or respiratory conditions were excluded.

### Study Groups

No distinct groups - all participants underwent measurement before and during exposure to juniper essential oil.

### Intervention

Juniper essential oil was diffused near participants for 5 minutes. 10 µL oil was applied to a cotton pad and diffused at a rate of 1.2 m/min, 30 cm from the nose.

### Outcome Measures

- Blood pressure was measured before and after oil exposure.
- Heart rate variability (HRV) was analyzed from ECG recordings before and during oil exposure.
- HRV measures: high frequency (HF) reflecting parasympathetic activity; low frequency (LF) reflecting sympathetic and parasympathetic activity; LF/HF ratio indicating sympathetic/parasympathetic balance.

### Analysis

- Pre-post differences in blood pressure, HF, LF, and LF/HF were compared with Student's t-tests.
- $p<0.05$ was considered statistically significant.

### Results

- Systolic and diastolic blood pressure decreased after juniper oil exposure.
- HF significantly increased during oil exposure compared to pre-exposure.
- LF/HF ratio significantly decreased during oil exposure.
- LF decreased during oil exposure.

### Conclusions

Inhaling juniper essential oil lowered blood pressure and increased parasympathetic nervous system activity, while decreasing sympathetic activity based on HRV changes.

## Strengths & Limitations

**Strengths:**

- Used an experimental pre-post design with participants serving as their own controls
- Assessed both subjective (HRV) and objective (blood pressure) outcomes
- HRV is a reliable, non-invasive measure of autonomic function
- Standardized oil exposure conditions

**Limitations:**

- Small sample size of healthy young adults limits generalization
- Lack of randomization, blinding, or control condition
- No measurement of psychological effects or correlates
- Acute effects only - no long-term follow-up
- Possible order/sequence effects in pre-post design
- Specific oil constituents and chemistry not characterized

Overall, this preliminary experimental study provides initial evidence that inhaling juniper essential oil can modulate the autonomic nervous system, reducing blood pressure and increasing parasympathetic "rest and digest" activity compared to sympathetic "fight or flight" activity. However, the lack of a control condition limits the ability to attribute the effects specifically to the juniper oil versus other factors. Large randomized blinded trials are needed to establish efficacy. Dose-response studies could identify optimal concentrations and exposure durations. Assessing effects on mood, stress, and other health parameters would further elucidate clinical applications of juniper aromatherapy. Characterizing the specific oil components may identify the active ingredients producing the autonomic effects observed.

## Reference

Seong Park, D. (2017). Effects of juniper essential oil on the activity of autonomic nervous system. *Biomedical Science Letters, 23*(3):286-289 DOI:10.15616/BSL.2017.23.3.286

## Effect of Lavender Cream with or without Foot-bath on Anxiety, Stress and Depression in Pregnancy: a Randomized Placebo-Controlled Trial

### Main Objective

To evaluate the effect of Lavender cream with or without foot-bath on depression, anxiety and stress of pregnant women

### Research/Study Design

This was a randomized, placebo-controlled trial conducted in Iran. The goal was to evaluate the effect of lavender cream, with or without footbath, on anxiety, stress and depression in pregnant women.

### Participants

The participants were 141 pregnant women between 25-28 weeks gestation, with parity of 1-3. Exclusion criteria included chronic diseases, regular medication use like sedatives, smoking, infertility, unwanted pregnancy, allergy to herbs, severe depression/anxiety/stress, obesity, night shift work, living outside the study city, no phone access, or unwillingness to return for follow-up.

### Study Groups

Participants were randomly allocated to three groups: lavender cream plus footbath (n=47), lavender cream alone (n=47), or placebo cream (n=47).

### Intervention

The intervention lasted 8 weeks.

Participants were randomly allocated to 3 groups:

- Lavender cream + footbath group
  - Applied lavender cream to legs daily
  - Soaked feet in warm water for 10-20 min starting 30 min after applying cream
- Lavender cream only group
  - Applied lavender cream to legs daily
- Placebo cream group
  - Applied placebo cream without lavender to legs daily

- All groups:
  - Used assigned cream for 8 weeks
  - Followed up at 4 and 8 weeks
  - Recorded cream use and footbaths in diaries
  - Returned cream tubes to assess compliance
- Lavender cream contained 1.25% lavender essential oil
- Placebo cream contained no active ingredients

All groups were followed up at 4 and 8 weeks. Compliance was monitored via self-report diaries and weighing returned cream tubes.

### Outcome Measures

The main outcome measures were depression, anxiety and stress, assessed using the 21-item Depression Anxiety Stress Scale (DASS-21). This questionnaire has 3 subscales, each with 7 questions scored 0-3. Higher scores indicate worse symptoms.

### Analysis

General linear models were used to compare groups over time, adjusting for baseline values. Multiple comparisons were done with Sidak method.

### Results

At 4 weeks, anxiety was significantly lower in the lavender alone group compared to placebo. Stress was significantly lower in both lavender groups. At 8 weeks, all three outcomes (anxiety, stress, depression) were significantly lower in both lavender groups compared to placebo. There were no serious side effects reported.

Adding footbath did not significantly enhance the benefits of lavender cream. The two experimental groups did not differ significantly from each other.

### Conclusions

The researchers concluded that lavender cream, with or without footbath, can reduce anxiety, stress and depression in pregnant women. The effects were greater with longer duration of use (8 vs. 4 weeks).

### Strengths & Limitations

**Strengths:**

- Randomized, placebo-controlled trial design
- Inclusion of subjective (diaries) and objective (cream weighing) measures of compliance
- Rigorous statistical analysis

**Limitations:**

- No follow-up after stopping intervention to assess persistence of benefits
- Only included healthy pregnant women, limiting generalization
- Did not report the specific species or chemical composition of the lavender oil
- No footbath alone comparison group
- Small sample size
- Single center study

In summary, this rigorously designed trial provides evidence that lavender cream can benefit pregnant women's mental health, with minimal risks. The footbath addition requires further study. Longer term follow-up would be informative. Overall, lavender appears a promising complementary therapy for antenatal depression and anxiety.

### Reference

Effati-Daryani, F., Mohammad-Alizadeh-Charandabi, S., Mirghafourvand, M., Taghizadeh, M., & Mohammadi, A. (2015). Effect of lavender cream with or without foot-bath on anxiety, stress and depression in pregnancy: a randomized placebo-controlled trial. *Journal of Caring Sciences*, *4*(1), 63–73. https://doi.org/10.5681/jcs.2015.007

## Evaluation of the Harmonizing Effect of Ylang-Ylang Oil on Humans after Inhalation

### Main Objective

To study the effects of ylang-ylang oil (Cananga odorata, Annonaceae) on hu-man physiological parameters and self-evaluation

## Research / Study Design

This was an experimental study conducted at the University of Vienna in Austria. The aim was to investigate the effects of ylang ylang essential oil on physiological parameters and self-evaluation in healthy human volunteers after inhalation.

### Participants

24 healthy adults (gender not specified) were recruited. They were briefed on the study, provided informed consent, and could withdraw at any time.

### Study Groups

Participants were randomly assigned to a control group (n=12) or ylang ylang oil group (n=12).

### Intervention

- The control group inhaled odorless water placebo.
- The experimental group inhaled ylang ylang oil (Cananga odorata) obtained by steam distillation of flowers. 1g of oil or water was administered. Oil administered by inhalation for 20 minutes.

### Outcome Measures

**Physiological outcomes:**

- Blood pressure (systolic and diastolic)
- Pulse rate
- Breathing rate
- Skin temperature

**Self-evaluation (visual analog scale):**

- Relaxation
- Vigor
- Calmness
- Attentiveness
- Mood
- Alertness

**Fragrance ratings:**

- Pleasantness
- Intensity
- Effect (stimulating)

### Analysis

Difference scores were calculated between trials 1 and 2 for physiological and self-evaluation measures. Mann-Whitney U test compared difference scores between groups. Correlations analyzed relationships between measures.

### Results

- Systolic and diastolic blood pressure decreased more with ylang ylang versus placebo (significant for diastolic, trend for systolic).
- Pulse rate decreased more with ylang ylang versus placebo (trend).
- No significant differences were seen in breathing rate or skin temperature.
- Self-rated alertness and attentiveness increased more with ylang ylang versus placebo.
- No significant differences were seen in calmness, relaxation, mood, or vigor.
- Ylang ylang was rated as more stimulating and intense versus placebo. No difference was seen in pleasantness.
- Changes in alertness correlated with changes in pulse rate.

### Conclusions

Inhalation of ylang ylang oil may lead to decreased physiological arousal but increased perceived alertness and attentiveness. This "uncoupling" of physiological and behavioral arousal suggests a harmonizing rather than sedating effect. The psychological impact of odor perception seems to play a key role. Larger rigorous randomized trials are needed to confirm the physiological and psychological effects.

### Strengths & Limitations

**Strengths:**

- Placebo controlled study
- Both physiological and psychological outcomes
- Statistical analysis appropriate for pre/post comparisons

**Limitations:**

- Small sample size
- Gender not specified
- Details of randomization not provided
- Multiple correlations done without adjustment
- Psychological effects may depend on cultural associations

## Reference

Hongratanaworakit, T., & Buchbauer, G. (2004). Evaluation of the harmonizing effect of ylang-ylang oil on humans after inhalation. *Planta Medica*, *70*(7), 632–636. https://doi.org/10.1055/s-2004-827186

## Efficacy of Aromatherapy at Relieving the Work-Related Stress of Nursing Staff from Various Hospital Departments during COVID-19

### Main Objective

To evaluate the efficacy of aromatherapy in relieving the stress of nursing staff working in different departments during COVID-19

### Research / Study Design

This was a quasi-experimental pre-post study design without a control group.
The aim was to evaluate the efficacy of aromatherapy with bergamot essential oil in relieving work-related stress and burnout among nursing staff working in different hospital departments during COVID-19.

### Participants

- 26 female nurses from a hospital in Taiwan.
- From 4 departments: general, palliative care, obstetrics & gynecology (ObGyn), and intensive care unit (ICU).
- Inclusion criteria: at least 3 months clinical experience, no major health conditions, maintained normal work schedule.

### Study Groups

- No control group.
- Participants acted as their own controls with pre-post comparisons.
- Groups were the 4 hospital departments: general (n=10), palliative (n=7), ObGyn (n=5), ICU (n=4).

### Intervention

- Bergamot essential oil diffused at nursing stations for 1 month, twice daily (4 hours each) on weekdays.
- Used ultrasonic diffuser with 5 drops pure bergamot oil without water dilution.
- Did not specify chemical composition or provide scientific name of bergamot.
- No analysis provided to confirm purity or composition of oil.

### Outcome Measures

- **Physiological:** Heart rate variability (HRV) indicators measured with HRV analyzer. Included heart rate, blood pressure, and autonomic nervous system activity.
- **Psychological:** Questionnaires on work stress (Nurse Stress Checklist) and burnout (Copenhagen Burnout Inventory).

### Analysis

- Compared pre- and post-intervention results with paired t-tests.
- Also did ANOVA to compare difference between departments.
- Correlations between physiological and psychological measures.

### Results

- No significant pre-post differences in physiological measures except:
- ICU nurses had increased LF% and LF/HF ratio and decreased HF% indicating increased stress.
- Significant pre-post improvement in work concerns and personal burnout scores on questionnaires.

**By department:**

- General nurses had improved work concerns and personal burnout.
- Palliative nurses had improved competence score.
- ObGyn and ICU nurses had nonsignificant reductions in most measures.

Correlations between physiological and psychological measures.

### Conclusions

- Bergamot aromatherapy showed reduction in perceived work stress and burnout after 1 month diffusion.
- No significant physiological stress reduction except indication of increased stress in ICU nurses.
- Psychological effects were greater in lighter workload departments (general, ObGyn) than heavier workload (palliative, ICU).
- Provides evidence for aromatherapy to reduce pandemic-related nursing stress, especially for those with lighter workloads.

### Strengths & Limitations

**Strengths:**

- Assessed both physiological and psychological measures.
- Looked at effects in different hospital departments.
- Fairly large total diffusion time (1 month).
- Correlated objective and subjective measures.

**Limitations:**

- No control group.
- Small sample size in subgroups.
- No blinding or randomization.
- No chemical analysis of oil provided.

- Did not specify species of bergamot used.
- Single post-intervention physiological measurement may have missed effects.
- Diffuser placement differed between open department areas.

In summary, this quasi-experimental pre-post study provides evidence that diffused bergamot aromatherapy for 1 month can reduce perceptions of work stress and burnout in nurses, especially those with lighter workloads. ICU nurses with heavier workloads showed increased stress after the intervention. More rigorous study with control groups, blinding, and standardized procedures is needed to confirm the effects. Chemical analysis of the oils would also strengthen the validity. Overall, the study suggests aromatherapy as a feasible intervention to alleviate pandemic-related nursing stress.

**Reference**

Hung, C. L., Lin, Y. L., Chou, C. M., & Wang, C. J. (2023). Efficacy of aromatherapy at relieving the work-related stress of nursing staff from various hospital departments during COVID-19. *Healthcare (Basel, Switzerland)*, *11*(2), 157. https://doi.org/10.3390/healthcare11020157

## Ambient odors of orange and lavender reduce anxiety and improve mood in a dental office

### Main Objective

To investigate the impact of the essential oils of orange and lavender on anxiety, mood, alertness and calmness in dental patients

### Research / Study Design

This was an experimental study conducted in a dental clinic waiting room to investigate the effects of ambient odors of orange and lavender essential oils on anxiety, mood, alertness, and calmness in dental patients. The study design involved random assignment of 200 patients to one of four groups: control (no odor or music), music only, orange odor, or lavender odor.

### Participants

The participants were 200 dental patients between 18-77 years old, with an equal number of males and females distributed across the groups. The mean ages were similar between groups. Patients self-reported on pain levels, allergies, and common colds, with no significant differences found between groups on these factors.

### Study Groups

There were four study groups:

1. Control - No odor or music while waiting for dental procedures
2. Music - Listened to upbeat "vacation-style" music while waiting
3. Orange odor - Exposed to ambient odor of orange essential oil diffused in the waiting room
4. Lavender odor - Exposed to ambient odor of lavender essential oil diffused in the waiting room

The study does not provide the scientific names of the orange and lavender oils used.

### Intervention (study procedures)

Upon arriving for dental procedures, patients first completed questionnaires on demographics, pain levels, and trait anxiety. They then waited for their appointments while exposed to the condition for their assigned group (control, music, orange odor, or lavender odor). During this waiting period, they completed state anxiety, mood, alertness, and calmness questionnaires.

The orange and lavender odors were diffused into the waiting room via an electronic dispenser hidden from patients' view. The odor concentrations were kept constant. After the study, the diffuser system was thoroughly cleaned before switching between orange and lavender oils.

### Outcome Measures

- State anxiety - assessed with the State-Trait Anxiety Inventory (STAI)
- Mood - assessed with the Mehrdimensionale Befindlichkeitsfragebogen (MDBF)

- Alertness - assessed with the MDBF
- Calmness - assessed with the MDBF

### Analysis

- ANCOVA was used to compare state anxiety between groups, with gender, age, and trait anxiety as covariates.
- Similar ANCOVA models were used for mood, alertness, and calmness measures.
- Post-hoc Tukey's tests compared differences between specific groups.

### Results

- Orange and lavender groups had significantly lower state anxiety compared to control group.
- Orange and lavender groups had significantly improved mood compared to control group.
- No significant differences between groups were found for alertness.
- Lavender group had significantly higher calmness than control group; orange group showed a trend but did not reach statistical significance.
- Music group did not significantly differ from control group on any measures.

### Conclusions

The researchers concluded that ambient odors of orange and lavender reduced anxiety and improved mood in patients waiting for dental treatment compared to no odor. They suggest odors may be helpful in reducing anxiety in dental offices.

### Strengths & Limitations

**Strengths:**

- Controlled experimental study design with random assignment to groups
- Validated measures used for assessing outcomes
- Statistical analysis appropriate for research questions

**Limitations:**

- Did not provide scientific names or chemical analysis data for the essential oils used
- Relied on self-report data for outcomes like anxiety and mood
- Conducted in only one dental clinic, may not generalize

Overall, this was a well-designed experimental study that provides evidence for anxiety-reducing and mood-enhancing effects of orange and lavender odors in a dental clinic setting. Use of validated outcome measures and appropriate statistical analyses lend credibility to the results. Limitations include lack of specifics on the essential oils used and reliance on self-report data. Additional research in other clinical settings could help confirm and generalize the findings.

## Reference

Lehrner, J., Marwinski, G., Lehr, S., Johren, P., & Deecke, L. (2005). Ambient odors of orange and lavender reduce anxiety and improve mood in a dental office. *Physiology & Behavior*, *86*(1-2), 92–95. https://doi.org/10.1016/j.physbeh.2005.06.031

## The Use of the Essential Oil Lavandin to Reduce Preoperative Anxiety in Surgical Patients

### Main Objective

To investigate whether the essential oil lavandin is more effective than standard care in reducing preoperative anxiety

### Research / Study Design

This was an experimental study with a prospective pretest/posttest design. The purpose was to investigate whether inhaling and applying the essential oil lavandin (*Lavandula hybrida*) is more effective than standard care in reducing preoperative anxiety in surgical patients.

### Participants

The study included 150 adult patients undergoing various surgical procedures at a large Midwestern hospital in the United States. Patients were included if they were at least 18 years old, could speak and read English, were alert and oriented, and agreed to receive essential oils before surgery. Patients were excluded if they were undergoing cardiac surgery, were allergic to lavandin, were pregnant or cognitively impaired, or wore perfume/aftershave on the surgery day.

### Study Groups

Patients were randomly assigned to one of three groups:

- **Control group (n=49):** Received standard preoperative care only.
- **Lavandin group (n=51):** Received standard care plus lavandin essential oil applied topically and by inhalation.
- **Jojoba group (n=50):** Received standard care plus jojoba oil (placebo) applied topically and by inhalation.

### Intervention

The lavandin oil was applied undiluted. Patients took one sniff of lavandin oil from a cotton ball taped near their shoulder. Lavandin oil was also applied topically to the pedal (or radial) pulse point. The jojoba oil placebo was administered the same way.

### Outcome Measures

The primary outcome was preoperative anxiety, measured using a 100-mm visual analog scale (VAS). Anxiety levels were assessed at admission and again when the patient was called to the operating room. Demographic data were also collected.

### Analysis

Analysis of covariance was used to determine if lavandin reduced preoperative anxiety compared to standard care alone or jojoba oil placebo. Associations between demographic variables and anxiety were also analyzed.

### Results

- Patients who received lavandin oil had significantly lower anxiety at the time of surgery compared to standard care alone or jojoba oil placebo ($p<0.01$).
- There were no significant gender differences in lavandin's effects.
- Due to small sample sizes, the effects of previous essential oil use could not be analyzed.

### Conclusions

Inhaled and topical application of lavandin essential oil was effective in reducing anxiety before surgery compared to standard care alone or placebo. The authors concluded that lavandin is a simple, low-risk, cost-effective nursing intervention for managing preoperative anxiety.

### Strengths & Limitations

**Strengths:**

- Randomized, placebo-controlled design
- Objective anxiety measure using VAS
- Two application methods tested for lavandin

**Limitations:**

- Convenience sample limits generalizability
- Patients and providers were not blinded
- Small sample sizes for subgroup analyses
- Specific species of lavandin oil not reported
- No chemical analysis done to verify oil composition
- Effects only tested preoperatively; postoperative anxiety not assessed

In summary, this rigorous experimental study provides evidence that lavandin essential oil can significantly reduce patients' anxiety before surgery. The oil was applied by inhalation and skin absorption for maximum effect. Larger studies are needed to confirm the results and test lavandin in other contexts. Chemical analysis of the oil would also strengthen future studies. Overall, lavandin oil appears to be a feasible, low-risk way to manage preoperative anxiety.

Braden, R., Reichow, S., & Halm, M. A. (2009). The use of the essential oil lavandin to reduce preoperative anxiety in surgical patients. *Journal of Perianesthesia Nursing, 24*(6), 348–355. https://doi.org/10.1016/j.jopan.2009.10.002

## The Efficacy of Aromatherapy with Melissa Officinalis in Reducing Anxiety in Cardiac Patients: A Randomized Clinical Trial

### Main Objective

To assess the effectiveness of aromatherapy using *M. officinalis* in alleviating anxiety in cardiac patients

### Research Design

This was a randomized, single-blind clinical trial conducted in Iran. The purpose was to investigate whether inhaling Melissa officinalis essential oil reduces anxiety in patients hospitalized in a cardiac care unit (CCU).

### Participants

The study included 96 patients admitted to the CCU of a hospital in Tehran. Patients were eligible if they were 20-75 years old, diagnosed with acute coronary syndrome, and met other inclusion criteria. Patients were excluded if they had asthma/allergies to plants, known psychological disorders, or used other complementary therapies recently.

### Study Groups

Patients were randomly divided into two groups:

- Control group (n=47): Received standard care plus a placebo (odorless sesame oil)
- Intervention group (n=45): Received standard care plus Melissa officinalis essential oil

Two patients in the intervention group were excluded during the study due to developing cardiac dysrhythmias.

### Intervention

- The Melissa officinalis essential oil and placebo sesame oil were prepared by an herbal medicine company. For the intervention, the oil was applied to a cotton pad which was attached near the patient's collar. Patients inhaled the oil for 30 minutes twice a day for 3 days.
- The control group received placebo sesame oil using the same method.

### Outcome Measures

The primary outcome was anxiety, measured using the 40-item Spielberger State-Trait Anxiety Inventory before, during, and after the intervention. Higher scores indicate greater anxiety.

### Analysis

Independent t-tests compared anxiety scores between groups. Analysis of covariance was used to control for differences in baseline anxiety.

## Results

- There were no significant differences in anxiety scores between groups at baseline or during treatment.
- After the intervention, anxiety scores were significantly lower in the *Melissa officinalis* group compared to control ($p<0.05$).
- In the intervention group, *Melissa officinalis* essential oil reduced anxiety compared to placebo.

## Conclusions

Inhalation of *Melissa officinalis* essential oil was effective in reducing anxiety in cardiac patients compared to placebo. The authors concluded aromatherapy with Melissa officinalis is a simple, low-risk intervention that could improve outcomes for cardiac patients.

**Strengths:**

- Randomized, placebo-controlled single-blind design
- Used a validated measure of anxiety (Spielberger questionnaire)
- Assessed anxiety at multiple timepoints
- Had few dropouts

**Limitations:**

- Small sample size from a single center
- Patients and providers were not fully blinded
- Anxiety was only measured during hospitalization
- Specific chemical composition of the oil not analyzed
- Long-term effects were not evaluated
- Possible lack of honesty in self-reports

Overall, this rigorous clinical trial provides evidence that inhaling *Melissa officinalis* essential oil can significantly decrease anxiety in hospitalized cardiac patients. The oil was administered for a short duration and effects were immediate. Future research should include larger multicenter trials, chemical analysis of the oil, and follow-up on long-term outcomes. The study adds to evidence that aromatherapy with essential oils can reduce patient anxiety and distress. Melissa officinalis aroma appears to be a feasible low-risk nursing intervention for managing anxiety in cardiac patients.

## Reference

Lotfi, A., Shiri, H., Ilkhani, R., Sefidkar, R., and Esmaeeli, R. (2019). The efficacy of aromatherapy With Melissa officinalis in reducing anxiety in cardiac patients: a randomized clinical trial. *Crescent Journal of Medical and Biological Sciences, 6*(3), 293–299. eISSN 2148-9696

## The Effectiveness of Neroli Essential Oil in Relieving Anxiety and Perceived Pain in Women during Labor: A Randomized Controlled Trial

### Main Objective

To determine the effect of neroli oil aromatherapy on anxiety and pain intensity perception

### Research/Study Design

This was a randomized controlled trial conducted in Italy to determine the effect of neroli essential oil aromatherapy on anxiety and pain intensity perception in women during labor. The study used a repeated-measures design, with anxiety and perceived pain assessed at 3 stages of labor: latent phase, early active phase, and late active phase.

### Participants

The participants were 88 pregnant women aged 18-40 years old, with low-risk, full-term pregnancies between 37-42 weeks gestation. Women with maternal/fetal complications, needing drug induction, or epidural analgesia were excluded.

Participants were recruited from a university hospital prenatal clinic and randomly assigned to intervention (n=44) or control (n=44) group.

### Study Groups

The intervention group received routine prenatal care plus aromatherapy with neroli essential oil diffused continuously during labor.
The control group received only routine prenatal care.

### Intervention

Neroli essential oil was extracted from Citrus aurantium flowers and diffused via an aroma diffuser at 4 drops of oil per 300ml of water. A 5% neroli oil formulation with water, alcohol and emulsifiers was used to promote diffusion. The intervention group had the neroli oil diffused continuously throughout labor.

The oil underwent chemical analysis to characterize the major constituents.

### Outcome Measures

The main outcome measures were anxiety, assessed by the Visual Analogue Scale for Anxiety (VAS-A) and State-Trait Anxiety Inventory (STAI-Y), and pain, assessed by the Visual Analogue Scale for Pain (VAS). Both were measured during the 3 stages of labor. Additional outcomes included labor duration and Apgar scores.

### Analysis

Differences between groups were analyzed using t-tests and repeated measures ANOVA. Chi-square tests compared demographic variables. Effect sizes were calculated using Cohen's d and eta squared.

### Results

Women receiving aromatherapy had significantly lower pain and anxiety scores at all stages of labor compared to controls. Pain and anxiety increased across labor stages in both groups, but the increase was less severe in the intervention group. Multiparous women reported higher anxiety than primiparous women. The aromatherapy intervention had a large effect size in reducing anxiety and pain. No differences were found between groups for labor duration or Apgar scores.

### Conclusions

Neroli oil aromatherapy during labor significantly reduced women's perceived pain and anxiety throughout all stages of labor compared to routine care alone. The non-pharmacological intervention was effective as an alternative approach to manage pain and anxiety during childbirth.

### Strengths & Limitations

Key strengths of this study were the randomized controlled design, repeated measures analysis at different labor stages, use of validated measures, and large effect sizes demonstrating a significant aromatherapy treatment effect.

Limitations were the lack of comparison to other essential oils or aromatherapy methods, and no measurement of previous birth experiences which could affect anxiety.
The study provided limited details on the specific chemical composition of the neroli oil.

Overall, this was a well-designed RCT demonstrating the efficacy of neroli aromatherapy in reducing anxiety and pain during labor.

### Reference

Scandurra, C., Mezzalira, S., Cutillo, S., Zapparella, R., Statti, G., Maldonato, N. M., Locci, M., & Bochicchio, V. (2022). The effectiveness of neroli essential oil in relieving anxiety and perceived pain in women during labor: A Randomized Controlled Trial. *Healthcare (Basel, Switzerland)*, *10*(2), 366. https://doi.org/10.3390/healthcare10020366

## The effect of aromatherapy by essential oil of orange on anxiety during labor: A randomized clinical trial

### Main Objective

To investigate the effect of aromatherapy using essential oil of orange on women's anxiety during labor

### Research/Study Design

This was a randomized controlled trial conducted in Iran to investigate the effect of aromatherapy using sweet orange (Citrus sinensis) essential oil on anxiety levels in women during labor. The study design was appropriate to determine the efficacy of the intervention.

### Participants

The participants were 100 nulliparous women ages 18-35 years old, with single pregnancies between 37-42 weeks gestation and 3-5cm cervical dilation. This was an appropriate participant population that was relevant to the research question.

### Study Groups

Participants were randomly assigned to an intervention group (n=50) that received aromatherapy with orange essential oil, or a control group (n=50) that received a placebo of distilled water. After dropouts, there were 48 participants in each group. The groups appeared comparable at baseline on demographic factors.

### Intervention

- **The intervention group** was exposed to two drops of 2% orange essential oil placed on a cloth 20cm from the face for 20 minutes.
- **The control group** received two drops of distilled water in the same manner.

### Outcome Measures

The primary outcome was anxiety, measured by the Spielberger State Anxiety Inventory before and after the 20-minute intervention period. Physiological measures (blood pressure, pulse, respiration rate) were also compared before and after.

### Analysis

Appropriate statistical tests were used to compare groups and analyze changes in anxiety scores and physiological parameters from before to after the intervention.

### Results

Anxiety scores decreased significantly in both groups, but the decrease was greater in the orange essential oil group compared to control. There were no significant changes in physiological parameters in either group, though diastolic blood pressure and heart rate decreased slightly more in the intervention group.

### Conclusions

The researchers concluded that aromatherapy with orange essential oil is an effective, non-invasive method to reduce anxiety during labor. Orange scent may be useful in labor and delivery settings to help women experiencing anxiety.

### Strengths & Limitations

Strengths of the study include the randomized controlled trial design, use of a validated anxiety scale, and comparison to placebo control.

Limitations were the lack of blinding, short 20-minute intervention time, and that the essential oil was not analyzed for chemical composition. Overall, this provides evidence for aromatherapy with orange essential oil to reduce anxiety in labor, but further studies are needed.

### Reference

Rashidi-Fakari, F., Tabatabaeichehr, M., & Mortazavi, H. (2015). The effect of aromatherapy by essential oil of orange on anxiety during labor: A randomized clinical trial. *Iranian Journal of Nursing and Midwifery Research, 20*(6), 661–664. https://doi.org/10.4103/1735-9066.170001

## The effect of lemon inhalation aromatherapy on blood pressure, electrocardiogram changes, and anxiety in acute myocardial infarction patients: A clinical, multi-centered, assessor-blinded trial design

### Main Objective

To determine the effect of lemon (Limon Citrus) inhalation aromatherapy on Blood Pressure (BP), electrocardiogram changes, and anxiety in patients with Acute Myocardial Infarction (AMI)

### Research / Study Design

This was a randomized clinical trial with parallel groups and blinded outcomes.

### Participants

The participants were 100 patients diagnosed with acute myocardial infarction by a cardiologist. Patients were recruited from coronary care units at 3 hospitals affiliated with Shiraz University of Medical Sciences in Iran.

*Inclusion criteria were:*
- Age 18 years or older
- Speaking Persian
- Oriented to time, person and place

*Exclusion criteria were:*
- Asthma or respiratory allergy
- Sensitivity to plant extracts
- Olfactory problems
- Nasal injury
- Psychological diseases like depression, anxiety, psychosis
- Previous cardiovascular disease or myocardial infarction
- Previous coronary artery bypass or angioplasty
- Previous arrhythmia
- Chronic respiratory diseases like bronchitis, atelectasis
- Participation in previous studies involving complementary therapies in past week

### Study Groups

- **Intervention group** (n=50) received lemon (Citrus limon) essential oil inhalation
- **Control group** (n=50) received paraffin oil inhalation

The coronary care units were randomly divided into intervention or control groups using block randomization to reduce potential for odor contamination between groups.

### Intervention

The intervention was provided for 3 consecutive days starting on the day after admission for acute myocardial infarction. This timeframe was chosen based on typical length of stay for myocardial infarction patients.

- **Intervention group:** 5 drops lemon essential oil placed on cotton pad in open box, 20 cm from patient. Repeated at set times throughout day to ensure at least 2 hours diffusion.
- **Control group:** 5 drops paraffin oil placed on cotton pad in open box, 20 cm from patient. Same frequency as intervention group.
- Same procedure done even if patient left unit for procedures.

Lemon essential oil was analyzed by gas chromatography-mass spectrometry to identify composition. Main components were limonene, β-terpinene, γ terpinene, β-caryophyllene, neral, α-terpineol, neryl acetate, geranial, and geranyl acetate.

### Outcome Measures

Outcomes were measured at baseline (before intervention), day 2, day 3 and day 4 after start of intervention.

- Blood pressure (systolic and diastolic)
- Heart rate
- ECG parameters: ST segment changes, T wave changes, arrhythmias
- Anxiety: State-Trait Anxiety Inventory

### Analysis

- Quantitative data: ANCOVA and repeated measures ANCOVA, controlling for medications, procedures as covariates
- Qualitative data: Chi-square test, Cochran's Q test
- Blinding: Personnel, statisticians, and data analysts blinded to group assignments

### Results

- Systolic blood pressure: Significant difference between groups on days 3 and 4, with lower systolic blood pressure in intervention group. Significant difference between groups over time.
- Diastolic blood pressure: No significant difference between groups at any timepoint or over time.
- Heart rate: No significant difference between groups except on day 4, when heart rate was significantly lower in intervention group. No significant difference over time.
- ST segment changes: Significantly lower percentage of ST changes in intervention group on days 3 and 4 compared to control. Significant decreasing trend over time in intervention group.

- T wave changes: Significantly lower percentage of T wave changes in intervention group on days 2, 3 and 4 compared to control. Significant decreasing trend over time in intervention group.
- Arrhythmias: No significant difference in incidence between groups at any timepoint or over time.
- Anxiety: Significantly lower anxiety scores in intervention group on day 4 for both state and trait anxiety compared to control.

## Conclusions

This randomized controlled trial found that lemon essential oil inhalation in patients with acute myocardial infarction significantly lowered systolic blood pressure, heart rate, ECG changes indicating ischemia (ST elevation/depression, T wave inversion/flattening), and anxiety compared to placebo. The effects seemed to increase over the 3 days of exposure.

The results suggest that lemon essential oil inhalation could be a useful complementary therapy in acute myocardial infarction patients to help stabilize cardiovascular parameters and reduce anxiety in the acute phase. Lemon oil likely exerts these effects through its antioxidant, anti-inflammatory, and neuron-modulating properties.

## Strengths & Limitations

**Strengths:**

- Randomized, blinded controlled trial
- Analysis of chemical composition of lemon oil
- Multiple cardiovascular outcome measures

**Limitations:**

- Covariates like medications could have influenced effects
- Did not specify species of lemon (Citrus limon)
- Short duration of follow-up
- Small sample size

Further studies with larger sample sizes, longer follow-up periods, and subjects from diverse ethnic backgrounds are warranted to confirm the cardiovascular and anxiolytic benefits of lemon essential oil. Studies comparing effects of different Citrus species may also be informative. Overall, this study provides preliminary evidence that lemon oil inhalation may have therapeutic potential as a complementary therapy for acute myocardial infarction patients.

## Reference

Rambod, M., Rakhshan, M., Tohidinik, S., & Nikoo, M. H. (2020). The effect of lemon inhalation aromatherapy on blood pressure, electrocardiogram changes, and anxiety in acute myocardial infarction patients: A clinical, multi-centered, assessor-blinded trial design. *Complementary therapies in clinical practice*, *39*, 101155. https://doi.org/10.1016/j.ctcp.2020.101155

## The Effect of Short-term Inhalation of Fir Essential Oil on Autonomic Nervous Activity in Middle-aged Women

### Main Objective

To investigate the effect of short-term inhalation of fir essential oil on autonomic nervous activity in middle-aged women

### Research Design

Randomized, controlled, crossover trial in South Korea

### Participants

26 middle-aged women aged 45-55 years
Study Groups Each participant attended 2 visits:

- Visit 1: Inhaled fir essential oil, then room air
- Visit 2: Inhaled room air, then fir essential oil

### Intervention

- Inhaled undiluted fir essential oil on filter paper for 3 minutes
- 3-minute washout period between fir oil and room air

### Outcome Measures

- Autonomic nervous system activity via heart rate variability analysis
- Parasympathetic indicator: High frequency (HF)
- Sympathetic indicator: Low frequency/(LF+HF) ratio
- Mood measured via Profile of Mood States (POMS)
- Semantic differential for subjective impressions

### Analysis

- Paired t-test comparing fir oil to room air

### Results

- HF significantly increased with fir oil, indicating increased parasympathetic relaxation response ($p<0.05$)
- LF/(LF+HF) marginally reduced with fir oil, indicating decreased sympathetic activation ($p=0.10$)
- Felt more "comfortable", "relaxed", "natural" after fir oil inhalation
- POMS showed improved mood and reduced negative affect

**Conclusions** Short-term inhalation of fir essential oil induced physiological and psychological relaxation in middle-aged women, as evidenced by reduced sympathetic activity, increased parasympathetic activity, and positive emotional effects.

## Strengths & Limitations

**Strengths:**

- Randomized, controlled, crossover design
- Assessed multiple outcomes
- Included subjective and objective measures

**Limitations:**

- Small sample size
- Very short inhalation duration
- Participants from one country
- Specific fir species not reported
- No oil chemical analysis

## Summary

In summary, *inhaling fir essential oil for 3 minutes increased parasympathetic activity, reduced sympathetic activation, and improved mood in middle-aged women compared to room air*. Findings indicate short-term inhalation of fir oil induces physiological and psychological relaxation.

The effects were seen after only 3 minutes of inhalation. Study provides evidence for aromatherapy with fir oil as a quick-acting and effective method to reduce stress and promote relaxation in middle-aged women. Limitations include small sample size and short inhalation duration. Overall, results support use of fir aromatherapy as a complementary approach for stress management in menopausal women.

## Reference

Kim, C., Lee, G., & Song, C. (2023). The effect of short-term inhalation of fir essential oil on autonomic nervous activity in middle-aged women. *Explore* (New York, N.Y.), S1550-8307(23)00104-0. Advance online publication. https://doi.org/10.1016/j.explore.2023.04.006

## Effectiveness of Anise Oil for Treatment of Mild to Moderate Depression in Patients With Irritable Bowel Syndrome: A Randomized Active and Placebo-Controlled Clinical Trial

### Main Objective

To evaluate the effectiveness of anise oil, a traditional Persian medicine, in treating symptoms of mild to moderate depression in patients with irritable bowel syndrome (IBS)

### Research Design

Randomized, double-blind, placebo-controlled trial was.

### Participants

120 patients aged 20-50 years with IBS and mild to moderate depression. Mild to moderate depression based on Beck Depression Inventory (BDI-II) scores. *Exclusion criteria:* severe depression, abnormal lab tests, cancer, pregnancy, breastfeeding, antidepressant use

The trial duration was 4 weeks, with a 2-week follow-up.

### Study Groups

Patients were randomly allocated to 3 parallel groups:

- Anise oil capsules (AnisEncap): 200 mg anise oil 3 times per day (n=40)
- Peppermint oil capsules (Colpermin): 187 mg 3 times per day (n=40)
- Placebo capsules (n=40)

### Intervention

- Anise oil capsules: Contained anise oil extracted from Pimpinella anisum fruit, prepared as an oleogel in a hard gelatin capsule
- Peppermint oil capsules (Colpermin): Commercially available enteric-coated peppermint oil capsules
- Placebo: Capsules containing oleogel without anise oil

### Outcome Measures

- Beck Depression Inventory (BDI-II) total score
  Assessed depression symptoms at baseline, 4 weeks, and 6 weeks
- Adverse effects

### Analysis

- BDI-II scores compared between groups using ANOVA
- $P<0.05$ was considered statistically significant

## Results

- No significant differences in baseline characteristics between groups
- At 4 weeks, BDI-II scores were significantly lower in the anise oil group compared to peppermint oil and placebo groups
- The improvement persisted at 6-week follow-up
- No major adverse effects reported

## Conclusions

- Anise oil was significantly more effective than peppermint oil and placebo in reducing symptoms of mild to moderate depression in patients with IBS.
- Anise oil may be a promising treatment for depression in IBS patients.

## Strengths & Limitations

### Strengths:

- Randomized, double-blind, placebo-controlled design
- Inclusion of active control group
- Standardized preparation of anise oil
- Use of validated scale for depression symptoms
- Follow-up assessment

### Limitations:

- Small sample size
- Limited follow-up duration
- Lack of chemical analysis data for anise oil
- Scientifically unproven mechanism of action
- Did not assess IBS symptoms
- Different dosage form than traditionally used

## Summary

In conclusion, this well-designed randomized controlled trial provides evidence that anise oil may be an effective treatment for reducing depressive symptoms in patients with IBS. The improvement was significantly greater than peppermint oil and placebo. However, larger trials with longer follow-up are needed to confirm the results. The study is limited by the small sample size, short follow-up, and lack of data on the composition of the anise oil. Overall, anise oil shows promise as a potentially useful natural medicine for depression in IBS patients. Further research is warranted on its efficacy, optimal dosage, duration of treatment, and mechanisms of action.

## Reference

Mosaffa-Jahromi, M., Tamaddon, A. M., Afsharypuor, S., Salehi, A., Seradj, S. H., Pasalar, M., Jafari, P., & Lankarani, K. B. (2017). Effectiveness of anise oil for treatment of mild to moderate depression in patients with irritable bowel ayndrome: A randomized active and placebo-controlled clinical trial. *Journal of Evidence-based Complementary & Alternative Medicine*, *22*(1), 41–46. https://doi.org/10.1177/2156587216628374

## Effects of the aroma of lemone verbena (Aloysia citriodora Paláu) essential oil on anxiety and the hemodynamic profile before cesarean section: A randomized clinical trial

### Main Objective

The main objective was to evaluate the effects of inhaling lemon verbena essential oil on preoperative anxiety and hemodynamic changes in women undergoing cesarean section.

### Study Design

Randomized, single-blind, controlled trial
84 pregnant women undergoing cesarean section

### Participants

**Inclusion:**

- 18-40 years old
- Term pregnancy
- Elective cesarean section
- ASA class I or II

**Exclusion:**

- Respiratory conditions
- Allergy to lemon verbena
- Medication use
- Cognitive disorders

### Intervention

Patients were randomly allocated to:

- **Lemon verbena group** (n=42): Inhaled 3 drops of lemon verbena essential oil on cotton at 10cm distance for 30 minutes preoperatively
- **Placebo group** (n=42): Inhaled 3 drops of distilled water on cotton at 10cm distance for 30 minutes preoperatively

Lemon verbena oil analyzed by GC-MS - main component alpha-cadinol (44.26%)

### Outcomes

- State-Trait Anxiety Inventory (STAI-S) score - assessed before and after intervention
- Vital signs - blood pressure, heart rate, respiratory rate - measured before and after intervention
- Pain score - assessed after surgery using numerical rating scale

### Analysis

- Between group comparisons done with t-test and chi-square test
- Within group comparisons done with paired t-test
- $p<0.05$ was statistically significant

### Results

- STAI-S score significantly decreased after lemon verbena aroma compared to placebo
- Heart rate, respiratory rate, systolic and diastolic blood pressure decreased significantly with lemon verbena but not placebo
- No difference in pain scores between groups

### Conclusion

Inhaling lemon verbena essential oil aroma effectively reduced anxiety and improved hemodynamic parameters before cesarean section compared to placebo.

#### Strengths

- Randomized, controlled study design
- Placebo control
- Standardized essential oil preparation
- Validated scale used to assess anxiety (STAI-S)
- Objectively measured hemodynamic outcomes

#### Limitations

- Single-blind instead of double-blind
- Small sample size
- Short duration of intervention and outcomes
- Didn't assess outcomes during/after surgery
- Lacked long-term follow up

### Summary

In summary, this randomized controlled trial provides good evidence that inhaling lemon verbena essential oil aroma can significantly reduce preoperative anxiety and improve hemodynamic stability in women undergoing cesarean delivery. The effects were greater than placebo. Limitations like small sample size, short duration, and lack of blinding should be addressed in future studies to confirm the results. Overall, aromatherapy with lemon verbena essential oil appears beneficial as an adjunct therapy for managing preoperative anxiety.

### Reference

Haryalchi, K., Kazemi Aski, S., Mansour Ghanaie, M., Fotouhi, M., Mansoori, R., Sadraei, S. M., Yaghobi, Y., & Olangian-Tehrani, S. (2023). Effects of the aroma of lemone verbena (Aloysia citriodora Paláu) essential oil on anxiety and the hemodynamic profile before cesarean section: A randomized clinical trial. *Health Science Reports, 6*(5), e1282. https://doi.org/10.1002/hsr2.1282