A FEASIBILITY STUDY OF THE EFFECTS OF LAVANDULA ANGUSTIFOLIA AROMATHERAPY ON THE INCIDENCE AND SEVERITY OF ACUTE PAIN IN PEDIATRIC PATIENTS

By

Katherine Curtin

Submitted to the

Faculty of the College of Arts and Sciences

of American University

in Partial Fulfillment of

the Requirements for the Degree of

Master of Science

In

Psychology

Chair:

Deborah Norris, Ph.D.

Maria Gomez, Ph.D.

Nathaniel Herr, Ph.D

Dean of the College of Arts and Sciences

July 6, 2016

Date

2016

American University

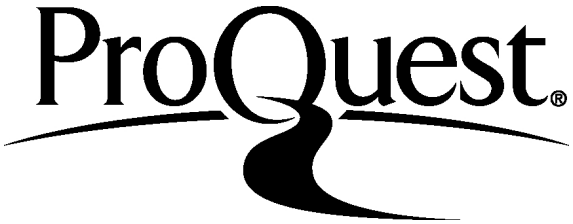
Washington, D.C. 20016

ProQuest Number: 10139884

All rights reserved

INFORMATION TO ALL USERS
The quality of this reproduction is dependent upon the quality of the copy submitted.

In the unlikely event that the author did not send a complete manuscript
and there are missing pages, these will be noted. Also, if material had to be removed,
a note will indicate the deletion.



ProQuest 10139884

Published by ProQuest LLC (2016). Copyright of the Dissertation is held by the Author.

All rights reserved.
This work is protected against unauthorized copying under Title 17, United States Code
Microform Edition © ProQuest LLC.

ProQuest LLC.
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106 - 1346

www.manaraa.com

© COPYRIGHT

by

Katherine Curtin

2016

ALL RIGHTS RESERVED

www.manaraa.com

A FEASIBILITY STUDY OF THE EFFECTS OF AROMATHERAPY

ON THE INCIDENCE AND SEVERITY OF

ACUTE PAIN IN PEDIATRIC PATIENTS

BY

Katherine Curtin

ABSTRACT

The purpose of this research was to estimate the feasibility of an alternative pain management intervention to reduce pain and distress caused by venipunctures in a pediatric population. The feasibility of the use of the aromatherapy essential oil *Lavandula angustifolia* for pain management intervention (Treatment Group) was compared to placebo aromatherapy with jojoba oil (Placebo Control Group) and to the current standard of care, which is no oil during a venipuncture (Standard of Care Control Group). Measures of heart rate, anxiety, and procedural pain were assessed using a double-blind randomized design and were taken over the course of ten minutes. This was done to note the pattern of change that occurs during anticipatory anxiety resulting from the impending procedure, the procedural pain experienced during the venipuncture, and the residual fear common after completion of the venipuncture procedure. 71% of those approached were interested in participating. 100% of participants who were enrolled completed the intervention, including inhaling the full dose of the oil, and 66.7% completed all research procedures within ten minutes or less. Outcome measures of pain and anxiety were not significantly different between the three groups. The Treatment Group rated the procedure as the most painful and had the highest level of pre-procedural anxiety, yet these participants had the lowest measure of heart rate during venipuncture and lowest level of post-procedural anxiety. Given that this group had lower measures than the Placebo Control Group and Standard of Care

www.manaraa.com

Control Group, there is mild evidence supporting that *L. angustifolia* may decrease psychological and physiological indices of procedural pain. Future research with a larger sample size is needed to further investigate the efficacy of *L. angustifolia* during pediatric venipuncture.

www.manaraa.com

ACKNOWLEDGMENTS

I would like to thank my academic advisor, Dr. Deborah Norris, for her support and guidance throughout this project. I would also like to thank my committee members Dr. Maria Gomez and Dr. Nathaniel Herr for their assistance, as well as Mark Kohoot from Aeroscena for his generous donation of aromatherapy materials. Lastly, I would like to thank my research team at Children's National Medical Center: my mentor Dr. Pamela Hinds and my Co-Investigators Marian McEvilly, Dr. Nora Stinley, and Dr. Yunfei Wang. Without their support this project would not have been possible.

www.manaraa.com

TABLE OF CONTENTS

www.manaraa.com

LIST OF TABLES

www.manaraa.com

CHAPTER 1

A FEASIBILITY STUDY OF THE EFFECTS OF AROMATHERAPY ON THE INCIDENCE AND SEVERITY OF ACUTE PAIN IN PEDIATRIC PATIENTS

Pain Management and Venipuncture in a Pediatric Population

Pain management is a critical aspect of patient care because it directly influences subjective patient experience (McGrath & McAlpine, 1993; Kozlowski et al, 2014). When approaching pain management, the combination of biological, psychological, and social aspects must be considered because these three facets constitute what is known as the pain phenomenon (Kozlowski et al, 2014). According to the pain phenomenon, factors such as the hospital environment, interactions with medical staff, prior associations with medical procedures, and procedural pain mediate reported pain levels (McGrath & McAlpine, 1993). Thus, the consequences of pain are exhibited not only physiologically, but psychologically as well (Cohen, 2008; Manuck, Cohen, Rabin, Muldoon, & Bachen, 1991; Rutter, 1981).

Due to the substantial impact of pain on patient health, pain management was declared a nationwide standard of care concern by the Joint Commission on Accreditation for Healthcare Organizations (JCAHO, 1999; Kozlowski, et al., 2014). At Children's National Medical Center, managing procedural pain is a fundamental aspect of patient care. A 2011 quality assurance survey conducted by the hospital found patient satisfaction scores to be low regarding procedural pain management (Press-Ganey, 2011). Requests within the Satisfaction Surveys explicitly called for improved techniques to aid patients undergoing medical procedures such as

www.manaraa.com

venipunctures (Press-Ganey, 2011).

Venipuncture is the process of inserting a needle into a vein for administering intravenous drugs and obtaining blood samples. It is one of the most frequent medical procedures conducted on pediatric patients, yet it has one of the highest pain score ratings (Eichenfield, Funk, Fallon-Friedlander, & Cunningham, 2002; Press-Ganey, 2011). In a study of 171 children and adolescents ages 3 to 17 years receiving venipunctures, procedural pain and anxiety were observed during blood draw (Fradet, McGrath, Kay, Adams, & Luke, 1990). Such pain was cited as the most aversive aspect of illness (Fradet, McGrath, Kay, Adams, & Luke, 1990). In another study, 223 children and adolescents were observed during venipuncture procedure. 51% of 7 to 12 year olds exhibited symptoms of distress (Humphrey et al., 1992). In a review of literature, it was noted that venipunctures were reported to be the most feared part of the hospital experience (Duff, 2003). Studies found that parents and pediatric patients alike reported venipunctures to be a physically and emotionally stressful experience (Duff, 2003; Eichenfield, Funk, Fallon-Friedlander, & Cunningham, 2002; Humphrey et al., 1992). Since it has been demonstrated that venipuncture procedures cause significant physiological and psychological stress, there is a need to investigate interventions that reduce the acute pain and anxiety that occurs during venipuncture procedures.

Standard of care procedures like topical anesthetics are used to address the physiological pain associated with venipuncture, yet they do not prevent the psychological distress that occurs before, during, and after the procedure (Duff, 2003). This is problematic because if left untreated, psychological distress can cause future medical procedures to be perceived as more aversive (Humphrey et al. 1992; Uman, Chambers, McGrath, Kisely, 2008). With pediatric patients, this can lead a failure to comply with medical staff and subsequent restraint or sedation (Duff, 2003;

www.manaraa.com

Humphrey et al., 1992; Manne et al., 1990; Goodenough et al., 1999).

Complementary and Alternative Interventions Address Physiological and Psychological Aspects of Pain

Complementary and alternative interventions such as distraction, hypnosis, and meditation have demonstrated a significant reduction in pediatric anxiety associated with venipucture (Tufekci, Celebioglu, & Kucukoglu, 2009; Stinley, 2014; Uman, Chambers, McGrath, Kisely, 2006). In a study assessing the pain and anxiety of 1,990 pediatric patients, complementary and alternative interventions produced a 21% reduction in reported pain, suggesting the promise of these interventions in reducing venipuncture affiliated pain and anxiety and the need for future research in this area (Uman, Chambers, McGrath, Kisely, 2008).

Aromatherapy is an alternative intervention that systematically uses essential oils derived from whole plants or plant parts for therapeutic benefit to treat specific ailments and improve quality of life (Abuhamdah & Chazot, 2008). Essential oils are extracted from plants via distillation and contain a high concentration of fragrance (Abuhamdah & Chazot, 2008). They can be administered in various ways; typical diffusers, personal essential oil diffuser sachets, and massage are three methods of aromatherapy administration (Abuhamdah & Chazot, 2008). These processes enact their effect via the transdermal (massage) or inhalation (typical diffuser, diffuser sachet) routes of administration (Meyer & Quenzer, 2004). Inhalation is particularly fast acting and is ideal for use during venipuncture because the aromatherapy can exert its effects within the short time frame clinicians spent with each patient (Meyer & Quenzer, 2004).

Research supports using aromatherapy for pediatric pain management to address both physiological and psychological aspects of distress. Psychologically, essential oils exert effects on the olfactory system, which can cause a change in mood due to the perception of the scent as

www.manaraa.com

(non)pleasant (Cavanagh & Wilkinson, 2002; Hongratanaworakit, 2009). Physiologically, essential oils affect HPA-Axis and autonomic nervous system functioning (Hongratanaworakit, 2009; Hongratanaworakit, 2010; Cavanagh & Wilkinson, 2002; Alaoui-Ismaili, Vernet-Maury, Dittmar, Delhomme, & Chanel, 1997; Shiina, Palermo, Powers, Grewe, & Smith, 2008). *Lavandula angustifolia* (common lavender) aromatherapy has been shown to reduce heart rate and blood pressure significantly, suggesting the activation of the parasympathetic nervous system: in a study of 67 adult women with insomnia, the group who received *L. angustifolia* aromatherapy (34 women) had a significantly lower mean heart rate after 12 weeks (Chien, Cheng, & Lui, 2011); the inhalation of *L. angustifolia* aromatherapy caused a significant drop in diastolic blood pressure of 26 undergraduate students from Tsuru Municipal University during rhythmic handgrip, an exercise that normally increases blood pressure (Nagai, Wada, Usui, Tanaka, & Hasebe, 2000). *L. angustifolia* aromatherapy has also been shown to decrease levels of serum cortisol, suggesting effects on of the HPA Axis: in a randomized controlled study using 30 healthy adult male participants, *L. angustifolia* aromatherapy significantly decreased levels of serum cortisol (Shiina, Palermo, Powers, Grewe, & Smith, 2008). Additionally, *L. angustifolia* aromatherapy reduced levels of self-reported stress and anxiety in multiple populations, including 28 patients in an intensive care unit as compared to those who received conventional nursing care only (Cho, Min, Hur, & Lee, 2013); 93 patients in an intensive care unit as compared to those who received massage or a period of rest (Dunn, Sleep, & Collett, 1995); and 40 healthy adults in a lab setting (Diego, Jones, Field, Hernandez-Reif, Schanberg, et al., 1998).

The use of *L. angustifolia* aromatherapy has been studied in pediatric populations, as well. Endpoints have included effects on measures such as quality of sleep (Williams, 2006), eczema improvement (Anderson, Lis-Balchin, & Kirk-Smith, 2000), and infantile colic (Cetinkaya &

www.manaraa.com

Basbakkal, 2012).

It is important to note that aromatherapy is noninvasive and of low risk. Across studies of *L. angustifolia*, no side effects have been reported. It has been used safely with clinical populations, including 42 college women for a duration of four weeks in a single blind randomized clinical trial (Lee & Lee, 2006); 17 cancer hospice patients experiencing pain and anxiety in a single blind randomized repeated measure (Louis & Kowalski, 2002); and 217 women experiencing pain after childbirth in a double blind randomized clinical trial (Dale & Cornwell, 1994). In a double-blind, six-week randomized controlled clinical trial of 77 participants, *L. angustifolia* in a capsule form was demonstrated to be comparable to the benzodiazepine Lorazepam without the adverse side effects of drowsiness and the potential for addiction (Woelk and Schlafke , 2010). The very rare possibility of an allergic reaction has been reported when using certain oils, such as ones with a nut base (Lua & Zakaria, 2012). To prevent this from occurring, subjects with an allergy to peanuts or any essential oil should be excluded from participation.

Limitations of Previous Research

Although previous research has demonstrated a potential use for complementary and alternative methods of pain management, methodological limitations call for additional work in this area. Studies investigating pain-reducing interventions largely did not adhere to randomized, controlled methodology (Chen, Joseph, & Zeltzer, 2000; Seers & Carroll, 1997; Tsao & Zeltzer, 2005; Walco, Sterling, Conte, & Engel, 1999) and did not investigate the efficacy of such interventions (Ushida et al., 2008; Chen, Joseph, & Zeltzer, 2000; McDonnell & Bowden, 1989; Pederson & Harbaugh, 1995; Rusy & Weisman, 2000; Seers & Carroll, 1998; Tsao & Zeltzer, 2005; Walco, Sterling, Conte, & Engel, 1999).

www.manaraa.com

Studies specifically investigating the use of aromatherapy as a treatment method likewise lack methodological strength (Lua & Zakaria, 2012). Reviews of the use of aromatherapy in a clinical setting critique factors such as few patient numbers, no use of a placebo oil, no baseline measures, heterogeneity of eligible participants, and lack of control groups (Buckle, 2007; Lua & Zakaria, 2012; Press-Sandler, Freud, Volkow, Peleg, & Press, 2016).

No previous studies reported investigating the ability of *L. angustifolia* aromatherapy to reduce the incidence and severity of acute pediatric pain during venipuncture procedures. Since venipunctures are one of the most frequent yet aversive medical procedures and *L. angustifolia* addresses both physical pain and psychological anxiety, this alternative technique should be investigated to assess its ability to reduce procedural pain and anxiety during venipuncture (Eichenfield, Funk. Fallon-Friedlander, & Cunningham, 2002; Press-Ganey, 2011; Chien, Cheng, & Lui, 2011; Nagai, Wada, Usui, Tanaka, & Hasebe, 2000; Shiina, Palmero, Powers, Grewe, & Smith, 2008; Cho, Min, Hur, & Lee, 2013, Dunn, Sleep, & Collett, 1995; Diego et al., 1998).

Purpose of this Research

This study investigated feasibility of the essential oil alternative pain management intervention *L. angustifolia* in the context of a double-blind randomized three group design. The intention was to gain information that may improve patients' immediate and future experiences during venipuncture procedures. The future goal of this research was to provide the basis of a study to evaluate efficacy of this pain management intervention.

www.manaraa.com

CHAPTER 2

METHODS AND MATERIALS

Design

The study included three groups: a Treatment Group, a Placebo Control Group, and a Standard of Care Control Group. The Standard of Care Control *Group* received parental comfort but no oil administration. The Treatment Group received *L. angustifolia* aromatherapy and parental comfort. The Placebo Control Group received jojoba aromatherapy and parental comfort.

Beneficial changes in pain or anxiety levels may not be due to *L. angustifolia* itself, but rather to distraction, inhalation, or expectancies. To determine if these placebo effects occurred, the groups receiving oil (Treatment Group and Placebo Control Group) were compared to the group not receiving oil (Standard of Care Control Group). The two oils, jojoba and *L. angustifolia*, may have had different effects on pain and anxiety. To determine if there was a difference in pain and anxiety due to the chemical composition of the oil, the Treatment Group was compared to the Placebo Control Group.

Materials

The Principal Investigator (PI) planned that participants in all three groups would be provided the option of having parental comfort, a topical anesthetic, and/or coolant spray during the venipuncture, as this is the standard of care protocol at Children's National. However, topical anesthetic and coolant spray were never offered by Children's National Laboratory Staff, so participants in this study only received parental comfort as a standard of care treatment.

The *L. angustifolia* used was a pure lavender essential oil, cultivated in Bulgaria and obtained from Aeroscena. The main components of L. angustifolia have been determined by gas chromatography and mass spectrometry. They include linalool (37-54%), linalyl acetate (21-

www.manaraa.com

36%), and (E)-beta-caryophyllene (1-3%) (Carrasco, Martinez-Gutierrez, Tomas, & Tudela, 2016). The jojoba oil used was a pure jojoba essential oil obtained from Aeroscena. The main components of jojoba have been determined by gas chromatography and mass spectrometry. They include erucyl jojobenoate (31-45%) and wax esters (41-57%). (Miwa, 1984).

Personal essential oil diffuser sachets are designed so that the scent is only apparent to the individual using the sachet. Sachets release a small amount of scent only when squeezed and only in their direct vicinity. This prevents contamination between groups and allows for double blind administration. Additionally, one can administer a standardized dose with a personal essential oil diffuser sachet by counting the number of times the sachet is squeezed. Thus it is possible to measure if the dosage administered was completely inhaled. Given that the dose could be standardized and the scent would not dissipate around the entire room, personal essential oil diffuser sachets were used as the method of administration in this study.

Jojoba and *L. angustifolia* personal essential oil diffusers sachets were labeled with different colors, chosen at random by the manufacturer Aeroscena. All sachets were sealed and made of plastic, so the scent could not be detected unless the sachet was opened and placed directly under one's nose- in this case the nose of the participant. After completing the intervention with all participants, Aeroscena revealed the color coding of the sachets. Sachets labeled with green stickers were *L. angustifolia* and sachets labeled with blue stickers were jojoba oil.

Setting

Children's National Medical Center, located in Washington D.C., is a freestanding children's hospital that serves 360,000 patients each year. The Laboratory Medicine Unit is an outpatient clinic that sees approximately 80 patients per day, from infants up to 18 years of age.

www.manaraa.com

Of these 80 patients, approximately 90% get venipunctures (Stinley, 2014). Clinical Laboratory Support Services granted permission to conduct the study in the Laboratory Medicine Unit, where participants were recruited.

Outcome Measures in the Current Study

Levels of pain are generally assessed by two outcome measures: physiological and psychological indicators (Uman, Chambers, McGrath, Kisely, 2008; Duff, 2003; Uman, Chambers, McGrath, & Kisely, 2006). To understand the effects of *L. angustifolia* on the complete pain experience, both physiological and psychological indicators of pain were measured in this study.

Physiological Outcome Measures Addressing Pain Levels of the Participants

Physiological measures of pain are recorded by measuring signs of hyperarousal during a procedure (Chen, Joseph, Zeltzer, 2000; McDonnell & Bowden, 1989; Pederson & Harbaugh, 1995; Rusy & Weisman, 2000). By measuring heart rate, information regarding the pain level of the patient can be collected (Moltner, Holzl, & Strian, 1990; Sweet & McGrath, 1998; Louis & Kowalski, 2002).

Heart rate is a physiological measure that generally increases with pain and anxiety (Sweet & McGrath, 1998; Moltner, Holzl, & Strian, 1990; Louis & Kowalski, 2002). *L. angustifolia* has been shown to lower autonomic arousal associated with procedural pain, while placebo oils like jojoba have no effect (Louis & Kowalski, 2002; Atsumi & Tonosaki, 2007; Toda & Morimoto, 2011; Chien, Cheng, & Kui, 2011; Nagai, Wada, Usui, Tanaka, & Hasebe, 2000; Shiina, Palermo, Powers, Grewe, & Smith, 2008). Therefore, it was expected that a trend for a reduced heart rate would occur in the Treatment Group in comparison to the Placebo Control Group and Standard of Care Control Group.

www.manaraa.com

Psychological Outcome Measures Addressing Distress Levels of the Participants

Psychological stress resulting from a medical procedure can be measured through the use of subjective scales of acute pain and anxiety. One such measure is the Hospital Fears Rating Scale (HFRS), which is a visual analogue scale that assesses patient anxiety in response to a medical event. The HFRS has been found to have high reliability and validity, especially related to its ability to report changes over a period of time (Bringuier et al., 2009).

Collecting data on participant anxiety level both before and after the venipuncture procedure allows for the detection of changes in anxiety over the course of the experiment. Given studies citing a reduction in subjective anxiety after the inhalation of *L. angustifolia* (Louis & Kowalski, 2002; Cho, Min, Hur, & Lee, 2013; Dunn, Sleep, & Collett, 1995; Diego, Jones, Field, Hernandez-Reif, Schanberg, et al., 1998), it was expected there would be a trend for decreased anxiety in the Treatment Group as compared to the other two groups.

The Visual Analogue Scale for pain (VAS) is a subjective scale of acute pain that assesses levels of patient psychological stress. It was found to be reliable and valid when used with 96 adults experiencing acute pain (Bijur, Silver, & Gallagher, 2001) and when used with 33 adults experiencing chronic pain (Price, Bush, Long, & Harkins, 1994). Validity was higher for the VAS than it was for verbal rating scales and both validity and reliability were higher for the VAS than it was for numerical rating scales (Price, Bush, Long, & Harkins, 1994). Visual analogue scales like the VAS for pain have been successfully and accurately completed by children age 5 and older, as demonstrated using a sample of 106 children ages 5 to 14 (Shields et al., 2003).

Measuring participant pain level using the VAS after the venipuncture procedure demonstrates the subjective level of acute pain experienced by the patients. Given studies citing

www.manaraa.com

a decrease in pain levels after the inhalation of *L. angustifolia* (Louis & Kowalski, 2002; Dale & Cornwell, 1994; Yip & Tse, 2006; Hadi & Hanid, 2011), it was expected there would be a trend for lower self-reported pain levels in the Treatment Group as compared to the control groups.

Procedure

After enrollment, the PI assigned the participant to one of the three conditions of the study using a list that was previously randomized by the study statistician. The participant was taken to a private blood draw room where they were connected to the heart rate monitor using a finger cuff (minute one). Then the participant was asked to answer a question about his/her level of anxiety. This question was a single item from the HFRS.

Two minutes after completing the HFRS, the assigned intervention was administered (minute three). If assigned to the blue or green oil group, the participant received three squeezes from the personal essential oil diffuser sachet, administered by an aromatherapist. Heart rate was recorded immediately after oil exposure. If in the Standard of Care Control Group, heart rate was recorded but no oil was administered. The aromatherapist administered a second round of aromatherapy to participants in the blue or green oil groups during the venipuncture procedure (minute five) and administered a third round of aromatherapy two minutes post-venipuncture (minute seven). Heart rate was recorded at minute five and minute seven for all three groups. (Note, the Laboratory Medicine team completed the venipuncture procedure, not the research team.) Five minutes after the venipuncture began (minute ten), the study staff removed the heart rate monitor. They then immediately administered the VAS for pain and the post-procedural HFRS. At this time the study session was complete.

www.manaraa.com

End Points

Feasibility was estimated by 1) ability of participants to inhale the complete dose of aromatherapy using personal essential oil diffuser sachets and 2) ability to complete the research process within ten minutes. In order to meet feasibility, 60% of participants would need to meet these criteria. Percentage of guardian interest in participating was also noted, as well as differences in the use of parental comfort between the three groups, to see if any patterns occurred. Efficacy of *L. angustifolia* to reduce pain and anxiety was measured as an exploratory hypothesis by determining differences in outcome measures between the three groups. The physiological indicator that served as the primary outcome measurement of efficacy was heart rate. The psychological indicators that served as secondary outcome measurements of efficacy included the VAS for pain and the HFRS.

Participants

The inclusion criteria are described in Table 1 below.

Table 1. Inclusion Criteria

Inclusion Criteria
1) Was scheduled for a venipuncture in the Laboratory Medicine Unit
2) Was between 7 and 11 years old
3) Was English reading & speaking
4) Had written consent from guardian
5) Had given verbal assent

Note: Inclusion criteria for study participants.

This age range was chosen because there is a strong relationship between age and distress resulting from venipunctures (Humphrey et al., 1992; Manne et al., 1990; Goodenough et al.,

www.manaraa.com

1999). Children younger than age seven exhibit behavioral symptoms of distress, such as resisting venipuncture, but children ages seven and up show self-reported distress (Humphrey et al., 1992). Based on verbal and reading comprehension abilities, seven to eleven year old children should be able to verbalize any distress during the procedure and tell the research team, as well as complete the HFRS and VAS (Humphrey et al., 1992; Shields, Palermo, Powers, Grewe & Smith, 2003). All ethnicities and genders who met the previously mentioned criteria were included in this study, as long as participants were English speaking and reading because the HFRS and VAS for pain were only validated in English and the research staff only spoke English.

The exclusion criteria for the participants are listed in Table 2 below.

Table 2. Exclusion Criteria

Exclusion Criteria
1) Had a serious developmental delay and could not complete visual analogue scales
2) Was allergic to essential oils
3) Was allergic to peanuts (nut-based oils are processed in the manufacturer's factory)
4) Had a history of asthma triggered by a foreign scent
5) Was hypersensitive to smell due to a neurological condition
6) Was on pain or anxiety medication
7) Experienced more than five venipunctures a year

Note: Exclusion criteria for the study participants.

In total 45 participants were approached for this study (25 female, M age 9.16 years). Of those participants who were Middle Eastern/Arab American, 0% were interested in participating (2 approached). 40% of Latino/Hispanic Americans were interested (10 approached), but only 10%

www.manaraa.com

participated. This was largely due to language barriers during the consent process. Conversely, 79.1% of Black/African American individuals (24 approached) and 100% of Caucasians (8 approached) were interested in participating.

Overall, 71% of those approached who had children ages seven to eleven were interested in participating. Eight were excluded: two had a peanut allergy; two had a documented developmental delay; and four regularly experienced venipuncture. Additionally, three children were eligible but their guardians decided not to give consent. In total there were 21 participants in the study (13 female, M age 9.04 years). 66.7% were Black/African American, 28.6% were Caucasian, and 4.8% were Latino/Hispanic American. The breakdown of age, ethnicity, and gender by study group is reported below (Table 3, Table 4, & Table 5).

Table 3. Participant Age by Study Group

Age	**Seven**	**Eight**	**Nine**	**Ten**	**Eleven**	**Total**
Placebo	0	1	3	2	1	7
Treatment	2	2	2	1	0	7
SOC	0	1	4	0	2	7
Total	2	4	9	3	3	21

Note: This table shows the breakdown of participant age by study group.

Table 4. Participant Ethnicity by Study Group

Ethnicity	**Caucasian**	**Black/African American**	**Latino/Hispanic**	**Total**
Placebo	0	7	0	7
Treatment	4	3	0	7
SOC	2	4	1	7
Total	6	14	1	21

www.manaraa.com

Note: This table shows the breakdown of participant ethnicity by study group.

Table 5. Participant Gender by Study Group

Gender	**Male**	**Female**	**Total**
Placebo	6	1	7
Treatment	1	6	7
SOC	1	6	7
Total	8	13	21

Note: This table shows the breakdown of participant gender by study group.

Records of exclusion criteria showed that of the interested participants none had a medical condition in which they were hypersensitive to smell, none had asthma triggered by smelling a foreign scent like aromatherapy, and none were allergic to essential oils. It is important to note these responses, as they provide evidence that the use of aromatherapy in this population is safe due to lack of risk factors that could trigger an adverse event. It should be noted that allergic reaction to essential oils is rare (Lua & Zakaria, 2012), but asthma attacks and adverse events in individuals with a hypersensitivity to smell have not been documented.

Analysis Plans

General statistical consideration was taken into account. All analyses were based on the Intention To Treat approach using the data according to the group that the patient was randomized to, regardless of the actual patient assignment in the three groups. All analyses were conducted with two-tailed $\alpha = 0.05$ for significance. Continuous data was summarized using the number of observations available: mean or standard deviation. Categorical data was summarized using percentages or counts. Missing data was not categorized in these summaries.

To assess feasibility, the sociodemographic characteristics of individuals who were asked

www.manaraa.com

to participate were described and compared to determine if there were patterns of interest and refusal. Descriptive statistics and ANOVAS were used to compare inhalation completion rates, use of parental comfort, and the duration of the research process between each of the groups.

To evaluate efficacy, the incidence and severity of acute pain within each group, between the three different groups, and across time was compared. ANOVA tests, repeated measures, percentage change, and descriptive statistics were used. For heart rate, time periods of two minutes before, exactly during, and two minutes after the venipuncture procedure were used, controlling for pre-treatment levels of these parameters. These time periods were T1: pre-venipuncture, T2: venipuncture, and T3: post-venipuncture. For the HFRS, participant scores from five minutes before and five minutes after the venipuncture were compared, controlling for pre-treatment levels. These time periods were T1 and T3, respectively. Reported pain scores five minutes after the start of the venipuncture were compared between groups. This time period was T3. Across time patterns of the trajectory of symptoms from T1 to T3 were assessed.

The variable distress was any verbal or physical sign of pain behavior shown by the participant during venipuncture. The PI recorded this measure for each participant and made note of children who cried, yelled, physically resisted the phlebotomist, and needed to be restrained. Distress was included as a covariate in the repeated measure analyses of both HFRS scores and heart rate. It was also a covariate in the between groups ANOVA of the VAS, in order to control for differences in individual levels of anxiety.

Given the sample size, missing data was reduced as much as possible. HFRS and VAS were reported for all participants (N = 21). Demographic data and eligibility criteria were reported for all participants, as well as procedural observations such as time to completion and ability to inhale the full dose of oil (N = 21). Heart rate was not recorded for the following

www.manaraa.com

participants: one participant in the Placebo Control Group at all time points; one participant in the Standard of Care Control Group at T2 and T3; two participants in the Standard of Care Control Group at T1. This was due to the heart rate monitor, a Masimo Radical 7 Single Extraction Pulse CO-Oximeter malfunctioning- the machine would not turn on. Afterwards, the research staff used the NONIN Onyx finger cuff heart rate monitor to avoid future problems.

www.manaraa.com

CHAPTER 3

RESULTS

There was no significant group difference between the frequency of venipunctures experienced at Children's National, $F(2, 20) = 0.318$, $p = 0.732$ (M Placebo = 1.71, M Treatment = 1.71, M SOC = 1.29) and elsewhere, $F(2, 20) = 0.619$, $p = 0.550$ (M Placebo = 0.43, M Treatment = 0.86, M SOC = 0.29). The amount of times participants experienced venipuncture at Children's National was fairly even between participants (Table 6), with 71.4% of participants never undergoing venipuncture elsewhere (Table 7).

Table 6. Frequency of Venipuncture at Children's National

Group	**Frequency of Venipuncture Experienced in Lifetime at CNMC**				
	0 times	**1-2 times**	**3-5 times**	**6+ times**	**Total**
Placebo	0	4	1	2	7
Treatment	1	2	2	2	7
SOC	3	1	1	2	7
Total Percentage	19.0	33.3	19.0	28.7	100
Total	4	7	4	6	21

Note: Frequency of venipuncture experienced at Children's National by the study participants

Table 7. Frequency of Venipuncture at places other than Children's National

Group	**Frequency of Venipuncture Experienced in Lifetime at CNMC**				
	0 times	**1-2 times**	**3-5 times**	**6+ times**	**Total**
Placebo	6	0	0	1	7
Treatment	4	1	1	1	7

www.manaraa.com

SOC	5	2	0	0	7
Total Percentage	71.4	14.3	4.8	9.5	100
Total	15	3	1	2	21

Note: Frequency of venipuncture experienced at places other than Children's National by the study participants. As the table shows, most participants received previous venipunctures exclusively at Children's National.

Parental comfort was given to 57.1% of participants, with the Standard of Care Control Group receiving the highest percentage of parental comfort (71.4%). Parental comfort was approximately even in both the Treatment and Placebo Control Groups (Table 8).

Table 8. Use of Parental Comfort

Study Group	**No**	**Yes**	**Total**
Placebo Control	4	3	7
Treatment	3	4	7
Standard of Care	2	5	7
Total	9	12	21

Note: Breakdown of participants who did and did not receive parental comfort by study group.

Findings showed that 66.7% of participants completed the research procedure within ten minutes or less (Table 9). There was not a significant difference between groups in the amount of time needed to complete the research procedure, $F(2, 20) = 0.700$, $p = 0.510$. The breakdown of completion by study group shows that 85.7% of Placebo Control Group completed the procedure in ten minutes or less while only 71.4% of the Standard of Care Control and 42.9% of Treatment Group was able to do so.

Table 9. Time to Completion

Time of Procedure	**Frequency**	**Percent**	**Cumulative Percent**
<10 minutes	3	14.3	14.3
10 minutes	11	52.4	66.7
>10 minutes	7	33.3	100.0
Total	21	100.0	100.0

www.manaraa.com

Note: Length of time it took participants to complete the intervention. The following is the breakdown of time to completion by study group: 6 of 7 participants in the Placebo Control Group (85.7%); 3 of 7 participants in the Treatment Group (42.9%); and 5 of 7 participants in the Standard of Care Control Group (71.4%) completed the intervention in 10 minutes or less.

Procedural observations recorded by the PI indicate that deviation from the timeline was, in some instances, due to Laboratory Medicine staff and not research procedures. The study team had no dedicated Laboratory Medicine Unit phlebotomist, and so the study team needed to rely on availability of the laboratory staff to perform the venipuncture at the correct time. Since there was not a specific reason cited for each instance when the procedure was longer than ten minutes, it is unknown if every deviation from the timeline was due to laboratory staff.

Findings showed that 100% of the participants inhaled the full dose of oil (both treatment and placebo). There were no instances of a negative reaction to the oil. In fact, many participants commented on the pleasant smell of the oil. This occurred for both treatment and placebo oils, despite the fact that jojoba is considered odorless (Toda & Morimoto, 2011).

There were significant group differences in baseline measures of anxiety. The HFRS, initially taken before the venipuncture and oil administration (T1), was significantly different between groups using an ANOVA, $F(2, 20) = 4.469$, $p = 0.027$. Post hoc analyses using a K matrix showed that HFRS 1 scores were significantly higher in the Treatment Group (2.857, +/- 0.900, $p = 0.014$) and Standard of Care Control Group (2.714, +/- 1.113, $p = 0.026$) compared to the Placebo Control Group (1.571, +/- 0.535). Given this difference, HFRS 1 scores were controlled for in the ANOVA analysis of HFRS 2 scores, taken after the venipuncture (T3). In this test, there was not a significant difference between groups, $F(2, 20) = 0.649$, $p = 0.535$. In the Treatment Group and Standard of Care Control Group, anxiety decreased from T1 to T3. In the Placebo Control Group, anxiety increased from T1 to T3. Group means for HFRS 1 and HFRS 2 scores as well as percentage changes are reported below (Table 10).

www.manaraa.com

Table 10. Group Means for HFRS

Study Group	HFRS1 Mean	Std. Error	HFRS2 Mean	Std. Error	Percentage Change
Placebo Control	1.571	0.333	1.872	0.404	+19.16
Treatment	2.857	0.333	1.226	0.370	-57.09
Standard of Care	2.714	0.333	1.616	0.361	-40.46

Note: This table show the mean scores of the HFRS at T1 and T3. HFRS 2 scores were estimated controlling for HFRS 1 scores: covariates appearing in the model for HFRS 2 are evaluated with a HRFS 1 score of 2.38.

Participant levels of observed distress showed the following: 0 of 7 children were distressed in the Placebo Control Group, with 3 of 7 (42.8%) in the Treatment Group and 4 of 7 (57.1%) in the Standard of Care Control Group showing signs of distress. Performing a Repeated Measure within subjects analysis with HFRS 1 and HFRS 2 as time points showed the following: a significant difference in within subjects HFRS scores, $F(1, 17) = 9.492$, $p = 0.007$; no significant within subjects interaction between HFRS scores and distress, $F(1, 17) = 0.026$, $p = 0.874$; no significant within subjects interaction between HFRS score and study group, $F(2, 17) = 1.715$, $p = 0.210$.

There was no significant between groups differences of heart rate at T1 as shown by an ANOVA, $F(2, 17) = 2.359$, $p = 0.129$. Group means for baseline heart rate were similar to group means for baseline HFRS, with the Placebo Control Group having the lowest mean (Table 11).

An ANOVA was used to assess heart rate at T2 controlling for heart rate at T1 and found no significant between groups difference, $F(2, 17) = 0.281$, $p = 0.759$. In all groups, heart rate increased from T1 to T2. Estimated marginal group means are shown below, as well as percentage changes (Table 11).

ANOVA analysis showed there was not a significant difference between groups in heart rate at T3, controlling for heart rate at T1 and T2, $F(2, 17) = 0.689$, $p = 0.520$. In all groups, heart rate decreased from T2 to T3. Estimated marginal group means are reported below, as well as

www.manaraa.com

percentage changes (Table 11).

Table 11. Group Means for Heart Rate

Study Group	Time Point	N	Mean	Std. Deviation	Percentage Change
Placebo	T1	6	85.833	4.347	-
Treatment	T1	7	94.143	4.025	-
Standard of Care	T1	5	99.600	4.762	-
Placebo	T2	6	105.771	4.995	+23.23
Treatment	T2	7	101.541	4.279	+7.86
Standard of Care	T2	6	105.518	5.370	+5.94
Placebo	T3	6	89.210	6.248	-15.66
Treatment	T3	7	95.098	5.395	-6.35
Standard of Care	T3	6	100.611	6.707	-4.65

Note: Group heart rate at all time points, T1, T2, and T3. Covariates appearing in the model for T2 heart rate are as follows: heart rate at T1 = 92.89. Covariates appearing in the model for T3 heart rate are as follows: heart rate at T1 = 92.89 and T2 = 104.06. Note that in all groups, heart rate is highest at T2 during venipuncture.

To further assess group differences in heart rate, a Repeated Measures within subject analyses was performed controlling for distress. Looking at the change in heart rate from T1 to T2 the following was found: there was no significant difference within subjects on heart rate, $F(1, 14) = 2.751$, $p = 0.119$; a significant within subjects interaction between heart rate and distress, $F(1, 14) = 5.440$, $p = 0.035$; no significant within subjects interaction between heart rate and study group, $F(2, 14) = 1.871$, $p = 0.190$. Looking at the change in heart rate from T2 to T3 the following was found: there was no significant difference within subjects on heart rate, $F(1, 15) = 1.866$, $p = 0.192$; no significant within subjects interaction between heart rate and distress, $F(1, 15) = 0.507$, $p = 0.487$; no significant within subjects interaction between heart rate and study group, $F(2, 15) = 0.556$, $p = 0.585$.

An ANOVA of between group differences on the VAS for pain showed no significant difference between groups, $F(2, 20) = 1.171$, $p = 0.333$. Group means are reported below (Table

www.manaraa.com

12). A between groups ANOVA controlling for distress showed a significant effect of distress on VAS score, $F(1, 20) = 4.436$, $p = 0.050$, but no significant difference between groups on VAS score, $F(2, 20) = 0.452$, $p = 0.644$.

Table 12. Group Means for the VAS for Pain

Study Group	**VAS Mean**	**Std. Error**
Placebo Control	1.857	0.937
Treatment	3.857	0.937
Standard of Care	3.143	0.937

Note: Group means for the VAS for pain.

www.manaraa.com

CHAPTER 4

DISCUSSION

Main Findings

Given that 66.7% of participants completed the research procedure in ten minutes or less and that 100% of participants inhaled the full dose of oil, the feasibility hypothesis was met.

More parental comfort was given to the Standard of Care Control Group than the other two groups. This is an interesting finding that suggests one of two things: 1) Participants were more distressed in the Standard of Care Control Group and thus needed more parental comfort, and/or 2) Participants were busy inhaling the oil in the Treatment and Placebo Control Group and parents did not want to interrupt the process. The former suggestion indicates a distraction effect of inhaling an oil (treatment or placebo), in that administering aromatherapy prevents participants from becoming distressed and needing parental comfort. This distraction effect may explain the greater need for parental comfort in the Standard of Care Control Group, because in this group heart rate was highest before and after the venipuncture and this group showed the largest percentage of distress behavior.

Percentages regarding length of research procedure suggest three things: 1) Placebo Control Group was, on average, completing the intervention fastest. This may account for their lower level of baseline anxiety and heart rate, as these participants were waiting in the blood draw room for a shorter duration of time; 2) Since the Placebo Control Group was completing the procedure faster than the Standard of Care Control Group, time of the research process may not be due to the administration of the oils but rather the availability of a phlebotomist; and 3) Treatment Group was completing the procedure the slowest, so this factor should be considered when assessing feasibility of the intervention. Although the procedure was identical, perhaps

www.manaraa.com

administering the *L. angustifolia* took longer than administering the jojoba for a reason other than phlebotomist availability.

It is very promising that all 14 participants who were given an oil (*L. angustifolia* or jojoba) were able to inhale the entire dose without any adverse effects. This finding shows that the children tolerated the scents and that the personal essential oil diffuser sachet is a feasible method of administration. Self-report suggested the children enjoyed the scent (both treatment and placebo). This finding demonstrates an important distinction between essential oils and other methods of pain and anxiety reduction, in that while medication and anesthetics may be tolerated they are not enjoyed in the way that essential oils are.

The comparison of HFRS scores show that anxiety after the procedure was reduced the most in the Treatment Group and actually increased in the Placebo Control Group. This non-significant finding suggests that *L. angustifolia* and jojoba oil may have differing effects on anxiety. Jojoba was used as the placebo oil because it is colorless and odorless (Wisniak, 1987). Previous studies found jojoba had no effect on physiological measures and therefore it is considered a good placebo oil (Toda & Morimoto, 2011; Braden, Reichow, & Halm, 2009; Nord & Belew, 2009; van der Ploeg, Eppingstall, & O'Connor, 2010). The results of this study likewise suggest that jojoba oil does not decrease anxiety, given that there was an increase in anxiety for participants in the Placebo Control Group.

The HFRS scores of the Treatment Group and the Standard of Care Control Group showed the same pattern: anxiety was reduced after the venipuncture. The non-significant reduction of anxiety was larger in the Treatment Group, which is trending towards supporting the exploratory hypothesis. Overall this research suggests that *L. angustifolia* may reduce anxiety during pediatric venipuncture slightly more than when no oil is given, but not significantly so.

www.manaraa.com

Heart rate increased the most from T1 to T2 in the Placebo Control Group, suggesting that jojoba oil does not decrease anxiety. The Treatment Group had the lowest measure of heart rate during venipuncture, suggesting a trend towards meeting the exploratory hypothesis. The Treatment Group and Standard of Care Control Group showed a similar increase of heart rate from T1 to T2 and decrease of heart rate from T2 to T3. Although the Treatment Group had lower levels of heart rate than the Standard of Care Control Group at T1, T2, and T3, these differences were not significant. Therefore, *L. angustifolia* is not decreasing heart rate significantly more than the current standard of care, parental comfort.

The trajectory of heart rate measures from T1 to T3 can be explained by the pain phenomenon, in that anxiety increases in the anticipatory period leading up to the aversive experience (T1 – T2) and decreases afterwards (T2 – T3) (Graham, Kabler, & Lunsford, 1961; McTeague, Lang, Laplante, & Bradley, 2011). The pain phenomenon also explains the relationship between the HFRS and VAS for pain: level of anticipatory anxiety of a procedure will influence the amount of pain experienced (Palermo & Drotar, 1996; Hilgard & LeBaron, 1982; Tsao, Myers, Craske, Bursch, Kim, & Zelter, 2004). Thus the group with the lowest baseline anxiety (Placebo Control) would have the lowest score on the VAS for pain and the group with the highest baseline anxiety (Treatment Group) would have the highest score on the VAS for pain.

Although the Treatment Group had the highest pain rating on the VAS as well as the highest initial HFRS score, their post-procedural markers of anxiety were non-significantly lower than the other two groups. This is an important finding as it may describe the effects of *L. angustifolia* on pain. The trend for lower heart rate and self-reported anxiety may suggest that participants who received *L. angustifolia* were not bothered by the pain sensation as much as the

www.manaraa.com

participants in the other groups. Although *L. angustifolia* does not decrease the sensation of pain, or pain intensity as measured by the VAS, it may change the perception of pain, also known as pain unpleasantness.

Limitations and Future Recommendations

The study findings did not show significant decreases in pain and anxiety during pediatric venipuncture when administering *L. angustifolia*. The mechanism behind the small anxiolytic trend of *L. angustifolia* administration should be investigated in future studies: are effects merely due to the distraction component, the process of inhalation, participant expectations, or the chemical composition of the oil? Since the Treatment Group had a decrease in anxiety that was slightly larger than the Standard of Care Control Group while the Placebo Control Group showed an increase in anxiety, evidence may point towards the chemical composition of the oil as the mechanism of action. However, the low baseline anxiety scores of the Placebo Control Group could have caused a floor effect on outcome measures. Additionally, the lack of significant between group differences in pain and anxiety need to be considered.

This difference in interest and enrollment by ethnicity may have been due to language barriers, as many Middle Eastern/Arab American and Latino/Hispanic American guardians did not speak English. The PI was responsible for approach and consent, and she did not speak Arabic or Spanish. Therefore, it was difficult to explain the nature of the study and the information in the consent form. It is important for future studies to consider techniques to avoid this barrier, such as having multi-cultural study-staff assist in approach. This would make future investigations more inclusive to other ethnicities.

Many patients in the Laboratory Medicine Unit of Children's National were physically impaired so that it was clear they had a developmental delay: they were wheelchair bound,

www.manaraa.com

unable to speak, and/or connected to respiratory or feeding assistance devices. Given that children with a developmental delay were excluded in this research, these patients were not approached. Future research should consider how to incorporate these individuals into the study order to make the intervention more inclusive.

Future studies should also consider using a dedicated phlebotomist, to control for differences in phlebotomist's skill level as well as to help ensure adherence to the study timeline. The PI should cite specific reasons for all cases when the research procedure is longer than ten minutes and should consider videotaping sessions to help determine if deviations in the research procedure timeline occur.

It is important for clinical staff to note that the entire intervention took ten minutes while the essential oil administration took approximately 60 seconds (20 seconds for each administration X three administrations). If this technique was to be incorporated into the standard of care, oil would only be administered for 60 seconds over the course of four minutes (20 seconds two minutes pre-procedure, 20 seconds during venipuncture, 20 seconds two minutes post-procedure). Creating a four-minute procedure instead of the ten-minute study intervention means it is less likely that the essential oil administration would cause increased burden for the Laboratory Medicine Unit team or the patients.

Future studies should consider using water vapor in a typical diffuser or air in a personal diffuser oil sachet as a placebo control. This may serve as a better option than jojoba oil, which in this study seemed to increase anxiety. Future studies should also investigate the difference between pain intensity and pain unpleasantness ratings to see if *L. angustifolia* has a differential effect on these aspects of pain.

www.manaraa.com

Conclusions

This study shows promising evidence for the feasibility of *L. angustifolia* administration during pediatric venipuncture. All participants inhaled the complete dose of the oil and no adverse events occurred. Additionally, the groups receiving oil did not take significantly longer than the Standard of Care Control Group, suggesting this intervention is not a burden to laboratory staff or patients. Despite the Treatment Group reporting the highest pain ratings, other physiological and psychological measures were lowest in this group, although not significantly. This data suggests that *L. angustifolia* showed a mild trend towards decreasing pain and anxiety during pediatric venipuncture. Further investigation with a larger sample size is needed to determine the effect of *L. angustifolia* in reducing pain and anxiety during acute medical procedures.

www.manaraa.com

APPENDIX A

AROMATHERAPY AND PAIN MANAGEMENT STUDY ELIGIBILITY CHECKLIST

Aromatherapy and Pain Management Study Eligibility Checklist

□ Consent for study participation

□ Assent for study participation

□ Meets all Inclusion Criteria and no Exclusion Criteria

INCLUSION CRITERIA (must answer yes to all questions to be eligible for the study)
Patient is:

1. Between 7 and 11 years of age □ Yes □ No
2. Can communicate in English (in order to use HFRS scale) □ Yes □ No
3. Scheduled for a venipuncture procedure the days and time that the research team is present in the Laboratory Medicine Unit □ Yes □No
4. Have permission (consent) from their guardian/parent to participate and have given their agreement (assent) to participate □ Yes □ No

EXCLUSION CRITERIA (A yes answer to one or more questions results in ineligibility for the study)
Patient has:

1. An allergy to any essential oil □ Yes □ No
2. An allergy to peanuts □ Yes □No
3. Has a documented developmental delay □ Yes □ No
4. Regularly experience venipunctures or other phlebotomy procedures □ Yes □ No
5. On anti-anxiety or pain medication □ Yes □ No
6. Hypersensitive to smell (may/may not be due to a neurological disorders) □ Yes □ No
7. History of asthma triggered by foreign smells □ Yes □ No

Research ID Number _____
Study Group _____

www.manaraa.com

APPENDIX B

AROMATHERAPY AND PAIN MANAGEMENT STUDY

PARTICIPANT DEMOGRAPHICS

Aromatherapy and Pain Management Study Participant Demographics

Directions: Please fill in the information or circle the most appropriate response below. Thank you.

RESEARCH ID NUMBER: _____

STUDY GROUP: _____

BIRTH DATE: _____

GENDER:

MALE FEMALE

ETHNICITY:

American Indian or Alaskan Native

East Asian or Asian American

South Asian or Indian American

Middle Eastern or Arab American

Black, Afro-Caribbean, or African American

Latino or Hispanic American

Native Hawaiian or Other Pacific Islander

Caucasian or Euro-American

Other _____

Frequency of Venipuncture at Children's: 0 times 1-2 times 3-5 times More than 5 times

If more than 5 times, how many? _____

Frequency of Venipuncture Elsewhere: 0 times 1-2 times 3-5 times More than 5 times

If more than 5 times, how many? _____

www.manaraa.com

Please list any medications you are on:

_____

_____

Standard of Care: Describe the type of standard of care used (EX: topical anesthetic, coolant spray, parental comfort, none, other):_____

Observations of Treatment Effects:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Observations of Non-Treatment Effects:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

www.manaraa.com

APPENDIX C

CONSENT TO PARTICIPATE IN A CLINICAL RESEARCH STUDY

CHILDREN'S NATIONAL MEDICAL CENTER
Center for Translational Science
111 Michigan Avenue, NW
Washington, DC 20010
(202) 476-5000

Consent/Parental Permission to Participate in a Clinical Research Study and Authorization to Use Protected Health Information

---

TITLE OF STUDY: A Feasibility Study of the Effects of Aromatherapy on the Incidence and Severity of Acute Pain in Pediatric Patients
PRINCIPAL INVESTIGATOR: Katherine Curtin, MA Candidate, Center for Translational Science

---

Throughout this document, "You" always refers to the person (you or your child) who takes part in the study.

We are inviting you to be part of a research study at Children's National Medical Center (Children's National). Before you decide if you would like to participate, we want you to know why we are doing the study. We also want you to know about any risks and what you will be expected to do in the study.

This form gives you information about the study. Your study doctor or a member of the research team will talk to you about the study and answer all of your questions. We encourage you to discuss this study with your family and anyone else you trust before making your decision. You must sign this form if you agree to take part in the study. We will give you a signed copy of this form to keep.

Your participation in this research is voluntary.

There will be no penalty or loss of benefits to which you are otherwise entitled if you decide not to be in the study or withdraw from the study later.

This means that:

- You do not have to join the study.
- You may change your mind and stop being in the study at any time.
- We will tell you if we make any important changes to the study or if there are any important new findings so that you can decide if you still want to be in the

www.manaraa.com

study.

Why is this research study being done?

The purpose of this research study is to see if aromatherapy is helpful in alleviating anxiety in children ages 7 to 11 when getting blood drawn or an IV.

Your child is being asked to be in this study because your child is between the ages of 7 and 11 and your child will be getting a needle stick for the purpose of an IV or blood draw. This procedure is known as a venipuncture.

This study will involve up to 60 children. They will all be recruited from the Laboratory Medicine Unit of Children's National Medical Center. The aromatherapy we will use is from Aeroscena, LLC.

Katherine Curtin is the person responsible for this research study at Children's National. She is called the Principal Investigator.

What will happen in this research study?

If you agree for your child to be in this study they will be randomized, which means they will have an equal chance of being in one of three groups: receiving aromatherapy using a lavender essential oil when getting a venipuncture, receiving plain oil when getting a venipuncture, and receiving the current standard care, which is no oil during a venipuncture. No matter what group your child is in, they will be receiving the current standard of care. This includes allowing the parent to comfort the child during the needle stick and allowing the use of topical pain medicine, if needed.

Your child will be placed in a group using a machine that gives out a number 1, 2, or 3. This is called a random assignment. Random assignment works a lot like flipping a coin, which makes sure that your child has an equal chance of being in any of the three groups. The two groups who receive an oil will be given an aromatherapy packet that is administered by a Registered Nurse, who is also a Certified Aromatherapist. Your child will be asked to smell the oil before, during, and after the venipuncture procedure. The study will proceed as follows:

1. Your child's heart rate will be recorded during the venipuncture, using a finger cuff.

2. Your child will inhale lavender essential oil or plain jojoba oil three times during the study- before, during, and after the venipuncture. If they are in the standard of care group, they will not inhale oil.

3. Your child will be asked to show her/his level of pain and anxiety in two ways. Pain will be measured after the venipuncture by choosing a number and face from 0-10 to show how much pain your child felt. Anxiety will be measured before and after the venipuncture by choosing a number from 1-5 to show how nervous your child felt. The children will verbally tell the research staff which option to pick for each form.

The venipuncture today is the only time your child will need to be involved in the study. There are no additional commitments.

www.manaraa.com

How long will my participation in the research study last?
The study should take approximately 10 minutes and will take place today while your child is getting their venipuncture. No other commitments are necessary for this study.

Participation in this research is voluntary. Your child's medical care will not be affected by participation in this research study. You have the right to decide not to participate or to stop participating in this study at any time. If you agree to participate in this study then later change your mind, in no way will your child's care be affected.

We will only ask you to drop out of the study if:

- There are any unexpected side effects
- Your study doctor thinks it is best for your child

What are the risks and possible discomforts from being in this research study?
There are no known risks or side effects from aromatherapy. There may be risks we don't know about. We will tell you if we find out about new risks that are discovered.

There may be some discomfort due to the venipuncture. This may include physical pain and anxiety/nervousness. This discomfort will be addressed using the standard of care protocol at Children's National- parental comfort and/or topical pain medicine. You can receive the standard of care protocol whether or not you participate in the study.

You should tell Katherine Curtin about any illness, side effect or discomfort that you have right away, even if it is not one of the things listed, or even if you think it is not related to the study.

What are the possible benefits from being in this research study?
We cannot promise that participating in this research study will help you or benefit your child. Your child may experience less pain during the venipuncture. The children who take part in this study will also help us find out if it is possible to use treatments like aromatherapy while patients get venipunctures. Children who are part of this study can also help us see if aromatherapy helps calm their bodies before, during, and after the venipuncture. This knowledge may help patients in the future.

What other choices do I have if I don't want to take part in the study?
If you do not want to participate in the study, there are no other choices besides receiving the standard of care during your child's venipuncture. If you chose not to take part, then your child's venipuncture will happen normally- without the aromatherapy.

Will it cost me anything to take part in the study?
There are no costs for participating in this study. Children's National Medical Center will give

www.manaraa.com

your child the aromatherapy used in this study at no cost to you. You will not be charged for anything else we do that is part of the study. You or your insurance company will have to pay for the costs of any routine or standard medical care that is not part of the study. This may include, but is not limited to, the venipuncture, visits to the clinic, having to stay in the hospital, laboratory tests, x-rays, or other tests. If your insurance company does not pay for the routine or standard care, you will be responsible for paying for it.

Will I be paid for taking part in this study?

You will not be paid for taking part in this study. If any commercial products are developed as a result of this research study, you will not receive any money from the sales.

How will you protect my privacy if I take part in this study?

Who will see the information that I give you?

If you decide to take part in this study, only the people working on the study will know your name. They will keep this information in case we have to find you later to let you know of any new information that may affect your health. Your personal information will not be given to anyone unless we get your permission in writing or if the law requires it. This information will also only be given for regular hospital care, payment, and hospital management activities. We will make every effort to keep your information private, but no one's privacy can be totally guaranteed.

Your medical record is confidential but, just like any medical record, there are some exceptions under state and federal law.

There are some government agencies or other groups that may check records that identify you without your permission. They might review the records of this study and your medical records to make sure we are following the law and protecting the children in the study. The agencies or groups who might see these records are the Office for Human Research Protections, Department of Health and Human Services, and the Institutional Review Board of Children's National Medical Center (the ethics board that reviewed and approved this research study).

The results of this research may be presented at meetings or in publications. You will not be personally identified.

HEALTH INSURANCE PORTABILITY AND ACCOUNTABILITY

In 1996 the government passed a law known as The Health Insurance Portability and Accountability Act (HIPAA). This privacy law protects your individually identifiable health information (Protected Health Information or PHI). The privacy law requires you to sign an agreement so researchers can use or share your PHI for research purposes. This describes to you how information about you may be used or shared if you are in a research study. It is important that you read this carefully and ask a member of the research team to explain anything you do not understand.

www.manaraa.com

I authorize the Principal Investigator, Katherine Curtin, and her research staff to create, access, use, and disclose my PHI for the purposes described below.

Protected Health Information that may be used and shared includes:

- Information that identifies you such as name, address, telephone number, date of birth, and other details about you
- Information obtained from the study procedures outlined in this consent form, for example: things done to see if you can join the study such as the eligibility screening that will ask medical information about your child's health history
- Questionnaires or surveys your child completes

The Researchers may use and share my Protected Health Information with:

- The Principal Investigator, other Investigators, Study Coordinators, and all administrative staff in charge of doing work for the study;
- Government agencies that have the right to see or review your PHI including, but not limited to, the Office of Human Research Protections and the Food and Drug Administration;
- Children's National Medical Center Institutional Review Board;
- Audit Committee of the Children's National Medical Center Institutional Review Board;
- Quality Improvement Program Coordinator and other staff in the Office for the Protection of Human Subjects at Children's National Medical Center.

In addition to the above people and organizations, the Researchers may also use and share my Protected Health Information with:

- The Data Safety Monitoring Board (a group of people who examine the medical information during the study)
- The Medical Monitor for the Study (a person who reviews medical information during the study)
- The Patient Advocate or Research Ombudsman (person who watches out for your best interest)

Also, your primary physician will be contacted if during the course of the study the researcher learns of a medical condition that needs immediate attention.

Should your health information be disclosed to anyone outside of the study, your information may no longer be protected by HIPAA and this Authorization. However, the use of your health information will still be regulated by applicable federal and state laws.

If you agree to participate in this research study, the research team may use Personally Unidentified Study Data. The Personally Unidentified Study Data does not include your name, address, telephone, or social security number. Instead, the researcher assigns a code to the Personally Unidentified Study Data. Personally Unidentified Study Data may include your date of birth, initials,

www.manaraa.com

and dates you received medical care. Personally Unidentified Study Data may also include the health information used, created, or collected in the research study. The research team or the research sponsor may share the Personally Unidentified Study Data with others to perform additional research, place it into research databases, share it with researchers in the U.S. or other countries, or use it to improve the design of future studies. They may also publish it in scientific journals, or share it with business partners of the sponsor and to file applications with U.S. or foreign government agencies to get approval for new drugs or health care products.

You do not have to sign this Consent/Authorization. If you decide not to sign the Authorization, you will not be allowed to participate in the research study.

After signing the Consent/Authorization, you can change your mind and revoke this Authorization.

- If you revoke the Authorization, you will send a written letter to the Principal Investigator to inform her of your decision.

  Katherine Curtin
  Children's National Medical Center
  Center for Translational Science
  111 Michigan Avenue, N.W.
  Washington, DC 20010-2970
- If you revoke this Authorization, researchers may only use and disclose the PHI that was collected for this research study before you revoked the Authorization.
- If you revoke this Authorization, your PHI may still be used and disclosed if you should have an adverse event (unexpected side effect).
- If you change your mind and withdraw the Authorization, you will not be allowed to participate in the study.

You will be allowed to review the information collected for this research study.

This Authorization does not expire.

If you have not already received a Notice of Privacy Practices from Children's National Medical Center, you may request a copy and will be given one. If you have any questions or concerns about your privacy rights, you may contact the Children's Hospital Privacy Officer at 301-572-6348.

Whom can I call if I have questions about this research study?

We want you to ask questions about any part of this research study at any time,

- For questions about the study or the information in this informed consent/parental permission document, call the Principal Investigator, Katherine Curtin, at 914-482-4303 or Dr. Pamela Hinds, Associate Center Director for the Center of Translational Science at Children's National Medical Center, at 202-476-4432.

www.manaraa.com

Whom can I call if I have questions or concerns about my rights as a research study participant?

The Children's National Office for the Protection of Human Subjects is available to talk with you about:

- Your rights as a research participant
- Your concerns about the research
- A complaint about the research

This is the administration office for the Institutional Review Board, which is a group of doctors, nurses, and non-medical people who review research studies for safety and the protection of people who participate in research. You can call the Office for the Protection of Human Subjects at 301-565-8452.

Children's National has a bilingual (English/Spanish) research participant and family advocate. The advocate, Dr. Tomas Silber, is here to answer your questions or concerns about taking part in this research. Dr. Silber does not work for the doctors who are doing this research and they do not pay him. He is here only to help and protect you during any research.

You may contact Dr. Silber at any time. This can be done before you decide to take part in the research, during the study, or even after you finish the study. You can call Dr. Silber at 202-476-3066 or reach him by e-mail at tsilber@childrensnational.org.

CONSENT/PARENTAL PERMISSION:

- I am the study participant or I am authorized to act on behalf of the participant.
- I have read this consent form or had it read to me.
- I have been invited to take part in a research study. I was told why the research is being done and how long my participation in the study is expected to last. I was told about what will happen in the study and if there are any procedures or drugs that are experimental.
- I was told that taking part in this research is voluntary. I also was told that I can decide not to take part or stop being in it at any time without any penalty to me or any change to the quality of care I receive at Children's National.
- I was told about the risks and possible discomforts of taking part in this research study. I was also informed if there are any possible benefits to me if I am in this study.
- I have been given the chance to ask questions about the study, and my questions have been answered. If I have questions later, I can ask one of the people listed in this form.
- I agree to take part in this research study.
- I will receive a copy of this Informed Consent/Parental Permission form to keep.

Signature of Parent(s)/Guardian for participant under the age of 18 years

www.manaraa.com

Printed Name of Participant: _____

Printed Name of Parent/Guardian:_____

Signature of Parent/Guardian: _____

Date and Time:_____ a.m. / p.m. (circle one)

AFFIDAVIT OF PERSON OBTAINING CONSENT / PARENTAL PERMISSION:

I certify that I have explained to the above individual(s) the nature and purpose of the study, potential benefits, and possible risks associated with participation in this study.
I have answered any questions that have been raised.

Printed Name of Person Obtaining Consent: _____

Research Role: _____

Signature: _____

Date and Time:_____ a.m. / p.m. (circle one)

AFFIDAVIT OF PERSON OBTAINING ASSENT FROM A 7-11 YEAR-OLD CHILD:

I have explained all aspects of the research study to the child participant to the best of his/her ability to understand.

I have answered all of the child participant's questions relating to the research study.

I believe the child participant's decision to enroll is voluntary.

The study doctors and study staff agree to respect the child participant's physical or emotional dissent at any time during this research study when that dissent pertains to anything being done solely for the purpose of the research.

Printed Name of Person Obtaining Assent: _____

Title: _____

www.manaraa.com

Signature: _____

Date and Time:_____ a.m. / p.m. (circle one)

Signature of Witness (if applicable)

Printed Name of Witness:_____

Witness's Signature: _____

Date and Time:_____ a.m. / p.m. (circle one)

www.manaraa.com

APPENDIX D

ASSENT SCRIPT (AGES 7 THROUGH 11) TO PARTICIPATE IN A

CLINICAL RESEARCH STUDY

CHILDREN'S NATIONAL MEDICAL CENTER
Department of Laboratory Medicine
111 Michigan Avenue, NW
Washington, DC 20010
(202) 476-5000

ASSENT SCRIPT (AGES 7 through 11) TO PARTICIPATE IN A CLINICAL RESEARCH STUDY

TITLE OF STUDY: A Feasibility Study of the Effects of Aromatherapy on the Incidence and Severity of Acute Pain in Pediatric Patients

PRINCIPAL INVESTIGATOR: Katherine Curtin, MA Candidate, Center for Translational Science

A & B. WHAT IS THE REASON FOR THE STUDY AND WHAT WILL HAPPEN IN THE STUDY?

We want to see if a procedure called aromatherapy, where you smell a special scent, helps so that you feel less nervous and less pain during your needle stick. You're going to be getting your needle stick just like you normally would. Some of the children in this study will be getting their needle stick while smelling an oil. The oil may be an essential oil, which is an oil used in aromatherapy, or a plain oil. We will be looking for changes in your body, like a change in how fast your heart beats, using a finger cuff. We will be looking to see if you can complete the aromatherapy and if you can do so within 10 minutes. Afterwards, you will fill out two forms telling us how you felt during the study.

C. WHAT POSSIBLE UNEXPECTED THINGS COULD HAPPEN?

The special scent might not work. It may make you feel worse. Your doctor and parents will look out for any problems and check to see how you are feeling. If any of those things happen, tell your parents or the research team right away and we will see if we can help. If you still feel uncomfortable, you can ask to stop being in the study.

D. WHAT POSSIBLE GOOD THINGS COULD HAPPEN?

Children who are part of this study will help us find out if using aromatherapy before, during, and after a needle stick makes a difference for patients. If aromatherapy does make a difference, it might help patients feel better during needle sticks.

www.manaraa.com

APPENDIX E

EXAMPLE OF A STUDY PROCEDURAL FIDELITY CHECKLIST

Checklist: Fidelity of Study Procedure by Research Team

Please indicated completion of item with Y for yes, or N for no if item is left incomplete.

Observed Research Team Members:

Katherine Curtin, Master's Candidate ____

Marian McEvilly, CI ____

Observed Intervention: Oils will be labeled with two different colors by the manufacturer, Aeroscena, and will not be known to the researchers until after the data is collected. Therefore, they will be called Oil A and Oil B until their identify is revealed at the conclusion of the data collection.

Oil A (Green) Oil B (Blue) Standard of Care Only

_____ Katherine Curtin briefly and thoroughly explains study, providing potential participant with information and obtains written informed consent from the parent and verbal assent from the patient.

_____ The patient is connected to heart rate monitor, using the finger cuff, immediately after consent and assent are gained to begin measuring heart rate.

_____ Marian McEvilly or Katherine Curtin provides participant with *HFRS*.

_____ Two minutes after starting to record physiological indicators, Marian McEvilly provides the personal essential oil diffuser sachet to the participant for three squeezes, if in the Treatment Group or Placebo Control Group. Standard of care procedures of parental comfort and topical anesthetic or coolant spray are offered to children in all three groups by the phlebotomist.

_____ Laboratory Medicine team completes the venipuncture procedure two minutes after the aromatherapy intervention. Marian McEvilly administers three more squeezes from the personal essential oil diffuser sachet to the participant, if in the Treatment Group or Placebo Control Group, during the venipuncture. Marian McEvilly allows the heart rate monitor to continue measuring heart rate for five minutes after the venipuncture begins (minutes 5 - 10).

_____ Marian McEvilly administers three more squeezes of the aromatherapy intervention to the participant two minutes after the venipuncture, if in the Treatment Group or Placebo Control Group. Then Marian McEvilly stops giving participant the intervention.

www.manaraa.com

_____The participant is disconnected from the heart rate monitor. Then Marian McEvilly or Katherine Curtin provides the participant with the VAS, followed by another *HFRS*.

_____ Research team checks in with the participant to be sure the participant is not feeling any discomfort upon completion of the intervention session, reminds participant of contact information should any problems arise, and that participant may withdraw from the study at any time.

Checklist Receipt of Intervention

Date:

Observer: Observed:

_____ Demonstrates adherence to Intervention Checklist

www.manaraa.com

APPENDIX F

TIMELINE OF INTERVENTION SESSION

Non-pharmacological Pain Management Intervention Session Timeline

Session begins when Katherine Curtin enrolls participant in the Laboratory Medicine blood draw room.

Prior to intervention or random number assignment, Katherine Curtin will give the potential participant information regarding the study and inform the potential participant that he/she may withdraw from the study at any time. If the potential participant agrees to participate in the study, Katherine Curtin will obtain written informed consent from the parent and verbal assent from the participant. When consent and assent are obtained, a random number generator will assign the participant to one of the three groups. This timeline applies to all three groups.

Minute of Session	Session Event
Minute 1:	Participant is connected to the heart rate monitor machine to begin measuring heart rate (physiological indicator) immediately after consent and assent are obtained. The machine will continue measuring heart rate for the duration of the study session, 10 minutes total. Marian McEvilly or Katherine Curtin provides the participant with the *HFRS*.
Minute 3:	Marian McEvilly gives participant the treatment that they were randomly assigned, if in the Treatment Group or Placebo Control Group. Participant inhales the oil via the personal essential oil diffuser sachet for three squeezes, will be administered by Marian McEvilly. If in the Standard of Care Control Group, the participant will not inhale an oil.
Minute 5:	Laboratory Medicine team performs venipuncture procedure. During the procedure the participant inhales three more squeezes from the personal essential oil diffuser sachet, administered by Marian McEvilly, if in the Treatment Group or Placebo Control Group. The heart rate monitor continues measuring physiological indicators for five minutes after the venipuncture begins (minutes 5 - 10).
Minute 7:	Marian McEvilly administers three more squeezes of lavandula angustifolia or jojoba two minutes after the venipuncture, if the participant is in one of these groups.
Minute 10:	The participant is disconnected from the heart rate monitor. Marian McEvilly or Katherine Curtin administers the Visual Analogue Pain Scale and then another *HFRS*.

www.manaraa.com

Marian McEvilly and Katherine Curtin check in with the participant's level of comfort prior to ending the intervention session and remind the participant of contact information on the Informed Consent Sheet should any problems arise. Additionally, Katherine Curtin reminds the participant that he/she can withdraw from the study at any time.

www.manaraa.com

APPENDIX G

VISUAL ANALOGUE SCALE FOR PAIN

Research ID Number: _____
Study Group: _____

Circle the number that matches how much pain you feel.

|0--------1--------2--------3--------4--------5--------6--------7--------8--------9--------10|

No Pain **Worst Pain Ever**

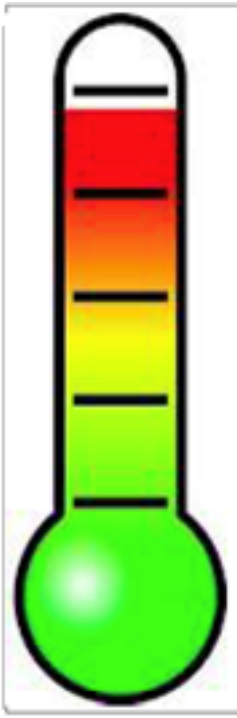
www.manaraa.com

APPENDIX H

HOSPITAL FEARS RATING SCALE

Research ID Number: _____
Study Group: _____

Pretend the thermometer below will measure how scared or nervous you felt about your needle stick. Circle the number next to the reading your thermometer would show.



5	This is really scary! I'm really anxious about this.
4	I'm between scared but ok and really scared.
3	This is scary, but I'm ok.
2	I'm between not being scared at all and scared but ok.
1	I am not scared at all.

www.manaraa.com

REFERENCES

Abuhamdah, S. & Chazot, P. (2008). Lemon balm and lavender herbal essential oils: Old and new ways to treat emotional disorders? *Current Anaesthesia & Critical Care, 19*(4), 221-226.

Alaoui-Ismaili, O., Vernet-Maury, E., Dittmar, A., Delhomme, G., & Chanel, J. (1997). Odor hedonics: connection with emotional response estimated by autonomic parameters. *Chemical Senses, 22*(3), 237-248.

Anderson, C., Lis-Balchin, M., & Kirk-Smith, M. (2000). Evaluation of massage with essential oils on childhood atopic eczema. *Phytotherapy Research, 14*(6), 452-456.

Atsumi, T. & Tonosaki, K. (2007). Smelling lavender and rosemary increases free radical scavenging activity and decreases cortisol level is saliva. *Psychiatry Research, 150*(1), 89-96.

Bijur, P.E., Silver, W., & Gallagher, E.I. (2001). Reliability of the visual analog scale for measurement of acute pain. *Academic Emergency Medicine, 8*, 1153-1157.

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.

Bringuier, S., Dadure, C., Raux, O., Dubois, A., Picot, M.C., & Capdevila, X. (2009). The perioperative validity of the visual analogue anxiety scale in children: A discriminant and useful instrument in routine clinical practice to optimize postoperative pain management. *Anesthesia & Analgesia, 109*(3), 737-744.

Buckle, J. (2007). Literature review: Should nursing take aromatherapy more seriously? *British Journal of Nursing, 16*(2), 116-120.

www.manaraa.com

Carrasco, A., Martinez-Gutierrez, R., Tomas, V., & Tudela, J. (2016). Lavandula angustifolia and lavandula latifolia essential oils from Spain: Aromatic profile and bioactivities. *Planta Medica, 82*(1-2), 163-170.

Cavanagh, H.M.A. & Wilkinson, J.M. (2002). Biological activities of lavender essential oil. *Phytotherapy Research, 16*(4), 301-308.

Cetinkaya, B. & Basbakkal, Z. (2012). The effectiveness of aromatherapy massage using lavender oil as a treatment for infantile colic. *International Journal of Nursing Practice, 18*(2), 164-169.

Chen, E., Joseph, M.H., & Zeltzer, L.K. (2000). Behavioral and cognitive interventions in the treatment of pain in children. *Pediatric Clinics of North America, 47*(3), 513-525.

Chien, L. W., Cheng, S. L., & Liu, C. F. (2011). The effect of lavender aromatherapy on autonomic nervous system in midlife women with insomnia. *Evidence-Based Complementary and Alternative Medicine*, *2012*(1).

Cho, M. Y., Min, E. S., Hur, M. H., & Lee, M. S. (2013). Effects of aromatherapy on the anxiety, vital signs, and sleep quality of percutaneous coronary intervention patients in intensive care units. *Evidence-Based Complementary and Alternative Medicine*, *2013*(2).

Cohen, L.L. (2008). Behavioral approaches to anxiety and pain management for pediatric venous access. *Pediatrics, 122*, 134-139.

Dale, A., & Cornwell, S. (1994). The role of lavender oil in relieving perineal discomfort following childbirth: a blind randomized clinical trial. *Journal of Advanced Nursing, 19*(1), 89-96.

Diego, M.A., Jones, N.A., Field, T., Hernandez-Reif, M., Schanberg, S., Kuhn, C., McAdam, V., & Galamaga, M. (1998) Aromatherapy positively affects mood, EEG patterns of alertness

www.manaraa.com

and math computations. *International Journal of Neuroscience, 96*(3-4), 217-224.

Duff, A.J.A. (2003). Incorporating psychological approaches into routine pediatric venipuncture. *Archives of Disease in Childhood, 88*, 931-937.

Dunn, C., Sleep, J., & Collett, D. (1995). Sensing an improvement: an experimental study to evaluate the use of aromatherapy, massage and periods of rest in an intensive care unit. *Journal of Advanced Nursing, 21*(1), 34-40.

Eichenfield, L.F., Funk, A., Fallon-Friedlander, S., & Cunningham, B.B. (2002). A clinical study to evaluate the efficacy of ELA-Max (4% liposomal lidocaine) as compared with eutectic mixture of local anesthetics cream for pain reduction of venipuncture in children. *Pediatrics, 109*(6), 1093-1099.

Fradet, C., McGrath, P.J., Kay, J., Adams, S., & Luke, B. (1990). A prospective survey of reactions to blood tests by children and adolescents. *Pain, 40*(1), 53-60.

Goodenough, B., Thomas, W., Champion, G. D., Perrott, D., Taplin, J. E., von Baeyer, C. L., & Ziegler, J. B. (1999). Unravelling age effects and sex differences in needle pain: ratings of sensory intensity and unpleasantness of venipuncture pain by children and their parents. *Pain, 80*(1), 179-190.

Graham, D.T., Kabler, J.D., & Lunsford, Jr. (1961). Vasovagal fainting: a diphasic response. *Psychosomatic Medicine, 23*(6), 493-507.

Hadi, N., & Hanid, A. A. (2011). Lavender essence for post-cesarean pain. *Pakistan Journal of Biological Sciences, 14*(11), 664.

Hilgard, J.R. & LeBaron, S. (1982). Relief of anxiety and pain in children and adolescents with cancer: Quantitative measures and clinical observations. *The Journal of Clinical and Experimental Hypnosis, 30*(4), 417-442,

www.manaraa.com

Hongratanaworakit, T. (2009). Simultaneous aromatherapy massage with rosemary oil on humans. *Scientia Pharmaceutica, 77*(2), 375.

Hongratanaworakit, T. (2010). Stimulating effect of aromatherapy massage with jasmine oil. *Natural Product Communications, 5*(1), 157-162.

Humphrey, G.B., Boon, C.M.J., Chiquit van Linden, van den Heuvell, G.F.E., & van de Wiel, H.B.M. (1992). The occurrence of high levels of acute behavioral distress in children and adolescents undergoing routine venipunctures. *90*(1), 87-91.

Joint Commission on Accreditation of Healthcare Organizations (JCAHO). (1999). Pain assessment and management: An organizational approach. *JCAHO*. Illinois: Oakbrook Terrace.

Kozlowski, L. J., Kost-Byerly, S., Colantuoni, E., Thompson, C. B., Vasquenza, K. J., Rothman, S. K., & Monitto, C. L. (2014). Pain prevalence, intensity, assessment and management in a hospitalized pediatric population. *Pain Management Nursing, 15*(1), 22-35.

Lee, I. S. & Lee, G. J. (2006). Effects of lavender aromatherapy on insomnia and depression in women college students. *Taehan Kanho Hakhoe Chi, 36*(1), 136-143.

Louis, M. & Kowalski, S. D. (2002). Use of aromatherapy with hospice patients to decrease pain, anxiety, and depression and to promote an increased sense of well-being. *American Journal of Hospice and Palliative Medicine, 19*(6), 381-386.

Lua, P. L., & Zakaria, N. S. (2012). A brief review of current scientific evidence involving aromatherapy use for nausea and vomiting. *The Journal of Alternative and Complementary Medicine, 18*(6), 534-540.

Manne, S. L., Redd, W. H., Jacobsen, P. B., Gorfinkle, K., Schorr, O., & Rapkin, B. (1990). Behavioral intervention to reduce child and parent distress during venipuncture. *Journal*

www.manaraa.com

of Consulting and Clinical Psychology, *58*(5), 565.

Manuck, S.B., Cohen, S., Rabin, B.S., Muldoon, M.F., & Bachen, E.A. (1991). Individual differences in cellular immune response to stress. *Psychological Science, 2*(2), 111-115.

McDonnell, L. & Bowden, M.L. (1989). Breathing management: A simple stress and pain reduction strategy for use on a pediatric service. *Issues in Comprehensive Pediatric Nursing*, *12*(5), 339-344.

McGrath, P.J. & McAlpine, L. (1993). Psychologic perspectives on pain. *The Journal of Pediatrics*, *122*(5), S2-S8.

McTeague, L.M, Lang, P.J., Laplante, M.C., & Bradley, M.M. (2011). Aversive imagery in panic disorder: agoraphobia severity, comorbidity, and defensive physiology. *Biological Psychiatry, 70*(5), 415-424.

Meyer, J.S. & Quenzer, L.F. *Psychopharmacology: Drugs, the brain, and behavior*. Mahwah: Sinauer Associates, 2004. Print.

Miwa, T.K. (1987). Structural determination and uses of jojoba oil. *Journal of the American Oil Chemists' Society, 61*(2), 407-410.

Moltner, A., Holzl, R., & Strian, F. (1990) Heart rate changes as an autonomic component of the pain response. *Pain*, *43*(1), 81-89.

Nagai, M., Wada, M., Usui, N., Tanaka, A., & Hasebe, Y. (2000). Pleasant odors attenuate the blood pressure increase during rhythmic handgrip in humans. *Neuroscience Letters, 289*, 227-229.

Nord, D. & Belew, J. (2009). Effectiveness of the essential oils lavender and ginger in promoting children's comfort in a perianesthesia setting. *Journal of PeriAnesthesia Nursing 24*(5), 207-312.

www.manaraa.com

Palmero, T.M, & Drotar, D. (1996). Prediction of children's postoperative pain: the role of presurgical expectations and anticipatory emotions. *Journal of Pediatric Psychology, 21*(5), 683-698.

Pederson, C. & Harbaugh, B.L. (1995). Nurses' use of nonpharmacologic techniques with hospitalized children. *Issues in Comprehensive Pediatric Nursing, 18*(2), 91-109.

Press-Ganey Question Analysis Quarterly Report, January – April 2011.

Press-Sandler, O., Freud, T., Volkow, I., Peleg, R., & Press, Y. (2016). Aromatherapy for the treatment of patients with behavioral and psychological symptoms of dementia: A descriptive analysis of RCTs. *The Journal of Alternative and Complementary Medicine.*

Price, D.D., Bush, F.M., Long, S., & Harkins, S.W. (1994). A comparison of pain measurement characteristics of mechanical visual analogue and simple numerical rating scales. *Pain 56*, 217-226.

Rusy, L.M. & Weisman, S.J. (2000). Complementary therapies for acute pediatric pain management. *Pediatric Clinics of North America, 47*(3), 589-599.

Rutter, M. (1981). Stress, coping and development: Some issues and some questions. *The Journal of Child Psychology and Psychiatry*, *22*(4), 323-356.

Seers, K. & Carroll, D. (1998). Relaxation for the relief of acute pain: A systematic review. *Journal of Advanced Nursing, 27*, 476-487.

Shields, B.J., Palermo, T.M., Powers, J.D., Grewe, S.D., & Smith, G.A. (2003). Predictors of a child's ability to use a *VAS. Child: Care, Health and Development. 29*(4), 281- 290.

Shiina, Y., Funabashi, N., Lee, K., Toyada, T., Sekine, T., Honjo, S., & Komuro, I. (2008). Relaxation effects of lavender aromatherapy improve coronary flow velocity reserve in healthy men evaluated by transthoracic Doppler echocardiography. *International Journal of*

www.manaraa.com

Cardiology, 128(2), 193-197.

Stinley, N. (2014). Complementary and integrative methods of pediatric acute pain management: a randomized controlled clinical trial *(Unpublished doctoral dissertation).* American University, Washington, D.C.

Sweet, S.D. & McGrath, P.J. (1998). Physiological measures of pain. In Finley, G.A., McGrath, P.J. (Eds.), *Measurement of Pain in Infants and Children,* 59-81, Seattle: IASP Press.

Toda, M. & Morimoto, K. (2011). Evaluation and effects of lavender and peppermint aromatherapy using sensitive salivary endocrinological stress markers. *Stress and Health, 27*(5), 430-435.

Tsao, J.C., Myers, C.D., Craske, M.G., Bursch, B., Kim, S.C., & Zelter, L.K. (2004). Role of anticipatory anxiety and anxiety sensitivity in children's and adolescents' laboratory pain responses. *Journal of Pediatric Psychology, 29*(5), 379-388.

Tsao J.C. & Zeltzer, L.K. (2005). Pediatric pain: A review of the state-of-the-science. *Evidence-Based Complementary and Alternative Medicine, 2*, 149-159.

Tufekci, F.G., Celebioglu, A., & Kucukoglu, S. (2009). Turkish children loved distraction: Using kaleidoscope to reduce perceived pain during venipuncture. *Journal of Clinical Nursing, 18*(15), 2180-2186.

Uman, L.S., Chambers, C.T., McGrath, P.J., & Kisely, S. (2006). Psychological interventions for needle-related procedural pain and distress in children and adolescents (review). *The CochraneLibrary, 11*, 1-22.

Uman, L.S., Chambers, C.T., McGrath, P.J., & Kisely, S. (2008). A systematic review of randomized controlled trials examining psychological interventions for needle-related procedural pain and distress in children and adolescents: An abbreviated Cochrane

www.manaraa.com

review. *Journal of Pediatric Psychology, 33*(8), 842-854.

Ushida, T., Ikemoto, T., Tanaka, S., Shinozaki, J., Taniguchi, S., Murata, Y., McLaughlin, M., Arai, Y.C.P., & Tamura, Y. (2008). Virtual needle pain stimuli activates cortical representation of emotions in normal volunteers. *Neuroscience Letters*, *439*(1), 7-12.

Van der Ploeg, E.S., Eppingstall, B., & O'Connor, D.W. (2010). The study protocol of a blinded randomized-controlled cross-over trial of lavender oil as a treatment of behavioural symptoms in dementia. *BMC Geriatrics, 10*(1), 49.

Walco, G.A. Sterling, C.M., Conte, P.M., & Engel, R.G. (1999). Empirically supported treatments in pediatric psychology: Disease-related pain. *Journal of Pediatric Psychology, 24*(2), 155-167.

Williams, T.I. (2006). Evaluating the effects of aromatherapy massage on sleep in children with autism: a pilot study. *Evidence-based Complementary and Alternative Medicine 3*(3), 373-377.

Wisniak, J. (1987). *The chemistry and technology of jojoba oil.* The American Oil Chemists Society.

Woelk, H. & Schläfke, S. (2010). A multi-center, double-blind, randomised study of the lavender oil preparation silexan in comparison to lorazepam for generalized anxiety disorder. *Phytomedicine, 17*(2), 94-99.

Yip, Y. B., & Tse, S. H. M. (2006). An experimental study on the effectiveness of acupressure with aromatic lavender essential oil for sub-acute, non-specific neck pain in Hong Kong. *Complementary Therapies in Clinical Practice, 12*(1), 18-26.

www.manaraa.com