Essential Oils for Sleep among Cardiac Rehabilitation Patients

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Why is sleep restorative?

- Neuron metabolism results in the accumulation of waste products in interstitial space surrounding cells of the brain.
- Brain cells are vulnerable to toxic effects of waste proteins.
- CSF circulates through the brain interchanging with interstitial fluid and removes waste proteins.
- Increased volume of interstitial fluid during sleep helps CSF clean waste proteins from the brain.

Relationship between sleep and cardiovascular morbidity

- Poor quality sleep has been linked to cardiovascular morbidity globally.
- Evidence indicates that many heart failure (HF) patients who are discharged with sleep problems still have sleep problems one year later.
- Persistent sleep problems in cardiac patients is associated with all cause and cardiovascular re-admissions.
- Data from Rotterdam cohort study shows that over time clinical heart failure (but not objective cardiac dysfunction as measured by echocardiography) increases the risk for poor sleep quality.
Essential Oils as a potential intervention for poor sleep quality

Weak evidence supports the use of some essential oils for sleep improvement.

Lavender
Lavandula hybrid var. Super

Bergamot
Citrus bergamia

Ylang-ylang
Cananga odorata

Essential Oil Chemistry

It is the chemistry of an essential oil that determines its therapeutic properties.

Essential oils, like all organic compounds, are made up of hydrocarbon molecules and can further be classified as terpenes, alcohols, esters, aldehydes, ketones, and phenols.

Alcohols and Esters are two of the major functional groups that are key to the therapeutic effects of the selected study oils.
Essential Oil Chemistry

- Linalol is an alcohol molecule that acts as a hypnotic by inhibiting the chemical bonding of glutamate receptors in the cerebral cortex of the brain.

- A study on mice showed that linalol had depressant effects when the glutamate receptors were inhibited through binding.

- These receptors are responsible for the glutamate-mediated postsynaptic excitation of neural cells and when linalol inhibits binding a sedative effect is produced.

Essential Oil Chemistry

- Esters are formed when an organic acid and an alcohol combine.

\[
\text{organic acid} + \text{alcohol} \rightarrow \text{ester} + \text{water}
\]

- Even though the method of action for esters is not fully understood, they are considered aromatically and therapeutically desirable.

- Esters are commonly accepted in the aromatherapy community as regulators of the nervous system and essential oils that contain esters are thought to be the most relaxing, balancing, and calming.

Essential Oil Chemistry

- \textit{Lavandula x intermedia} (Lavandin Super)

\[(\text{Acetic acid} + \text{Linalol} = \text{linalyl acetate})\]
Essential Oil Chemistry

**Citrus bergamia**  
(Bergamot)  
(Acetic acid + Linalol = Linalyl acetate)

![Chemical structure of Citrus bergamia](image)

**Cananga odorata**  
(Ylang ylang)  
(Benzoic acid + Benzyl alcohol = Benzyl benzoate)

![Chemical structure of Cananga odorata](image)

<table>
<thead>
<tr>
<th></th>
<th>L. intermedia Super</th>
<th>C. bergamia</th>
<th>C. odorata</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linalol</td>
<td>37.12%</td>
<td>10.63%</td>
<td>6.26%</td>
</tr>
<tr>
<td>Esters</td>
<td>30.37%</td>
<td>30.12%</td>
<td>57.93%</td>
</tr>
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</table>
Purpose of the Study

- Compare the sleep quality of cardiac rehabilitation patients who inhale an essential oil mixture, including lavender, bergamot, and ylang-ylang, as part of their bedtime routine to the sleep quality of the same patients when they are not exposed to the essential oil mixture.

Design and Methods

- Randomized, double-blind, cross-over study
- Sample of 43 outpatient cardiac rehabilitation patients
- Random allocation to treatment and placebo groups
- Placebo consisted of aromatic vehicle oils of the same color as the treatment
Design and Methods

- Cotton balls infused with the treatment or placebo mixture were placed in black mesh bags.
- Participants placed the bags at their bedside for 5 nights as part of their normal bedtime routine.
- After a one week wash-out period the participants crossed over to the alternate group.

Measurement

- Pittsburgh Sleep Quality Index (PSQI)
- Good evidence for validity and reliability in the literature
- Well established and used frequently in sleep studies
- Lower PSQI scores indicate better sleep quality
- PSQI administered at the end of the treatment week and at the end of the placebo week
- Mean PSQI global scores after treatment and placebo conditions were compared using student’s t-test
43 Participants Analyzed:

<table>
<thead>
<tr>
<th>Gender</th>
<th></th>
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<tbody>
<tr>
<td>Female</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>31</td>
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Age: Ranged from 43 years to 85 years with an average of 67 years.

Sleep Time: 85% went to bed between 10pm and 11pm (7% went to bed later than 11pm).

Time to Fall Asleep: Ranged from 0-90 minutes at baseline with an average of 20 minutes.

Hours of Sleep: Ranged from 4-9 hours with an average of 7 hours.

Results: Quality of Sleep

- The mean PSQI global score when receiving the intervention oil was 4.9 and the mean PSQI global score when receiving placebo was 8.

- Sleep quality during treatment was significantly better than sleep quality during placebo.

<table>
<thead>
<tr>
<th>Essential Oil Treatment</th>
<th>Mean PSQI score</th>
<th>t-value for difference</th>
<th>Projected difference</th>
<th>Effect size (Cohen's d)</th>
<th>Mean difference</th>
<th>CI of the difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4.9</td>
<td>-6.306</td>
<td>0.0001</td>
<td>1.00 (very large effect)</td>
<td>3.1</td>
<td>2.12 to 4.08</td>
</tr>
</tbody>
</table>
Results: Hours of Sleep

• No significant difference between hours of sleep between the two conditions.

Conclusion

• Effect of essential oil mixture on sleep quality was substantial.
• The quality of sleep, rather than sleep duration, was affected.
• Essential oils may be an inexpensive and effective nursing intervention and complimentary medicine to improve sleep among cardiac rehab patients.

What questions do you have?
### References

- Papaphotopoulou, T., Tzavara, C., Theodori, C., Sidabras, C., Touretzky, Y. Physical activity may promote sleep in cardiac patients suffering from insomnia. J Cardiovasc Nurs 2015; 30; 142-56.
- Recipe for essential oil mixture is proprietary