

## Mini Review

# Review of Lavender Aromatherapy: Past, Present, and Future

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Lavender aromatherapy, once only considered a holistic or alternative treatment, has traditionally been used to combat anxiety and improve feelings of wellness. Despite its long history, it has not yet been readily adopted by the medical community. The emergence of new data suggests that lavender oil may in fact have a significant impact on patient well-being, primarily through anxiolysis. These studies suggest that lavender aromatherapy does have utility in a controlled clinical setting and may be used to promote patient wellness and improve patient outcomes in the hospital. Specifically, reducing anxiety in the preoperative period is a focus of this review and we look at current studies as well as indications for future research. Awareness and knowledge of the benefits of aromatherapy should allow effective utilization in clinical care in order to improve patient satisfaction. This paper will serve as a review of the current literature on lavender aromatherapy as well as an overview of important research to come.

**Keywords:** Aromatherapy; Lavender; *Lavandula angustifolia*; Linalool; Anxiety; Preoperative period**Abbreviations**

LO: *Lavandula Angustifolia*oil; MA: *Michelia Alba* Leaf Oil; CAM: Complementary and Alternative Medicine; STAI: The State Trait Anxiety Inventory

**Introduction**

Complementary and Alternative Medicine (CAM) is a practice that incorporates unconventional medical therapies such as aromatherapy, acupuncture, and massage in order to alleviate medical problems. CAM practice is a huge undertaking in the United States, in a 1993 report in the NEJM 1 out of 3 Americans used CAM therapies [1]. It was estimated at that time that \$13.7 billion dollars per year were spent on CAM therapies and that three quarters were paid out of pocket. In 2007 it was determined that 4 out of 10 adults in the U.S. used CAM therapies, which is a significant increase since the prior study [2], and the National Center for Complementary and Integrative Health reported that \$33.9 billion were spent on CAM therapies. It was further determined that when there was concern about the cost of conventional care, individuals were more likely to use CAM therapy [2]. Aromatherapy is commonly defined as therapy through the use of aromatic plant extracts and essential oils through various methods (inhalation, oral, massage, baths). The physiologic effects of aromatherapy have been recognized in folk medicine for many years [3]. In particular, lavender oil has been attributed to have mood enhancing and analgesic properties by aromatherapists [4,5]. As alternative medicine continues to grow, aromatherapy is at the forefront of this growth [6]. Interest in lavender oil in particular has increased, not just in retail but also in the medical community. Lavender oil in vapor form is purported to have multiple beneficial effects in humans including: relief of anxiety, analgesia, sleep improvement, pain relief, and decreased restlessness. Many recent

clinical trials have supported these claims and suggest that lavender aromatherapy can be a useful adjunct to standard care.

**Mechanism of action**

Lavender oil is derived from *Lavandula angustifolia* and generally consists of  $\beta$ -Linalool (35.01-38 %), Linalyl acetate (34-38.28 %), Borneol/Lavandlrol (3.4%),  $\beta$ -cis-Ocimene (2.8%), Caryophyllene (2.6%), Lavandulylacetate (2%),  $\beta$ -trans-Ocimene (1.8%), Eucalyptus (1.7%), Terpinolol-4 (1.7%), Myrcene (1.2%), and 1,8-Cineole. Isolated linalool has been shown in animal models to cause a significant reduction in anxiety levels and is thought to be the primary anxiolytic agent present in *Lavandula angustifolia* [7]. Several sites have been implicated in linalool's mechanism of action including the NMDA receptor, the AMPA receptor, the kainate receptor, and the GABA system [8-10]. It is important to note that the composition of the oil can vary greatly depending on the method of preparation. Therefore, any investigation of the potential therapeutic effects of LO must examine the composition of the product being tested. Also, given this information it is necessary to point out that the term "aromatherapy" may be a misnomer as the effect of lavender may be independent of the olfactory system. One animal study has revealed that anosmia does not seem to impair the anxiolytic effects of lavender oil inhalation [11]. This may also be seen in studies demonstrating that oral LO administration possesses many of the same pharmacological actions as LO administered as vapor [1, 2,6,12,13].

**Existing research**

Although the National Center for Complementary and Integrative Health mentions that there may be no benefit and is little scientific evidence of its effectiveness, there has been a number of recent research studies involving LO aromatherapy with promising results and this is certainly worth exploring.

In healthy volunteers, lavender aromatherapy has been demonstrated to reduce stress levels, BIS values, and perception of pain upon needle injection [14]. Lavender aromatherapy has also been shown to increase parasympathetic activity in patients undergoing minimally invasive facial cosmetic procedures compared to controls [15]. In a 2016 study, the broad indications of aromatherapy were exemplified in the acute care setting. In this study, patient-reported pain, anxiety, and nausea were evaluated before and after aromatherapy usage (lavender, ginger, and sweet marjoram). Significant improvements in patient scores were seen, and lavender appeared most efficient at improving anxiety scores [16]. LO aromatherapy has also demonstrated a significant reduction in pain and anxiety levels for burn patients (<20% body surface area) as compared to controls [17]. As anxiety and pain are often interrelated, we would expect to see decreased levels of pain as well. In a clinical trial at our institution, a single post-operative LO aromatherapy treatment compared to placebo resulted in patients expressing greater satisfaction with their pain control despite there being no difference in pain scores or medications taken. In a further study, LO aromatherapy decreased the need for postoperative analgesics in morbidly obese patients undergoing lap-band surgery [18]. While LO aromatherapy has been studied in multiple situations, we are most concerned with its effect on anxiety and pain levels in the preoperative period and that will be the focus of our current research.

### Lavender aromatherapy and preoperative anxiety

Preoperative anxiety is common and well documented and has been shown to significantly increase patient discomfort. Preoperative anxiety and pain sensitivity have also been shown to increase intra-operative anesthetic requirements [19] which can also lead to longer stays in the post-anesthesia care unit. Treating pre-operative anxiety can therefore improve both patient comfort and potentially operative outcomes. In current clinical practice, benzodiazepine administration is typically used to decrease pre-operative anxiety. However benzodiazepine administration is not without side effects and patients may develop anterograde amnesia, excessive sedation, and rarely respiratory depression. Furthermore, because of these side effects, benzodiazepines are usually not administered until the patient arrives in the operating room where they can be monitored. This leaves the patient anxious in the preoperative holding room and while in transit to the operating room. Lavender aromatherapy on the other hand, is safe, inexpensive, easy to administer, and not overly sedating. To this point, a 2010 double-blinded randomized study comparing lavender oil to lorazepam concluded that the lavender oil preparation is as effective as a 0.5mg/day dose of lorazepam in patients with generalized anxiety disorder but without the sedation or abuse potential of the lorazepam [20]. The State Trait Anxiety Inventory (STAI) is a well-accepted method of assessing anxiety levels and a 2011 study using this test revealed a significant decrease in anxiety levels in patients receiving LO aromatherapy as compared to controls (which received sterile water) in the preoperative period [21]. Perhaps the patient population most prone to anxiety and where anxiety can be the most detrimental to patient health are those undergoing cardiac surgery. The past two years have brought a number of studies involving LO and cardiothoracic surgery. A 2016 study evaluated the inhalation of lavender essence on patients prior to undergoing open-heart surgery. This study demonstrated a significant reduction

in mean anxiety score and cortisol levels in patients inhaling lavender essence versus control subject [22]. However, another study which initiated LO aromatherapy in patients following coronary artery bypass grafting did not find a statistically significant difference in reported anxiety levels or physiologic variables (blood pressure, heart rate, respiratory rate) compared to controls [23]. Despite the number of studies produced in the last few years, there is still a void of useful data pertaining specifically to preoperative use of LO for anxiety. Many of the current studies also have a small sample size and may not adequately account for all common confounders. Therefore, there is a clear need for further research regarding lavender oil aromatherapy and preoperative anxiety.

### Future research

Our study aims to determine the effects of lavender aromatherapy on preoperative anxiety and postoperative pain medicine usage in outpatients undergoing breast surgery. As previously mentioned linalool has been postulated to be *Lavandula angustifolia* oil's most active component so this will also be examined. LO contains approximately 30% linalool and this will be compared to *Michelia Alba* Leaf oil (MA), which contains approximately 80% linalool. Interestingly, studies of *Michelia Alba* extract and anxiety are sparse despite its high concentration of linalool and therefore its potential usefulness as an anxiolytic agent; this will be explored in our study. Common confounders for lavender aromatherapy studies are the independent effects of both aroma and patient interaction on anxiety levels. For instance, a prior study involving lavender aromatherapy and unscented oil aromatherapy suggested that pre-operative interaction with patients may have a placebo effect on patient anxiety levels due to the extra attention given to patients in both groups [24]. Furthermore, it is possible that the pleasant aroma of lavender may be the source of patient comfort. To avoid these potential confounders, unscented almond oil and water will also be used in this study. Study participants will be randomized into four groups: either they will receive 2 drops of lavender oil or 2 drops of *Michelia Alba* leaf oil or 2 drops of unscented almond oil or 2 drops of water on the inside of an oxygen face mask for 15 minutes. Anxiety levels will be assessed both before and after treatment using both the Spielberger STAI and vital signs (heart rate and blood pressure). Changes in STAI scores and pulse rate, pre and post-study treatment will be calculated and compared across all groups. As mentioned earlier, anxiety is a contributor to pain perception, so we will record the amount of pain medications required postoperatively. Our study is designed to tailor lavender aromatherapy to use in the preoperative period and to avoid common pitfalls of prior studies. Through this study, we plan to determine the effectiveness of LO as well as the role of linalool in the attenuation of preoperative anxiety.

### Conclusion

There has been an increased interest in aromatherapy in the medical community over the past few years. This may be evidenced by the revival of clinical trials on the topic which is likely sparked by the immense consumption of lavender oil in the US as well as by physician desire to deliver quality patient care. Knowledge of the current literature is important because lavender oil aromatherapy may provide a safe, quick, and inexpensive method of reducing anxiety levels in the hospital and specifically in the preoperative

period. Despite the increase in recent studies, many of the trials have small sample sizes and hint at possible confounders to the results so it is important to pursue more data. Furthermore, the efficacy of linalool as compared to LO is yet to be fully explored in human subjects. Ultimately, through current knowledge and future research, we would like to use lavender aromatherapy to promote a more pleasant environment for patients undergoing surgery.

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