Anxiety-Reducing Efficacy of Inhaled Essential Oils: A Case Study and Literature Review

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Disclosure Statement

I have the following financial relationships to disclose:

- As faculty, I received financial assistance for conference attendance from Augusta University College of Nursing.
- As a PhD student, I received a Travel Grant for conference attendance from The Graduate School at Augusta University.
- I am the sole proprietor of Aromatherapeutic Solutions in Augusta, Georgia, USA.

Learning Objectives

The learner will be able to:

1. Describe the prevalence and impact of anxiety in the United States.
2. Differentiate between different anxiety treatments.
3. Discuss the role of inhaled essential oils for anxiety reduction.

Anxiety (1 of 3)

- Anxiety is “an emotion characterized by feelings of tension, worried thoughts and physical changes like increased blood pressure…sweating, trembling, dizziness or a rapid heartbeat” (APA, 2017).
- Occasional anxiety is normal, but for many people thoughts of worry and fear do not go away or get worse over time. These anxious emotions can effect personal relationships, work, and school performance (NIMH, 2016).
- Other symptoms of anxiety include difficulty sleeping, fatigue, irritability, muscle tension, restlessness, and trouble concentrating (NIMH, 2016).

Anxiety (2 of 3)

- Anxiety disorders develop from a complex set of risk factors, including genetics, brain chemistry, personality, and life events (ADAA, 2016).
- Anxiety includes generalized anxiety disorder, panic disorder and panic attacks, phobias, separation anxiety and the closely-related obsessive-compulsive disorder and post-traumatic stress disorder (ADAA, 2016; NIMH, 2016).
- Comorbidities often include ADHD, bi-polar disorder, chronic pain, depression, eating disorders, headaches, irritable bowel syndrome, and substance abuse (ADAA, 2016).

Anxiety (3 of 3)

- Side effects from pharmacological treatment include dry mouth, weight gain, tremors, and sexual dysfunction (ADAA, 2016).
- Anxiety-induced nausea is very common. Anxiety-induced nausea and vomiting can also occur infrequently to frequently. For these clients, anti-emetics, calming themselves down, or using distraction may help with nausea (ADAA, 2016).

Anxiety Statistics (NIMH, 2016)

- Average age on of anxiety onset is 11 years old.
- Upwards of 25% of teens ages 13-18 are diagnosed with anxiety disorders.
- Anxiety disorders affect more females and Caucasians.
- Anxiety disorders are the most common mental health disorder affecting approximately 18% of Americans, or 4 million people in the United States (U.S.).
- Anxiety consumes 1/3 of the total U.S. mental health budget costing an estimated $42 billion dollars annually.

Anxiety Management (ADAA, 2016)

Pharmacological

- Benzodiazepines (e.g., lorazepam, diazepam, alprazolam)
- Selective Serotonin Reuptake Inhibitors (SSRIs; e.g., sertraline, fluoxetine, citalopram)
- Serotonin-Norepinephrine Reuptake Inhibitors (SNRIs; e.g., duloxetine, venlafaxine)
- Tricyclic Antidepressants (e.g., amitriptyline, imipramine, nortriptyline)

Non-Pharmacological

- Acupuncture
- Aromatherapy (not referenced)
- Cognitive Behavioral Therapy
- Deep Breathing
- Guided Imagery
- Meditation
- Relaxation Techniques
- Residential Treatment
- Transcranial Magnetic Stimulation
- Yoga

Case Study Participant

- Caucasian male in his mid-twenties suffering from anxiety-induced nausea and vomiting.
- Came for consult because his anxiety was affecting both his home and work lives.
- Complained about …
  - Not being able to keep a job for very long because of needing to leave to vomit frequently.
  - Feeling out of control and his anxiety impacting quality time with his family.

Case Study Visit

Pre-Treatment

- Discussed with client which aspects of anxiety impacted his life the most and his goals for therapy.
- Client completed an intake form and verified no allergies.
- Client declined a separate visit to determine scent likes and dislikes prior to aromatherapy blend development.

Case Study Blend

Essential Oils	Selection Rationale
Angelica archangelica	For centering and grounding to help the client perceive a sense of control in his life
Citrus aurantium varieties	For anxiolytic and antidepressant effects
Elettaria cardamomum	For nausea, stomach upset, and overall calming
Lavendula angustifolia	For anxiolytic and stress-reducing effects
Oraganum marjorana	For anxiolytic and stress-reducing effects, as well as an abdominal antispasmodic to aid nausea and vomiting

Case Study Visit: Week 1

- Client assessed to determine side effects or problems related to the study blend.
- Client expressed that he really did not like the smell of the blend, but was using it because nothing else was helping him.
- Client complained of having an anxiety attack while watching a National Football League (NFL) game with his family. He stated, ”My kids ran to the bedroom, grabbed the bottle, brought it to me, and told me to smell it.”

Case Study Visit: Week 2

- Client assessed to determine side effects or problems related to the study blend.
- Client reports more frequent use of the study blend and diminished aversion to the smell.
- Overall, the client stated that he has a positive response from the study blend.

Case Study Visit: Week 3

- Client assessed to determine side effects or problems related to the study blend.
- Client reported continued positive response from the study blend.
- Client reported no anxiety-related nausea or vomiting events in the past two weeks.
- Client given the tools to continue aromatherapy treatment on his own and case study closed.

Clinical Aromatherapy Blend

Genus and species	***Angelica archangelica***	***Citrus aurantium ssp or var. bergamia***	***Elettaria cardamomum***	***Lavendula angustifolia***	***Citrus x aurantium***	***Origanum marjorana***
Common name	Angelica Root	Bergamot	Cardamom	Lavender	Petitgrain	Sweet Marjoram
Plant Image						
Reference	© NAHA, 2014	© NAHA, 2014	© NAHA, 2014	© Langley-Brady, D., 2012	© Essential Oils Canada	© Essential Aura

Table 1. Clinical aromatherapy blend including *genus, species*, common name, and image of aromatic plants.

Primary Chemical Constituents

Angelica archangelica (Angelica Root)	Citrus aurantium ssp bergamia (Bergamot)	Elettaria cardamomum (Cardamon)	Lavendula angustifolia (Lavender)	Citrus x aurantium (Petitgrain)	Origanum marjorana (Sweet Marjoram)
β-Phellandrene	(+) – Limonene	1,8-Cineole	Linalool	Linalyl acetate	Terpinen-4-ol
α-Pinene	Linalyl acetate	α-Terpinyl acetate	Linalyl acetate	Linalool	(Z)-Sabinene hydrate
α-Phellandrene	Linalool	Linalyl acetate	Lavandulyl acetate	(+) - Limonene	Linalyl acetate
(+) - Limonene	Sabinene	(+) - Limonene	β-Caryophyllene	α-Terpineol	Y-Terpinene
δ -3- Carene	Y-Terpinene	Linalool	Terpinen-4-ol	Geranyl acetate	α-Terpineol
p-Cymene	β-Pinene	α-Terpineol	Borneol	β-Pinene	(E)-Sabinene hydrate
β-Myrcene	α-Pinene	Sabinene	α-Terpineol	Neryl acetate	α-Terpinene
(E)-β-Ocimene	Bergamottin	Terpinen-4-ol	(Z)-β-Ocimene	Geraniol	Terpinen-4-yl acetate
Pentadecanolide	β-Myrcene	(E)-Nerolidol	3-Octanone	(E)-β-Ocimene	Sabinene
Terpinolene	Neryl acetate	β-Myrcene	(E)-β-Ocimene	β-Myrcene	p-Cymene

Table 2. Primary chemical constituents in select essential oils listed by percentage from highest to lowest (Tisserand & Young, 2014).

Chemical Group Mechanisms of Action

Esters	Furano-coumarins	Monoterpene Alcohols	Monoterpene Hydrocarbons	Oxides	Sesquiterpines
Anti-inflammatory, antispasmodic, immuno-modulatory, CNS relaxant, myorelaxant	Antidepressant, antifungal, antimicrobial, antioxidant, anti-tumoral, photosensitizer, spasmolytic	analgesic, anti-inflammatory, antispasmodic, immuno-modulatory, vasorelaxant, motor relaxant	acetylcholinesterase inhibitor, analgesic, anti-inflammatory, antispasmodic, enhances transdermal penetration, immunomodulatory, motor relaxant	Acetyl cholinesterase inhibitor, analgesic, antibacterial, anti-inflammatory, antiviral, expectorant, myorelaxant	Anesthetic, anti-inflammatory, antispasmodic, anxiolytic

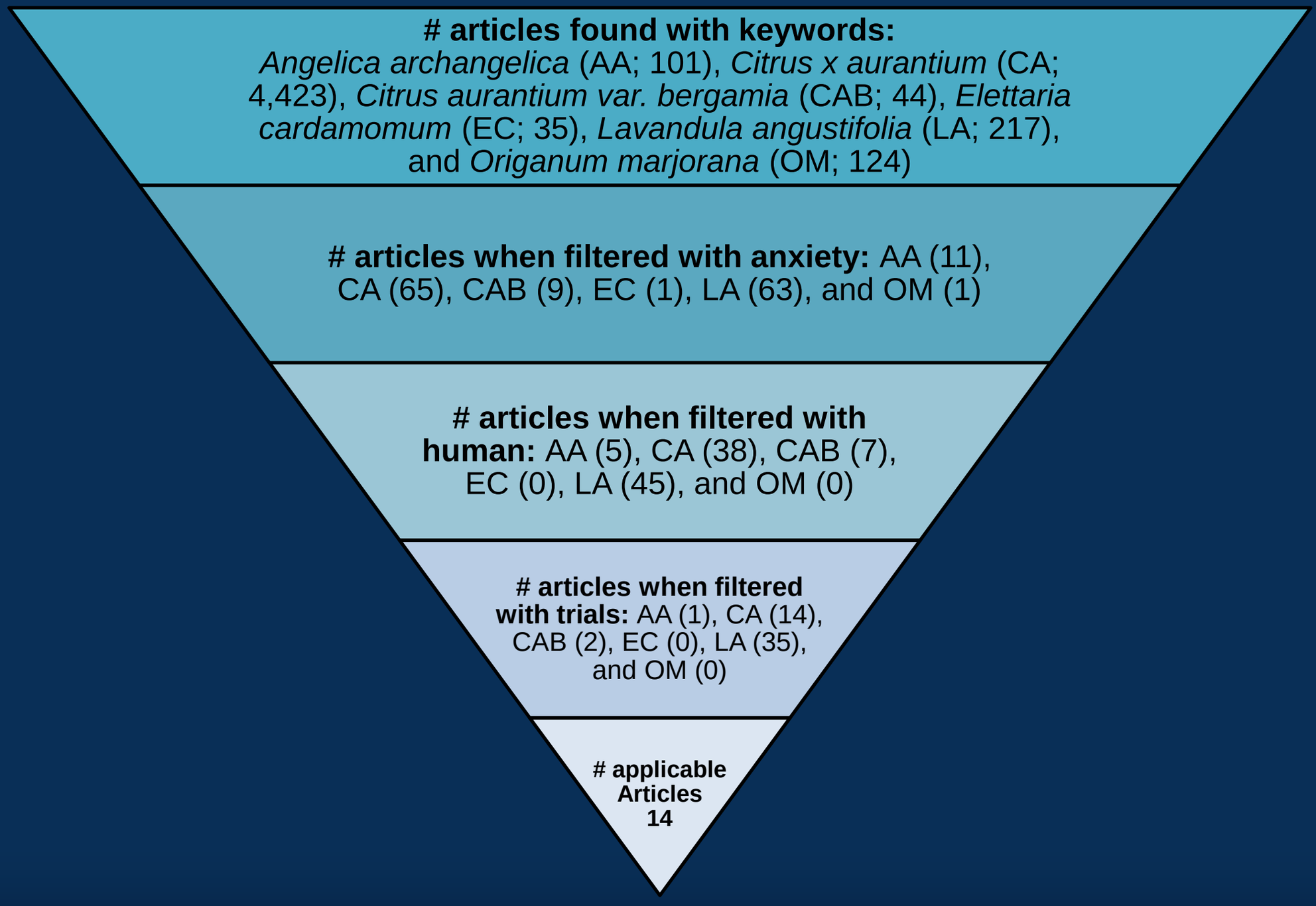
Table 3. Chemical group mechanisms of action are listed only for primary chemical constituents of select essential oils (Shutes, 2013).

Literature Review

Medline via PubMed, ProQuest, and TRIP databases were searched for peer-reviewed journal articles in English, published since 2010 with the following individual keywords: *Angelica archangelica*, *Citrus x aurantium*, *Citrus aurantium var. bergamia, Eletteria cardamomum*, *Lavandula angustifolia*, and *Origanum marjorana*.

A downward filtering approach was used to filter articles further by anxiety, human, and trial.

Filter used to identify appropriate research articles written in English



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Results

- A total of 53 articles were found. Articles pertaining solely to massage-applied aromatherapy were not reviewed because massage can be stress-reducing. Duplicate and non-applicable studies were also removed resulting in 14 articles.
- No studies were found using *Elettaria cardamomum* for anxiety.
- One study was found using *Origanum marjorana* for potential mood enhancement in mice via monoamine (e.g., serotonin) reuptake inhibition.

Literature Review Matrix Table

Year	Author	Genus, species	Population	n	Study Design	Administration Method	Findings
2017	Donaldson, Et al.	*A blend including Eriocephalus punctulatus*, *Citrus aurantium var bergamia, Citrus limon, & Citrus sinensis*	Orthopedic Surgical/ Trauma Nurses	44	Quasi-experimental, nonrandomized design	Inhalation via electric atomizer diffusion	No significant differences between groups on State Trait Anxiety Inventory Form Y (STAI Y-1) scores
2016	Franco, et al	*Lavandula angustifolia*	Patients scheduled for diag. or reconstructive breast surgeries	88	RCT Comparing lavender fleur oil to unscented oil	2 drop of oil inside plastic oxygen mask applied to face for 10 minutes @2lpm	Decrease in Speilberger State Anxiety Inventory for Adults (STAI) scores, p=0.001
2016	Johnson, et al.	Multiple including *Lavandula angustifolia* & *Origanum marjorana*	Adult acute care aromatherapy sessions	10,262	Retrospective observational study of EHRs for 10 hospitals with nurse-delivered aromatherapy	Inhalation, topical or combination	Decreased numerical rating scale scores for nausea, anxiety, and pain with average anxiety change of -2.73 units
2015	Effati-Daryani, et al	*Lavandula angustifolia* implied, but not written	Pregnant Women	137	RCT Comparing lavender cream to lavender cream and foot bath to placebo	2gm cream self-applied to legs 1.5 hours before bed; 2gm cream applied to legs and feet x 10 minutes followed by a foot bath x 20 minutes at 40 - 42 °C	Decrease in DASS-21 scores at 4 and 8 weeks, p=0.002 and p=0.003

Literature Review Matrix Table

Year	Author	Genus, species	Population	n	Study Design	Administration Method	Findings
2015	Kasper, et al.	Silexan (*Lavandula angustifolia*)	Outpatients with restlessness	170	RCT comparing Silexan to placebo	One 80mg Slexan capsule per day	Significance achieved after 4 weeks on Hamilton Anxiety Scale (HAMA), $p<0.04$
2015	Watanabe, et al.	*Citrus aurantium var. bergamia*	Healthy adult females	41	Crossover design with 3 groups	Inhalation with water vapor for 15 minutes at rest	Decreased STAI in Bergamot group, $p=0.003$
2014	Fiebler & Quante	Lasea® containing *Lavandula angustifolia*	Patients with Major Depressive disorder on Lasea®	8	Retrospective analysis of Case Series	Lasea® 80mg orally once or twice daily	6 out of 8 patients the HAMD-17 total score was reduced during treatment with
2014	Namazi, et al	*Citrus aurantium (Neroli)*	Patients in the 1st Stage of Labor	113	RCT Comparing distillate and saline placebo	4ml placed on gauze attached to collar, changed q 30 minutes	Decrease in STAI scores from 3-4 cm dilation through delivery, $p<0.001$
2013	Ni, Et al.	*Citrus aurantium var. bergamia*	Ambulatory Surgery Patients in Taiwan	109	RCT Comparing essential oil and water control	Inhalation via diffuser for 30 minutes	Decrease in STAI scores, $p=0.021$
2012	Conrad & Adams	Blend of *Rose otto* & *Lavandula angustifolia*	High-Risk Postpartum Women	28	RCT comparing inhalation and inhalation + hand m'technique and control	Inhalation via cotton pad with 8 drops of a 2% dilution rose/lavender blend, or hand massage	Decrease in Edinburgh Postnatal Depression Scale (EPDS) and Generalized Anxiety Disorder Scale (GAD-7) scores, $p<0.05$

Literature Review Matrix Table

Year	Author	Genus, species	Population	n	Study Design	Administration Method	Findings
2011	Akhlaghi et al.	Citrus aurantium	Minor surgery patients	60	RCT Comparing oral distillate to saline placebo	Oral distillate at 1ml/kg^{-1} two hours before anesthesia	Decrease in STAI and Amsterdam Preoperative Anxiety and Information Scale (APAIS), $p<0.05$
2011	Chang & Shen	Citrus aurantium var. bergamia	Elementary school teachers in Taiwan	54	Quasi-experimental, non-controlled interventional	2% dilution of Bergamot Diffused for 10 minutes	Decrease in BP, HR, and LF and LF/HF Ratio and Beck Anxiety Inventory (BAI) scores, $p<0.005$; However, increased in HF and HRV
2011	Kimura, et al.	Angelica archangelica	Lewy Body Dementia	20	Prospective, open label study	Feru-guard (cont. Angelica) Orally, BID, x 4 weeks	Decrease in Neuropsychiatric Inventory (NPI) subscales and Mini-Mental State Exam (MMSE) score, $p=0.044$
2010	Ndao, et al.	Citrus aurantium var. bergamia	Children undergoing stem cell infusions & their parents	37	RCT comparing anxiety, pain, and nausea	Bergamot or placebo (scented shampoo) via diffuser	No significant differences between groups with any of the four instruments.

Conclusion (1 of 2)

- The literature review found insufficient evidence-based (EB) knowledge on the use of *Elettaria cardamomum* and *Origanum marjorana in* reducing anxiety, although they are prevalent in aromatherapy literature.

- Minimal EB knowledge was found on the use of *Angelica archangelica* for anxiety reduction.

- Based on the results of this case study, further *Angelica archangelica, Elettaria cardamomum,* and *Origanum marjorana* research is warranted.

Conclusion (1 of 2)

- The literature review found sufficient EB knowledge on the use *Lavandula angustifolia*, *Citrus x aurantium*, and *Citrus aurantium var. bergamia*.
- These three essential oils demonstrated anxiety-reducing efficacy via inhalation, topical application and oral administration.
- Barring any contraindications, nurses can feel confident advising patients in the use of these three essential oils via inhalation and topical application. Consult a certified aromatherapist for internal dosing.
- The use of essential oils to reduce anxiety may allow patients to reduce the need for prescription medications, thereby minimizing side effects and reducing costs.

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