The Effect of Gender and Ethnicity on Children's Attitudes and Preferences for Essential Oils: A Pilot Study

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Abstract

Context: Aromatherapy is frequently recommended for children but children's preferences for specific essential oils are not well documented.

Objective: To measure preferences of school aged children for essential oils based on gender and ethnicity.

Design: Descriptive study measuring children's responses to and preferences for selected essential oils.

Setting: Pediatric integrative medicine clinic in a Midwestern children's hospital.

Participants: Healthy school-age children of Latino (N = 39) and non-Latino Caucasian (NLC) (N = 48) ethnicity, 41.7% of the NLC group and 59.0% of the Latino Group were males.

Intervention: Participants smelled single essential oils, answered three forced choice questions and one open ended question, order of exposure was varied.

Outcome measures: Participants evaluated each scent's effect on mood and energy, stated their preferences, indicated if scents evoked particular thoughts and selected a favorite essential oil.

Results: Females were more likely to feel happy when smelling sweet orange ($p = .043$). Female Latinos were more likely than NLC females to find sweet orange calming (56.2% vs. 18.5%). Male Latinos were more likely (65.2%) to describe peppermint as "energetic" than male NLC (30%). Children chose an essential oil that they rated as "making them feel happy" (72.6%) and/or as "liking the most" (64.3%). Other results that approached statistical significance were: females felt more energetic with spearmint ($p = .055$). Latinos preferred spearmint over NLC ($p = .075$), and all males felt more energetic when smelling ginger ($p = .091$). Ginger and lavender were the least preferred. Results indicate that children have specific essential oil scent preferences. There is trend toward differences based on gender and ethnicity.

Key words: Children, aromatherapy, essential oil, ethnicity

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INTRODUCTION

Complementary and alternative medicine (CAM) is used in significant numbers throughout the United States,[1,2,3] for adult and pediatric patients alike, whether healthy or chronically ill. Reports on the extent of pediatric CAM use range from 33% in a primary care setting, [4] to 56% for children with cerebral palsy [5] and 47-84% for children with cancer.[6,7,8,9] Although CAM therapies are accessed by populations that are racially and ethnically diverse, the rate of use and type of therapies utilized may vary. [10,11,12,13] Aromatherapy (the use of essential oils) is a form of CAM that is recommended for and used by children and adolescents.[14,15,16]

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Although essential oils have long been used in traditional healing practices, scientific investigation into the therapeutic benefits of specific essential oils is fairly recent. To date this research has been predominantly in the form of small pilot studies or case reports in adults. Health care providers, particularly nurses, have shown a great deal of interest in incorporating aromatherapy into patient care but the lack of empirical evidence has been a barrier.[17] The lack of studies is even more evident in the pediatric population.

While existing research is not definitive, a number of studies point to promising uses for clinical aromatherapy in pain management, [18,19,20] for symptom management in cancer care, [21,22,23,24] for abdominal pain in children with irritable bowel syndrome, [25,26] for treatment of postoperative nausea [27,28] and for calming of adolescent psychiatric patients. [29] Additionally there are many case reports of clinical aromatherapy for a range of conditions including relaxation, reduction of anxiety, relief of insomnia and prevention of infections. [16,18,30,31] In general, this literature suggests that the use of essential oils is a treatment approach that is gentle, non-invasive, safe and cost-effective and can be used as part of an integrated, multidisciplinary approach for optimizing outcomes in children facing a variety of health challenges.

Although the exact mechanism of therapeutic change that occurs with use of essential oils is unknown several possibilities exist. Inhalation of odors may activate the limbic system gener-

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ating an effect on arousal and emotional response. Smelling an essential oil may evoke memories and feelings, and recollection of pleasant, scent – associated memories might be related to positive emotional connections leading to general relaxation and stress reduction.[18] There may be biological or energetic effects on the autonomic nervous system from the essential oils.[32] Essential oils are also used as topical preparations in which they are absorbed locally and into the blood stream. At the local area specific anti-inflammatory or antiseptic effects are noted. There may be other specific effects for inhaled or ingested oils such as the anti-spasmodic effects of peppermint or eucalyptus, or the sedative, anxiolytic or analgesic effects of lavender. These effects are dependent on the specific chemical properties of the alcohols, esters, aldehydes, phenols, and terpenes that comprise each essential oil.[18,31]

Anecdotal evidence suggests that specific essential oils will produce a predictable range of cognitive and emotional responses; however, there is variation by individual. For example, lavender is reported to be relaxing and it is often used for stress reduction and sleep promotion whereas peppermint is often cited as alerting and is used to promote wakefulness.[18,31] Studies have been carried out in animal models and in humans to better delineate effects of specific essential oils on cognition, memory, and emotional response. These studies have demonstrated a complex interaction between effects of the essential oils, type of mental process being tested, and subject factors such as preference for a given essential oil.[33,34,35,36]

Studies of essential oil of lavender (*Lavandula officinalis*) highlight the range of responses. Lavender is generally thought to produce relaxing or sedative effects. It was found to reduce activity levels in mice when administered by inhalation.[36] However, in humans when it was inhaled during a work break, it enhanced subsequent work performance, while jasmine, which is considered to be alerting, was found to have no effect.[33] When tested against rosemary, lavender produced a decrease in memory and impaired reaction times whereas rosemary enhanced cognitive performance.[34]

Individual reactions to and preferences for specific essential oils have been shown to have an effect on the mental processing of test subjects. Moss et al[34] noted that control subjects who experienced cognitive testing with no essential oil were less content than groups exposed to either lavender or rosemary. In another study, subjects who were exposed to clove essential oil reported experiencing a more negative mood and were less likely to return for remaining testing sessions than the lavender group.[37] Finally, Yagya [38] demonstrated that subject preference for an essential oil effected EEG changes in response to jasmine and lavender aromas. Although lavender was shown overall to be sedating in comparison to jasmine, those subjects that favored an essential oil showed an increase in alpha activity as compared to those that reacted unfavorably. The author stated that the "quality of the EEG changes depended on both the direct effects of the essential oil and the subjects' preferences.

Exposure to essential oils may affect subjects' response to and memory of a situation. Gedney et al[39] found that there was no difference in report of pain between groups exposed to essential oils of lavender or rosemary as compared to a control of distilled water. However, in retrospective evaluation subjects reported less pain intensity and pain unpleasantness after lavender treatment (and a trend in that direction with rosemary) as compared to control. The researchers postulated that although there was no detectable analgesic response, the use of essential oils might have provided a pleasant olfactory stimulus that led to more positive appraisal. No differences were noted between men and women in this small sample (N=26) although there was a trend toward men reporting less pain intensity and women less pain unpleasantness in subjects exposed to lavender.

This research demonstrates the complex interaction between essential oils and physiologic and psychological factors. An important issue may be the preference of an individual for a particular scent. This might be related to the memories that are evoked by a scent or other personal factors, all of which are difficult to predict in a specific individual. One factor in developing preference for specific scents or smells is the cultural or ethnic context in which we live. Throughout our lives we are exposed to a variety of smells and aromas through contact with people, cooking, cleaning products, perfumes, and plants. Odors may take on cultural values and reaction to smell will often depend on these cultural references.[40,41]

Children are very different from adults in their preferences for odors and tastes. The bulk of knowledge in the arena of aromatherapy is based on experience with adults and may not be directly applicable to children. It is the authors' experience that some essential oils recommended for children are often described by children as unappealing. Children often approach new smells and tastes cautiously and may make decisions regarding aromatherapy based on their first exposure. Ethnic and gender variation may also be a component in how children react to and participate in therapy. Children are unlikely to use or benefit from essential oils they find unpleasant.

There are significant benefits to understanding children's preferences for essential oils. Increased knowledge will help practitioners make appropriate choices when presenting oils to children. By initially choosing an essential oil that a child is more likely to favor, a positive experience is created and the child is more likely to be intrigued and cooperative, enhancing treatment adherence. Additionally aromatherapy is often coupled with other CAM approaches, such as massage, or used to create a welcoming, healing environment. Utilization of a pleasing aroma can create a response of relaxation or calmness whereas introduction of a scent that is perceived as unpleasant could negatively impact a child's willingness to participate in care. Having a better understanding of children's preferences is important in designing pediatric spaces and working with pediatric patients. However, there have been no formal studies of children's preferences to aid in the process of determining which essential oils are most likely to be accepted by children and if there is gender or ethnic variation.

METHODS

Participants

Subjects were healthy children six to twelve years of age and were of non-Latino Caucasian (N=48) or Latino (N=39) ethnic groups. Excluded from this study were children with significant impairment in olfaction, mental retardation, communication

Table 1. Essential Oil Information

Common name	Sweet Orange	Lemon	Spearmint	Peppermint	Ginger	Lavender
Latin name	*Citrus sinensis*	*Citrus limonum*	*Mentha spicata*	*Mentha piperita*	*Zingiber officinale*	*Lavandula angustifolia*
Country of origin	Italy	Italy	USA	Italy	Sri Lanka	Bulgaria
Plant part	Peel	Peel	Leaf	Leaf	Rhizome	Flower
Extraction method	Expressed	Expressed	Distilled	Distilled	Distilled	Distilled
Growing method	Biodynamic*	Biodynamic*	Organic	Biodynamic*	Organic	Organic

*Derneter Biodynamic certification: products were produced without the use of synthetic pesticides and fertilizers and without animal by-products; the use of genetic engineering is prohibited

deficits, severe acute mental illness, or multiple environmental allergies. The mean age of non-Latino Caucasians was 8.6 years, similar to that of Latinos at 8.8 years. The gender distributions of the two groups were statistically similar where 41.7% of the non-Latino Caucasian group was male compared to 59.0% of the Latino group.

Recruitment

Subjects were recruited through a flyer that was placed in the hospital's staff newsletter and at local schools and clinics. Interpreter/cultural care staff distributed flyers to families as well. These flyers described the study, eligibility requirements, and contact information. An option for a Spanish language contact was included. Screening of potential participants was done by telephone when the parent called for information. If the child met inclusion criteria and the parent agreed to be present for the testing, an appointment was made and a packet was sent out that included study information, parent consent and child assent forms and directions. Flyers and information were provided in English or Spanish. Enrollees received a reminder call a few days prior to the appointment.

Setting

Testing was carried out on in a pediatric integrative medicine clinic on the campus of a Midwestern children's hospital. The clinic was closed to other patients at the time of the testing. Subjects were scheduled for a specific block of time and total testing time averaged 30-45 minutes for each participant.

The study was submitted to the Institutional Review Board of the hospital and approved on June 27, 2005. Consent and assent forms were provided to participants in both Spanish and English. Child participants were provided a $15.00 gift certificate to a local department store and an essential oil of their choice for participating. In order to assure safe use the chosen essential oil was given to a parent. Parents were provided with a parking voucher or a bus pass in addition to a gift bag of Aveda cosmetic products.

DATA COLLECTION METHODS

Procedures

The essential oils used in the study were peppermint, spearmint, ginger, lavender, sweet orange and lemon supplied by the Aveda Corporation. All of the oils were either certified organic or biodynamic (Demeter) certified. See Table 1. These oils were chosen for their relative safety, because they were scents that would be familiar to participants, and because they were commonly used in clinical work with children for relaxation, alerting, or management of nausea.

To insure quality, Aveda Corporation provided pure and undiluted plant-derived essential oils that had been tested by Gas Chromatography Mass Spectrometry (GCMS) to verify their chemical profile and assure their quality. Additionally each type of essential oil used in this study came from the same lot to reduce any variation. Material Safety Data Sheets (MSDS) were provided for all essential oils.

When subjects arrived, written consent and assent was obtained and an enrollment form that documented age, gender, ethnicity, health problems, use of medications, and allergies was completed. Subjects were sent individually to a series of six rooms, each containing a single essential oil. Upon entering each room children were greeted by the tester who explained that they would be asked to smell an essential oil and then answer questions. Children were not told the name of the essential oil. The tester dipped a blotter strip into the undiluted essential oil and presented it to the subjects to smell. They could hold the strip themselves or the tester would hold it for them. They could smell it as often as they wanted, although the majority of the children smelled it only once. The subjects were then asked to answer three-forced choice questions and one open-ended question regarding their reaction to the essential oil. See Table 2. It was possible that a previous oil might affect a child's reaction to a subsequent oil. In order to minimize those carryover effects participants were offered the essential oils in random order to provide each oil at the six possible positions of the sequence.

Measures

Essential oil score card. Scoring criteria was designed to assess the participant's judgment of each oil's effect on his/her mood and energy level, as well as how much it was liked. These questions were placed on a scale of 1 to 5. The participant was also asked if the oil evoked any thoughts. Questions on the scorecard were administered orally with Spanish translators available as needed. Questions were pre-tested on children in this age group to ensure that the questions were understood as intended.

Data Analysis

Differences in scores on each of three questions for males compared to females and for non-Latino Caucasian compared to Latino were analyzed for significance with independent non-

Table 2. Essential Oil Score Card

Question	Responses
1) Which words describe how you like this smell?	1=Really Great, 2=Like it, 3=Not sure, 4=Don't like it, 5=Really terrible
2) How does this smell make you feel?	1=Very happy, 2=A little bit happy, 3=No change, 4=A little bit sad, 5=Very sad
3) How does this smell make your body feel?	1=Lots of energy, 2=A little bit of energy, 3=No change, 4=A Little bit relaxed and calm, 5=Very relaxed and calm
4) Did smelling this oil make you think of anything?	Yes, No, If yes what?_____

parametric two-sided Wilcoxon U tests. This test was selected based on applying the Wilks-Shapiro Test, which rejected normality in all sub-groups. Significant results are reported with mean ranks. Question number 3 describing how the aroma made their body feel was further analyzed by grouping the two energy selections (Energetic) and the two relaxed and calm selections (Calm/Relaxed) and a third "No change" group. Chi-square and Fisher exact statistics were used to compare these three groups by ethnicity within gender. Results were reported as significant at $p < .05$. SPSS 11.5 (SPSS, Chicago, Ill) was used for the analyses.

RESULTS

There were some differences in scores for 3 of the 6 aromas as described in Table 3. Although only one of the following results met the criteria for $p<.05$, the additional items suggest that differences may exist at $p<.1$ Females were significantly more likely to feel "happy" when smelling sweet orange as compared to males ($p=.043$). Females reported feeling more "energetic" than males when smelling spearmint ($p=.055$) Latinos liked spearmint better than Caucasians ($p=.075$). Males felt more "energetic" than females when smelling ginger ($p=.091$).

The distribution of responses for sweet orange by gender to question 2: "How does this smell make you feel?" which was significant at $p=.043$ demonstrated the magnitude of the response difference where the percent of males responding "very happy" or" happy" was 67% compared to females at 86%. Males were more than twice as likely to respond with "No Change" as compared to females. See Figure 1.

Differences by ethnicity within gender for question 3, "How does this smell make your body feel?" were significant for sweet

Table 3. Median Scores for All Aromas

		Gender		Ethnicity	
Score Card	Oil Code	Male	Female	Latino	Non-Latino Caucasian
Question 1. Which words describe how you like this smell?	**GI**	4	4	4	4
	LA	3	3	3	3
	LE	2	2	2	2
	PE	2	2	2	2
	SO	2	2	2	2
	SP	2	2	2[c]Mean Rank: 38.45	2[c] Mean Rank: 47.69
Question 2. How does this smell make you feel?	**GI**	3	3	3	3
	LA	3	2.5	2	3
	LE	2	2	2	1.5
	PE	2	2	2	2
	SO	2[a] Mean Rank: 48.62	2[a] Mean Rank: 38.38	2	2
	SP	2	2	2	2
Question 3. How does this smell make your body feel?	**GI**	3[d] Mean Rank: 39.64	3[d] Mean Rank: 48.47	3	3
	LA	3	4	4	4
	LE	3	3	3.5	3
	PE	3	3	3	3
	SO	3	3	3	3
	SP	3.5[b] Mean Rank: 48.65	3[b] Mean Rank: 38.58	3	3

Aroma Codes: Ginger (GI), Lavender(LA), Lemon(LE), Peppermint(PE), Sweet Orange(SO), Spearmint(SP)

[a]$p=.043$,
[b]$p=.055$,
[c]$p=.075$,
[d]$p=.091$

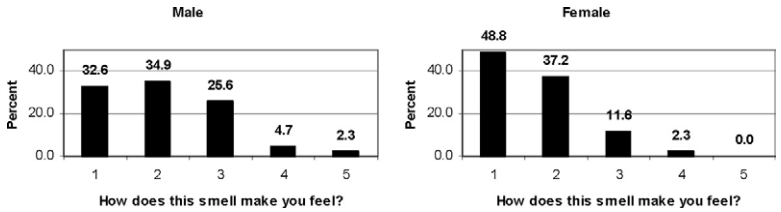

Figure 1. Responses to question 2 for sweet orange, by gender. 1, very happy; 2, a little bit happy; 3, no change; 4, a little bit sad; and 5, very sad.

orange among females (p=.038) and for peppermint among males (p=.037) when "Lots of energy" and "A little bit of energy" were grouped to "Energetic", and "A little bit relaxed and calm" and "Very relaxed and calm" were grouped to "Calm/Relaxed". In the case of sweet orange, female Latinos were more likely to respond "Calm/Relaxed" at 56.25% compared to non-Latino Caucasians at 18.51%. In contrast, 55.56% of non-Latino Caucasian females responded with "Energetic" compared to Latinos at 31.25%. Non-Latino Caucasian females were twice as likely to respond with "No change" compared to Latino females. See Figure 2.

In the case of peppermint, male non-Latino Caucasians were more likely to respond "Calm/Relaxed" at 45% compared to male Latinos at 30.4%. In contrast, 65.2% of Latino males responded with "Energetic" compared to non-Latino Caucasians at 30%. Non-Latino Caucasian males were more than five times as likely to respond with "No change" compared to Latino males. See Figure 3.

Participants were given the opportunity to select an aroma to take home. Among Latinos, spearmint and sweet orange accounted for 81 % of male and 73% of female choices. See Table 4. Among non-Latino Caucasians, lemon and sweet orange were the most frequently selected aromas with totals of 60% for males and 60.7% for females. There is a significant difference between choice of spearmint by ethnic group (p<.01) where 38.9% of Latinos chose spearmint compared to 10.4% of non-Latino Caucasians. This result parallels the response to question 1, "Which words describe how you like this smell?" in which Latinos were more likely to give this question a more positive response than non-Latino Caucasians (p=.075). Both ginger and lavender were rarely selected.

Overall, 72.6% of subjects selected the essential oil that elicited the highest score for question 2, "How does this smell make you feel?" while 64.3% selected the oil that reflected the highest score for question 1, "Which words describe how you like this smell?". This suggests that the emotional effect of a smell on a participant may have had a greater impact on choice than the degree to which it was preferred. This difference was demonstrated only for non-Latino Caucasians (p<.01) where both males (70% vs. 55%, p=.05) and females (82.1% vs. 71.4%, p<.01) were significantly more likely to select an essential oil based on high scores for question 2. See Table 5.

The last question was "Did smelling this oil make you think of anything?" There were a total of 392 responses to this question and children's responses varied from comments about the smell itself ("It was minty") to describing a memory evoked by the smell. Most responded with an answer that matched the type of oil they smelled, such as "lemonade" when smelling lemon. The majority of the responses were pleasant or neutral, such as "candy", "flowers" or "toothpaste". There were 14 clearly negative responses to the six oils including: "vomit", "barf", "bad", "weird" and "dirty garbage", where 11 of the 14 were associated with ginger or lavender. There were no clearly negative word responses to either peppermint or lemon. Fifteen responses were

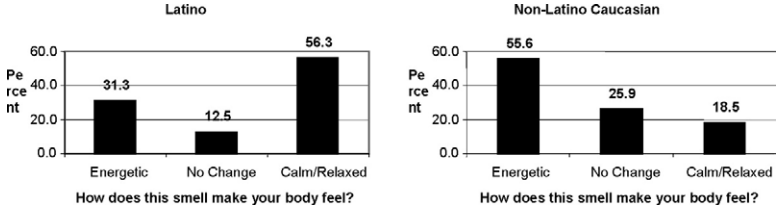

Figure 2. Female responses to question 3 for sweet orange, by ethnicity.

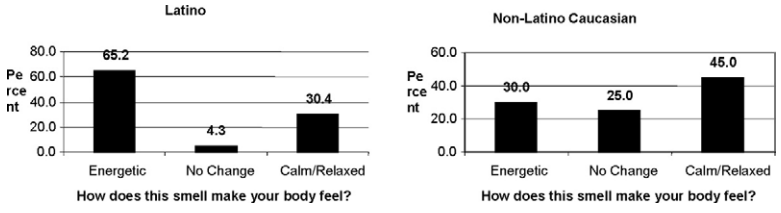

Figure 3. Male responses to question 3 for peppermint, by ethnicity.

Table 4. Percent Selecting Aroma to Take Home

	Latino		Non-Latino Caucasian	
	Male	Female	Male	Female
Ginger			5.0	3.6
Lavender	4.8		10.0	10.7
Lemon	14.3	26.7	35.0	32.1
Peppermint			15.0	14.3
Spearmint	42.9	33.3	10.0	10.7
Sweet Orange	38.1	40.0	25.0	28.6

memory associations such as "my aunt from Mexico", "a flower in Ecuador", or "grandma's house". Memory responses occurred equally for the six essential oils and were more likely to be reported by Latino children. Ginger and lavender evoked the widest range of responses. Children described ginger in terms such as "walking through a park" to "beans", to "vinegar". And lavender ranged from "going potty", to "tangerine" to "honey, when you pick it off a tree". Children were also more likely to have no response to the memory question if they were smelling ginger (N=46) or lavender (N=43). As noted above ginger and lavender were rarely selected as essential oils that children wished to take home with them.

DISCUSSION

This study demonstrates that children have specific preferences for scents. It supports the need to offer children aromatherapy options in order to help them choose essential oils that are pleasing and help promote the therapist's desired effect. The need for individualized choices is made apparent by the variation between ethnic groups and also within ethnic groups between males and females.

The essential oils tested in this study were oils that are commonly recommended for a variety of common concerns including nausea (peppermint, spearmint and ginger) anxiety and insomnia (lavender and sweet orange), mental fatigue (lemon and peppermint) and pain (lavender and peppermint). Better understanding of the uses and effects of essential oils as well as children's preferences will enable better use of this therapy. It was clear from this study that some essential oils have a higher likelihood of being pleasing to school-age children and that, like other therapies, aromatherapy may be more effective when customized to children. Developmental stage, cultural, experiential, and personal preference are all important considerations when working with children. Scent preferences of children may not align with adult preferences. While adult studies often report subjects' preference for lavender, children in this study generally rated it low.

This sample of participants demonstrated that school-age children perceive aromatherapy as acceptable and appealing. This effect is more likely to be enhanced if children's initial experience is positive. Although no one essential oil is preferred by all children, this study indicated that there are particular essential oils that are more likely to be accepted, such as sweet orange or lemon and that others such as ginger are more likely to be perceived negatively. When working with a child who is uncertain about using essential oils it would set a more positive therapeutic environment to start with those oils that are more likely to be perceived as pleasing and may increase the child's willingness to explore other options.

This study also demonstrated that children are generally attracted to and willing to try aromatherapy as a treatment option. With only two exceptions, the participants were willing and interested subjects. They offered their opinions, both positive and negative regarding the essential oils, and were willing to continue on to the next essential oil even if they did not care for the previous one. The testing was terminated in only one subject who began to cry and did not wish to continue. A second subject gave negative responses to all the essential oils but wished to continue through to the end of testing. Additionally the investigators found recruitment to be very easy for this study. Overrecruitment was done to cover no shows but on the day of testing most subjects came at their appointed time.

Reactions to specific essential oils may be guided by cultural experience. In this study more non-Latino Caucasian males described peppermint as calm/relaxing than energetic, whereas it is normally thought of as an alerting essential oil. Additionally the strong negative reaction to ginger might be less profound in another cultural group, such as Asian populations in which it is commonly used in cooking.

LIMITATIONS

There were a number of elements that made this project challenging. It was important to focus on an age group since developmental and cognitive changes would effect how children reported preferences and preference might change with aging. However, there is continual, cognitive, psychological, and neurological growth throughout childhood. The 6-12 year old age span was chosen as it is frequently utilized in pediatric research because it roughly corresponds to Piaget's stage of concrete operations, Erickson formulation of middle childhood, and Freud's latency period. Although developmental timelines are individual this age range established some developmental consistency and made the study more comparable to other pediatric studies.

Emotional or cognitive state of the children on the day of the study might also affect results. The researchers were all experi-

Table 5. Percent Selecting One of Their Highest Scored Aromas

	Latino		Non-Latino Caucasian	
Score Card	Male	Female	Male[a]	Female[b]
Question 1 Describe how you like this smell	66.7	60	55	71.4
Question 2 How does this smell make you feel?	66.7	66.7	70	82.1

[a]p=.05,
[b]p<.01

enced pediatric providers and reported that the participants, with two exceptions (as noted above), all were interactive and seemed pleased to have the opportunity to participate. Future studies might be strengthened by using a simple self-report measure for children to report on their emotional status on the day of testing.

It was a challenge to determine a reporting tool that was simple and easy to use and would capture children's responses to essential oils on cognitive and emotional levels. Tools based on words were designed based on the researchers' experience with children of this age group. It was felt this offered a better opportunity to explore both physical and emotional reactions than pictorial scales such as a faces scale. However, each child's concept of what constitutes a little or a lot of energy or a little or very sad might vary significantly. Providing a reference source for children as they answered each question might enhance a study of this nature.

Subject enrollment had to be tightly controlled during the study as families often had older and younger children that also wanted to participate. The research team found that it was challenging to help parents understand the need for in-person parental consent. In three cases Latino children came with other relatives and could not be tested. It was not clear if this was an issue of inadequate translation during telephone enrollment, the Latino population being less familiar with research protocols, the nature of family structure in which close relatives assume parental roles or the nature of the study, which seemed fun and included a desirable gift certificate.

Cultural variation is difficult to define. It exists within as well as across ethnic and racial groups. In this study the groupings of Latino and non-Latino Caucasians still contained a great deal of internal variation. For example Latinos could have been recent immigrants from Mexico, Central or South America or have been in the United States for many years. Tighter groups might have offered different results but would have presented significant issues in recruitment and obtaining an adequate sample. Having subjects list their ancestry or country of origin for better comparison might strengthen a future study. Results of this study cannot be applied to other racial or ethnic groups.

Essential oils are used therapeutically as single oils and in aromatherapy blends. The focus of this study was to evaluate preferences for single essential oils. Future studies that focus on blends of essential oils and children's choices in putting blends together would be interesting. In this study essential oils were presented undiluted on a smell strip. Since children are most often exposed to essential oils in a dilution, the undiluted form may have provided a smell that was stronger creating less preference for some oils, such as lavender, than was expected. A study comparing reactions to undiluted versus diluted essential oils would strengthen the knowledge base regarding children's responses to essential oils. Additionally essential oils vary with product lots so these results are specific to the essential oils tested.

Future studies should be done to compare additional ethnic or racial groups as well as school age children to adolescents. Identifying scent preferences within certain symptom management categories, such as pain or nausea would help clinicians in clinical pediatric practice. Outcome studies on specific clinical applications and safety are especially needed. For providers discussing CAM therapies with patients, aromatherapy is an option that is safe and low cost. However, without further validation of its efficacy providers may be hesitant to recommend this therapy.[42] Therefore it is important to continue to advocate for continued research on aromatherapy specifically and CAM generally in pediatrics.

CONCLUSIONS

This study demonstrates that children do have scent preferences for essential oils and that these preferences may vary both by gender and ethnicity. It continues to support past work demonstrating that response to essential oils is a complex process affected by multiple variables including gender, cultural exposure to specific odors, and/or individual experiences that create either pleasant or unpleasant memory associations.

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