Dog Behavior, 1-2024, pp. 13-22 • DOI 10.4454/db.v4i1.185

Effectiveness of lavender aromatherapy in reducing canine stress in a veterinary setting: A pilot study

Ariana Hope Yelverton[1], Emmanuel Perez[1], Brittany Hall[1], Megan Broadway*[1]

[1] *University of Louisiana at Monroe, 700 University Ave, Monroe LA, 71209, USA*

Abstract: Aromatherapy has been shown to provide significant calming effects for people, but there have been relatively few studies assessing possible benefits for animals. This study investigates the anxiolytic effects of lavender aromatherapy on dogs held in a veterinary setting. Dogs in the treatment group who were exposed to lavender aromatherapy were observed laying down more frequently and displayed more ground-level head positions, which indicated a calmer state compared to the control group. Additionally, the treatment group exhibited significantly lower alert and tense statuses, as well as reduced perceived stress levels, highlighting the potential calming effects of lavender aromatherapy for dogs in this setting. The findings suggest that lavender aromatherapy may serve as a simple, non-invasive method to alleviate stress in dogs during short term veterinary stays when the owner is not present and may enhance overall well-being. This study adds to the limited research on aromatherapy's therapeutic use in animals and suggests further investigation into its efficacy across different species and settings.

Key Words: dog, anxiolytic, essential oil.

* *Corresponding Author*: megan.s.broadway@gmail.com

Introduction

Canine stress, and more specifically fear, in a veterinary setting has become a recognized problem that continues to be discussed in the veterinary literature (Demaline, 2018; Edwards et al., 2019; Kartashova et al., 2021; Riemer et al., 2021; Wess et al., 2022; Jokela et al., 2023). Canines rely heavily on their sense of smell (Alvites et al., 2023). Therefore, modifying the clinic's sensory environment through the use of aromatherapy could be an effective way to reduce stress (Herron & Shreyer, 2014; McCaskill, 2021; Edwards et al., 2023) and create a more calming atmosphere for animals.

Dunning (2013, pg. 1) defined aromatherapy as "the controlled use of essential oils from named botanical sources using a variety of application (external) or administration (internal) methods to suit the individual's needs to promote and support health and wellbeing using an evidence-based quality use of medicines approach." Essential oils are highly concentrated, complex phytochemicals that are extracted from specific plant parts (Dunning, 2013), such as the leaves, flowers, roots, or stems (Solorzano-Santos & Miranda-Novales, 2012). As such, the oils derived from each plant part possess disparate chemical composition and uses. Essential oils are administered via aromatherapy to produce specific effects in an individual. Some essential oils can stimulate arousal, such as peppermint and rosemary (Kovar et al., 1987; Graham et al., 2005), and therefore may exacerbate stress in an individual, while other essential oils are known to decrease arousal resulting in a calming effect (Graham et al., 2005; Ali et al., 2015).

Lavender is one of the most popular essential oils for reducing stress (see McCaskill, 2021). Lavender has been shown to decrease stress and anxiety in humans (see Setzer, 2009) and animals, including mice (Takahashi et al., 2012), gerbils (Bradley et al., 2007), rats (Shaw et al., 2007), horses (Bini de Lima et al., 2023), pigs (Bradshaw et al, 1998; Elmi et al., 2024), and cats (Goodwin & Reynolds, 2018; Ellis & Wells, 2010). A few studies have demonstrated its effectiveness in dogs (Graham et al., 2005; Wells, 2006; Komiya et al., 2009; Amaya et al., 2020b; Stanghellini, 2019; Amaya et al., 2020b).

Submitted, 09/3/2024
Accepted, 11/20/2024

However, not all studies testing the efficacy of lavender aromatherapy demonstrated clear benefits. For example, Uccheddu et al. (2018) found that one drop of lavender oil on the collar of dogs in a shelter resulted in a significant reduction in saliva cortisol levels. Yet, similar results were also seen in the control group (Uccheddu et al., 2018). Pattillo et al. (2021) used passive diffusion (cotton balls clipped above the kennels) in a shelter environment to test four essential oils. They found no significant effects of lavender or the other scents tested, possibly due to the method of diffusion (Pattillo et al., 2021). Given the inconclusive results of these previous studies and lack of testing conducted in a veterinary setting, the current study aims to explore the impact of lavender aromatherapy on reducing stress related behaviors and increasing relaxation of healthy dogs housed in a veterinary clinic.

Methods

Data were collected at Morris Veterinary Hospital in Rayville, Louisiana, USA, between January 17, and March 22, 2022. Data included a sample of 20 different dogs between the ages of eight months old and two years. These dogs were healthy individuals that were brought in at around 7 A.M. for spay/neuter procedures and were picked up by their owners in the afternoon between 4 and 5 P.M. The group consisted of a mix of breeds and sexes. Dogs were held in an enclosed, canine holding room. The room was approximately 3 x 6 meters, containing six kennels on one side and nine small cages on the other. The large kennels were 1 x 1.5 meters. Although up to 15 (six medium/large and nine small) dogs could be housed in the holding area at one time (one dog per kennel), the room typically held between two to five dogs at a time.

To avoid scent contamination, data were first collected for a control period to obtain video recordings for a control group of ten dogs. This was followed by a treatment period where aromatherapy using lavender was administered to obtain video recordings of ten additional dogs. A flexible tripod and a GoPro 7 Hero camera were used for recording. The tripod was attached to a shelf, ~2 meters above the ground on the wall opposite the large kennels. The tripod's position resulted in the visual field of the GoPro being limited to three of the five large kennels. A Sharper Image – misting diffuser was used to administer the aromatherapy scent during the treatment condition. The diffuser had a water capacity of 180 ml/6.0 fl oz and a misting volume of 300 - 400 sq ft. During the treatment condition, five drops of Young Living –, 100% therapeutic grade lavender essential oil and 180 ml of water was added to the diffuser's water receptacle before recording each day. The water solution was emptied and dried at the end of each recording period. Throughout the study, recording began at 7 A.M. and concluded at 8 A.M. daily.

Ethogram and Scoring Procedure

Table 1 depicts a behavioral ethogram used to categorize and define 25 behavioral variables. The ethogram was created to better represent behavior of dogs that are kenneled rather than leashed and included behaviors to capture information on the state of arousal. Ethograms with similar components have been used by Pastore et al., (2011); Beerda et al., (1998); Carrier et al., (2013); and Hekman et al., (2012).

Table 1. Working Ethogram

Category	Behavior	Definition	Scoring
Body Position	Laying down	Chest and stomach are on the ground.	0-1
	Sitting	Hind quarters are on the ground with front legs and chest upright.	0-1
	Standing	Only back paws are touching the ground.	0-1
	Walking	Moving around in the kennel on all four legs.	0-1
	Jumping	Both front extremities leave the ground simultaneously.	0-1
Head Position	Ground Level	Head is touching the ground and remains in this position for more than two seconds.	0-1
	Body Level	Head is at or above the level of the torso and remains in this position for more than two seconds.	0-1
	Looking Around	Head is moving in different directions or positions every few seconds.	0-1
Kennel Position	Front	Positioned at the front two thirds of the kennel.	0-1
	Middle	Positioned at the second third of the kennel.	0-1
	Back	Positioned at the last third of the kennel.	0-1
Vocalization	Whimper	Whiney, feeble vocalization.	0-1
	Bark	Sharp, explosive vocalization.	0-1
	Growl	Low, aggressive vocalization.	0-1
	Howl	Extended, loud vocalization with head and neck extended upward.	0-1
Activity	Digging	Pawing at ground level.	0-1
	Pawing	Pawing above ground level; includes pawing at the kennel.	0-1
	Hiding	Covering or hiding face.	0-1
	Licking Self	Licking own body.	0-1
	Licking Other	Licking anything other than their own body.	0-1
	Yawning	Wide opening of mouth without loud noise production.	
Status	Hunched	Raised shoulders in combination with heat bent over.	0-1
	Alert Status	Rating of dog's level of alertness. 0. Unfocused; Appears inattentive. 1. Moderate: Intermediate level of alertness. 2. Alert: Appears focused.	0-2
	Tense Status	Rating of dog's level of tenseness. 0. Relaxed: Musculature and mood seem comfortable. 1. Moderate: Intermediate, neither relaxed nor tense. 2. Tense: Musculature and mood seem tight and rigid.	0-2
	Perceived Status	Rating of dog's perceived stress appearance. 1. Extremely relaxed. 2. Moderately relaxed. 3. Slightly relaxed. 4. Neither stressed nor relaxed. 5. Slightly stressed. 6. Moderately stressed. 7. Extremely stressed.	1-7

Each one-hour recording was coded based on 15-second intervals. Most behaviors and positions were recorded as either present or absent. The variables alert status and tense status were scored as low, moderate, or high, 0-2 respectively (Table 1). The perceived stress score ranged from one to seven, with one being least stressed and seven being most stressed. All items on the ethogram were scored according to the behaviors, positions, and conditions observed during the entirety of the 15-second interval. Therefore, more than one head position, kennel position, or body position could be recorded for a single interval. For example, in a single 15-second interval, a subject could be recorded as being in the front, middle, and back of the kennel if the dog changed positions during the interval.

Coding was conducted by two observers through visual inspection of the video recordings (inter-rater reliability > 80%). One coder was completely blind to the study condition. The other coder was responsible for setting up and removing the video equipment during data collection, therefore, was technically not blind to the condition. Each coder was responsible for coding and rating specific videos, which meant coding and rating behaviors for up to three dogs at a time for the entire hour of video footage.

Analytical Methods

For behaviors and conditions that were scored as presence/absence, the total number of intervals with occurrences for each variable was summed for each canine. All further reference to frequency or occurrences refers to the number of intervals where the behavior was present. This approach was used to ensure an accurate representation of frequently occurring behaviors, preventing overrepresentation, while also uniformly capturing behaviors that were performed continuously (such as laying down). Variables included: laying down, sitting, standing, walking, jumping, ground level, body level, looking around, front, middle, back, whimper, bark, growl, howl, digging, sniffing, pawing, hiding, licking self, licking other, yawning, and hunched. For variables with more than two possible ratings (tense status, alert status, and perceived stress status), the scores for each dog were averaged. Statistical analysis was conducted using SPSS and Microsoft Excel.

Results

Body positions included laying down, sitting, standing, walking, and jumping (Fig. 1). Laying down and jumping were the only body position that differed significantly between the treatment and control groups, Mann Whitney U Tests: $U = 14$, $z = -2.73$, $p = 0.006$, *ns*, $r = -.61$; $U = 27.5$, $z = -2.1$, $p = 0.036$, *ns*, $r = -0.469$, respectively. Dogs in the treatment group were observed laying down significantly more than any of the other postures, Friedman's ANOVA: $X^2(2) = 31.28$, $p < 0.001$. In the control group, there was more engagement in the higher energy positions such as sitting, standing, walking, and jumping, compared to the treatment group, but occurrences were more evenly distributed, Friedman's ANOVA: $X^2(2) = 6.42$, $p = 0.169$.

Increased ground level head positions consistent with resting or sleeping were seen in higher frequency within the treatment group, Friedman's ANOVA: $X^2(2) = 15$, $p < 0.001$. Head positions at body level and looking around were seen more often in the control group, but there were no significant differences in the distribution of behaviors, Friedman's ANOVA: $X^2(2) = 1.9$, $p = 0.387$. When comparing the treatment and control groups, head positions at ground level were higher for the treatment group (Mann Whitney U Test: $U = 15.5$, $z = -2.61$, $p = 0.009$, *ns*, $r = -0.58$) and head positions at body level were higher for the control group, Mann Whitney U Test: $U = 21.5$, $z = -2.16$, $p = 0.031$, *ns*, $r = -0.48$.

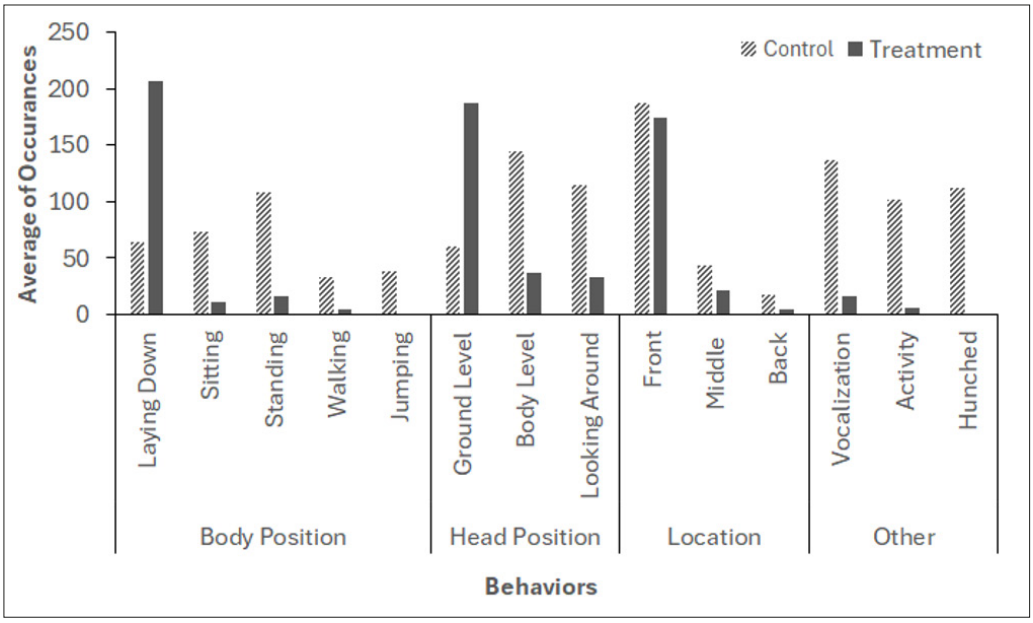

Figure 1. Average Occurrence of Each Behavior for Control and Treatment Groups

Significant differences in kennel spatial usage were detected, Friedman's ANOVA: $X^2(2) = 28.26$, $p < 0.001$. However, there was no difference across conditions (Mann Whitney U Tests: Front $U = 50$, $z = 0$, $p = 1.00$; Middle $U = 47$, $z = -2.32$, $p = 0.816$; Back $U = 50$, $z = 0$, $p = 1.00$). Dogs in both groups, treatment and control, were in the front of the kennels much more than the middle or the back (72 vs 78% of intervals for front, 9 vs 18% middle, 2 vs 7% back, respectively).

Due to low occurrence in the treatment condition, the behaviors digging, sniffing, pawing, hiding, licking self, licking other, and yawning were combined into one category called activity. Activity engagement differed significantly across conditions, Mann Whitney U Test: $U = 12.5$, $z = -2.88$, $p = 0.01$, ns, $r = -0.64$. The control condition participated in significantly more activity, with hiding, digging, sniffing, and pawing being the most frequent behaviors. A different pattern of activity was seen in the treatment group. Although frequencies were low, sniffing, pawing, and licking-self were the most common behaviors observed in the treatment group, produced in nearly equal frequencies.

Vocalizations included whimpering, barking, growling, and howling. Due to the low occurrence of some vocalizations, all vocalizations were combined. More vocalization occurred in the control group compared to the treatment group, Mann Whitney U Test: $U = 20.2$, $z = -2.29$, $p = 0.023$, *ns*, $r = -0.51$. Hunched behavior was observed in the control group at a level similar to that of the activity category. However, it was not observed in the treatment group, therefore statistical analysis was not possible.

The average score for each individual was calculated for alert status, tense status, and perceived stress (Fig. 2). A significant reduction in alert status (control $M = 1.24$, $SE = 0.192$ vs. treatment $M = 0.465$, $SE = 0.140$; Independent Samples T-test: $t(18) = 3.26$, $p = 0.004$, Cohen's d = 0.531) and tense status (control $M = 1.60$, $SE = 0.101$ vs. treatment $M = 0.225$, $SE = 0.089$; Independent Samples T-test: $t(18) = 10.18$, $p < 0.001$, *Cohen's d* = 0.302) was observed for the treatment group. A significant reduction in perceived stress was also observed in the treatment group, Mann Whitney U Test: $U = 0$, $z = -3.78$, $p < 0.001$, ns, $r = -0.85$. A comparison of perceived stress scores showed that the control group had an average stress score of 4.3 out of 7 and the treatment group had an average stress score of 1.4 out of 7.

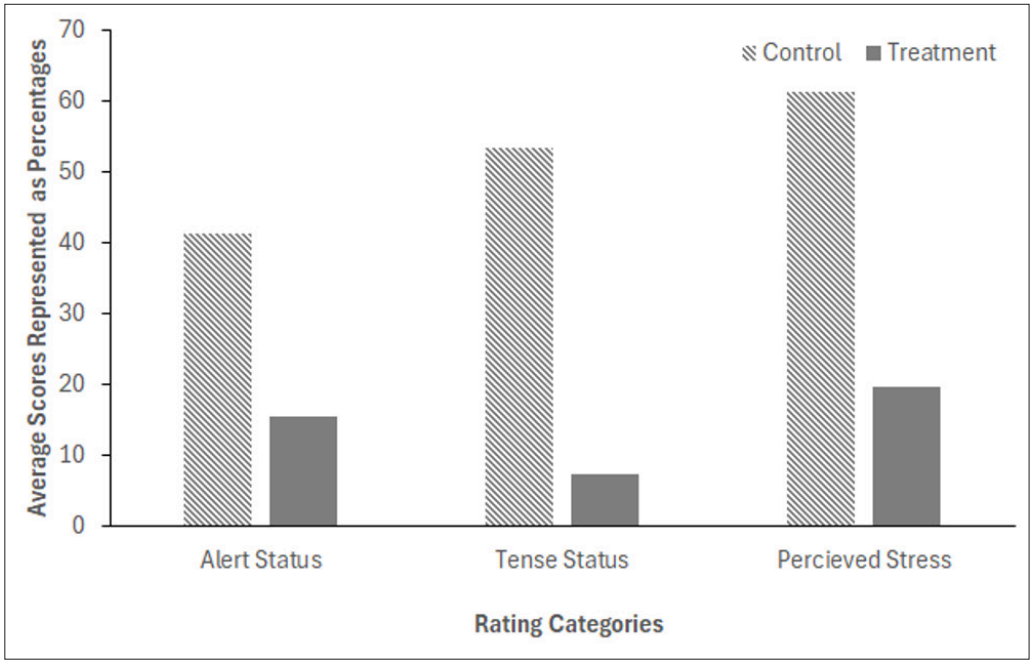

Figure 2. Average Rating Scores for Each Condition for Alert Status, Tense Status, and Perceived Stress

Discussion

The results of this study suggest that the diffusion of lavender essential oil did produce increased relaxation in dogs temporarily kenneled in the holding area of a veterinary clinic awaiting spay and neuter procedures. There were significant increases in behaviors associated with relaxation, such as laying down with head at ground level, and significant decreases in behaviors associated with higher activity levels. The control group displayed significantly more vocalization, activity, and hunched postures. Ratings by independent observers to assess the alertness, tenseness, and perceived stress of each animal showed similar trends, with significantly higher ratings seen in the control group. These results are consistent with previous studies that found lavender essential oil to be effective in promoting relaxation in other settings such as in an animal shelter (Graham et al., 2005; Stanghellini, 2019, Amaya et al., 2020b) or during travel (Wells, 2006). Although the ethograms used in prior studies were different, many of the behaviors monitored were similar.

It is known that dogs can experience, sometimes extreme, stress, anxiety, and fear when undergoing veterinary care (Lloyd, 2017; Demaline, 2018; Edwards et al., 2019; Riemer et al., 2021; Mercier et al., 2023). These behaviors are clearly evident to owners and result in owners wanting to avoid placing undue stress on their canines (Volk et al., 2011; Demaline, 2018). As a result, owners may put off seeking medical attention for their pets when it is needed (Volk et al., 2011; Lloyd, 2017; Demaline, 2018). Due to this delay, animals may be seen when they are "two or three days sicker" than professionals would prefer (Volk et al., 2011).

In this study, dogs were dropped off at the veterinary clinic and left there by their owners. This situation could be stressful for the animal, as it may induce fear of abandonment and alarm. In addition to separation anxiety, dogs may experience overstimulation and fear due to the environment, unfamiliar handlers, unsettling sounds (anxious vocalizations from other animals) and odors that are present (novel chemical compounds, and bodily fluids and tissues from surgeries being performed). Signs of fear and agitation, such as increased vocalization and hunched pos-

tures, were observed in the control group. These behaviors were reduced in the treatment group. Effect sizes were generally strong despite a small sample size, which could be seen as a limitation in this study.

Dogs visit veterinary offices for short term appointments but are often held in clinics for various reasons, such as overnight boarding, scheduled surgeries, and emergency procedures. Diffusion of lavender essential oil may help animals relax in each of these situations and could potentially reduce harm to the animal and staff (Frank, 2014; Lloyd, 2017; Edwards, 2023). In addition, animals often form negative associations at a young age which can last many years (Simpson, 1997; Döring, 2009; Lloyd, 2017). It can be difficult and time consuming to 'undo' negative associations that have already been formed (see Riemer et al., 2021). The use of a simple and relatively inexpensive treatment, such as diffusing lavender essential oil, could reduce dogs' negative experiences and associations with the vet office at an early age.

Different species exhibit differing reactions to particular essential oils; hence it is imperative to carry out suitable testing on each oil before introducing it to animals (Štrabac et al., 2021). Some plant derivatives are known to be toxic to cats and dogs (Genovese et al., 2012; McCaskill, 2021). Additionally, the amount of oil used, its concentration, administration method, and the length of exposure are also critical factors, as animals are known to experience ill or unintended effects to some innocuous oils at high exposures (Lloyd, 2017). Lavender essential oil is generally considered safe when diffused in the presence of dogs, but there are still concerns regarding the safety of other oils and toxicity to other species such as cats and birds (Lloyd, 2017; Vetere et al., 2020; Štrbac, 2021).

Limitations

Data regarding the sex, age, and breed of the dogs in this study was not available to the researchers. It is possible that one of these factors, or other variables, such as the influence of pheromones when males and females were housed next to one another, could have influenced the behavior of dogs in the control or treatment groups. A larger sample size may have helped to mitigate such effects. Having a small sample size could also have been a limitation as this often leads to a reduction in the power of the statistical tests to detect significant differences among groups.

Outside environmental factors could also be of concern. However, the area outside of the holding room was located in a relatively secluded area that received little traffic from staff or other animals. The holding room itself was constructed of concrete blocks with a heavy metal door and no windows. This construction would have minimized outside noises and other influences such as exposure to sunlight. The seclusion and construction would also have helped to minimize exposure to outside smells.

In addition to small sample size, there was one other evident study limitation. One of the coders was not fully blind to the study condition due to being present during data collection. However, the coder was only briefly exposed to the dogs while starting and stopping video recordings. To prevent overexciting the dogs, the researcher was instructed to avoid directly looking at the dogs, and to move in and out of the room quickly with minimal disturbance. There was also a two-week gap between data collection and coding. Additionally, the researcher reported that during the coding process, they were unaware of the study condition of the videos being analyzed. Based on these factors, the authors determined that bias due to prior knowledge of the study condition could not be ruled out, but was unlikely to have occurred. Conclusions

This method of stress reduction is affordable, non-invasive, and low maintenance, making it a convenient choice for widespread use in veterinary settings in hopes of reducing canine stress. Other essential oils like chamomile (Graham et al., 2005) have been investigated with similar effects. Essential oils should continue to be investigated to clarify the effectiveness of lavender es-

sential oil compared to other treatments or methods of delivery, and to test effects in other species that frequent vet clinics, particularly cats (Lloyd, 2017; Štrbac, 2021). Future research should also investigate the effects of lavender oils on behavior in the waiting room and in the exam room with the owner present.

Acknowledgements

We would like to thank Audrey Plants for her assistance with data coding and Morris Veterinary Hospital for allowing research to be conducted at their facility. We would also like to thank Dr.'s Ann Findley and Will Rogers for their expertise and advice on revisions.

References

Ali, B., Al-Wabel, N.A., Shams, S., Ahamad, A., Khan, S.A., & Anwar, F. (2015). Essential oils used in aromatherapy: A systemic review. *Asian. Pac. J. Trop. Biomed.*, *5*(8), 601-611.

Alvites, R., Caine, A., Cherubini, G.B., Prada, J., Varejão, A.S.P., & Maurício, A.C. (2023). The olfactory bulb in companion animals—anatomy, physiology, and clinical importance. *Brain Sci.*, *13*(5), 713.

Amaya, V., Paterson, M.B., Descovich, K., & Phillips, C.J. (2020a). Effects of olfactory and auditory enrichment on heart rate variability in shelter dogs. *Animals*, *10*(8), 1385.

Amaya, V., Paterson, M.B., & Phillips, C.J. (2020b). Effects of olfactory and auditory enrichment on the behaviour of shelter dogs. *Animals*, *10*(4), 581.

Beerda, B., Schilder, M.B., Hooff, J.A. V., Vries, H.W.D., & Mol, J.A. (1998). Behavioural, saliva cortisol and heart rate responses to different types of stimuli in dogs. *Appl. Anim. Behav. Sci., 58*(3-4), 365–381. doi: 10.1016/s0168-1591(97)00145-7

Bini de Lima, A.C., Sebastião da Fé, V.C., Palermo Hernandes, M.S., & Oliveira dos Santos, V. M. (2023). Olfactory stimulation as environmental enrichment for domestic horses—a review. *Animals*, *13*(20), 3180.

Bradley, B.F., Starkey, N. J., Brown, S.L., & Lea, R.W. (2007). Anxiolytic effects of *Lavandula angustifolia* odour on the Mongolian gerbil elevated plus maze. *J. Ethnopharmacol.*, *111*(3), 517-525.

Bradshaw, R.H., Marchant, J.N., Meredith, M.J., & Broom, D.M. (1998). Effects of lavender straw on stress and travel sickness in pigs. *J. Altern. Complement. Med., 4*(3), 271-275. doi:10.1089/acm.1998.4.3-271

Carrier, L.O., Cyr, A., Anderson, R.E., & Walsh, C.J. (2013). Exploring the dog park: Relationships between social behaviours, personality and cortisol in companion dogs. *Appl. Anim. Behav. Sci., 146*(1-4), 96-106. doi: 10.1016/j.applanim.2013.04.002

Demaline, B. (2018). Fear in the veterinary clinic: History and development of the fear free initiative. *Conspectus Borealis*, *4*(1), 2.

Döring, D., Roscher, A., Scheipl, F., Küchenhoff, H., & Erhard, M.H. (2009). Fear-related behaviour of dogs in veterinary practice. *Vet. J.*, *182*(1), 38-43.

Dunning, T. (2013). Aromatherapy: Overview, safety and quality issues. *OA Altern. Med., 1*(1), 6.

Edwards, P.T., Smith, B.P., McArthur, M.L., & Hazel, S.J. (2019). Fearful Fido: Investigating dog experience in the veterinary context in an effort to reduce distress. *Appl. Anim. Behav. Sci.*, *213*, 14-25.

Edwards, P.T., Smith, B.P., McArthur, M.L., & Hazel, S.J. (2023). Implementing stress-reducing veterinary care: Perceptions of Australian veterinary professionals working with dogs. *Anthrozoös*, *36*(4), 555-578.

Ellis, S.L., & Wells, D.L. (2010). The influence of olfactory stimulation on the behaviour of cats housed in a rescue shelter. *Appl. Anim. Behav. Sci.*, *123*(1-2), 56-62.

Elmi, A., Correa, F., Ventrella, D., Scozzoli, M., Vannetti, N.I., Govoni, N., Truzzi, E., Belperio, S., Trevisi, P., Bacci, M.L., & Nannoni, E. (2024). Can environmental nebulization of lavender essential oil (*L. angustifolia*) improve welfare and modulate nasal microbiota of growing pigs? *Res. Vet. Sci.*, *171*, 105251.

Frank, D. (2014). Recognizing behavioral signs of pain and disease: A guide for practitioners. *Vet. Clin. North Am. Small Anim. Pract.*, *44*(3), 507-524.

Genovese, A.G., McLean, M.K., & Khan, S.A. (2012). Adverse reactions from essential oil-containing

natural flea products exempted from Environmental Protection Agency regulations in dogs and cats. *J. Vet. Emerg. Crit. Care*, *22*(4), 470-475.

Graham, L., Wells, D., & Hepper, P. (2005). The influence of olfactory stimulation on the behaviour of dogs housed in a rescue shelter. *Appl. Anim. Behav. Sci.,91*(1-2), 143-153. doi:10.1016/J.APPLANIM.2004.08.024

Goodwin, S., & Reynolds, H. (2018). Can aromatherapy be used to reduce anxiety in hospitalised felines. *Vet. Nurse*, *9*(3), 167-171.v

Hekman, J.P., Karas, A.Z., & Dreschel, N.A. (2012). Salivary cortisol concentrations and behavior in a population of healthy dogs hospitalized for elective procedures. *Appl. Anim. Behav. Sci., 141*(3-4), 149-157. doi: 10.1016/j.applanim.2012.08.007

Herron, M.E., & Shreyer, T. (2014). The pet-friendly veterinary practice: A guide for practitioners. *Vet. Clin. North Am. Small Anim. Pract.*, *44*(3), 451-481.

Jokela, F., Mercier, P., Honeckman, L., Dunham, A.E., & Overall, K.L. (2023). Sensitivity of benchmarked behavioral assays for distress: Should we attend to certain behaviors during exams?. *J. Vet. Behav.*, *66*, 36-42.

Kartashova, I.A., Ganina, K.K., Karelina, E.A., & Tarasov, S.A. (2021). How to evaluate and manage stress in dogs–a guide for veterinary specialist. *Appl. Anim. Behav. Sci.*, *243*, 105458.

Komiya, M., Sugiyama, A., Tanabe, K., Uchino, T., & Takeuchi, T. (2009). Evaluation of the effect of topical application of lavender oil on autonomic nerve activity in dogs. *Am. J. Vet. Res.*, *70*(6), 764-769.

Kovar, K.A., Gropper, B., Friess, D., & Ammon, H.P.T. (1987). Blood levels of 1, 8-Cineole and locomotor activity of mice after inhalation and oral administration of rosemary oil. *Planta. Med.*, *53*(04), 315-318.

Lloyd, J. (2017). Minimizing stress for patients in the veterinary hospital: Why it is important and what can be done about it. *Vet. Sci., 4*(4), 22. doi:10.3390/vetsci4020022

McCaskill, L.D. (2021). The use of essential oils in traditional Chinese veterinary medicine: Small animal practice. *Am. J. Trad. Chin. Vet. Med.*, *16*(2), 67–78. doi.org/10.59565/VGCP9123

Mercier, P., Honeckman, L., Jokela, F., Dunham, A.E., & Overall, K.L. (2023). Using standardized scales to assess fear at veterinary visits: Intra-and inter-rater reliability. *J. Vet. Behav., 62*, 12-17.

Pastore, C., Pirrone, F., Balzarotti, F., Faustini, M., Pierantoni, L., & Albertini, M. (2011). Evaluation of physiological and behavioral stress-dependent parameters in agility dogs. *J. Vet. Behav., 6*(3), 188–194. doi: 10.1016/j.jveb.2011.01.001

Pattillo, M. J., Mitchell, L. N., Catchpole, J. A., & Martin, A. L. (2021). The effects of olfactory enrichment on shelter dog behavior. *The Kennesaw J. Undergrad. Res.*, *8*(1), 1.

Riemer, S., Heritier, C., Windschnurer, I., Pratsch, L., Arhant, C., & Affenzeller, N. (2021). A review on mitigating fear and aggression in dogs and cats in a veterinary setting. *Animals*, *11*(1), 158.

Setzer, W. N. (2009). Essential oils and anxiolytic aromatherapy. *Nat. Prod. Commun.*, *4*(9), 1934578X0900400928.

Shaw, D., Annett, J.M., Doherty, B., & Leslie, J.C. (2007). Anxiolytic effects of lavender oil inhalation on open-field behaviour in rats. *Phytomedicine*, *14*(9), 613-620.

Simpson, B.S. (1997). Canine communication. *Vet. Clin. North Am. Small Anim. Pract.*, *27*(3), 445-464.

Solorzano-Santos, F., & Miranda-Novales, M.G. (2012). Essential oils from aromatic herbs as antimicrobial agents. *Curr. Opin. Biotechnol.*, *23*(2), 136-141.

Stanghellini, A.L. (2019). Effect of lavender (*Lavandula angustifolia*) essential oils on sheltered dog behavior: Preliminary results. *Dog Behav.*, *5*(3), 19-22.

Štrbac, F., Petrović, K., Stojanović, D., & Ratajac, R. (2021). Possibilities and limitations of the use of essential oils in dogs and cats. *Vet. J. of Repub. of Srpska*, *21*(1-2), 238-251. doi: 10.7251/VETJEN2101238S

Takahashi, M., Yoshino, A., Yamanaka, A., Asanuma, C., Satou, T., Hayashi, S., Masuo, Y., Sadamoto, K., & Koike, K. (2012). Effects of inhaled lavender essential oil on stress-loaded animals: Changes in anxiety-related behavior and expression levels of selected mRNAs and proteins. *Nat. Prod. Commun.*, *7*(11), 1934578X1200701132.

Uccheddu, S., Mariti, C., Sannen, A., Vervaecke, H., Arnout, H., Gutienrrez Rufo, J., ... & Haverbeke, A. (2018). Behavioural and cortisol responses of shelter dogs to a cognitive bias test after olfactory enrichment with essential oils. *Dog Behav.*, *4*(2).

Vetere, A., Bertocchi, M., Pelizzone, I., Moggia, E., Travaglino, C., Della Grotta, M., Casali, S., Gerosa, S.,

Strada, L., Filia, K., Casalini, J., Parmigiani, E., & DiIanni, F. (2020). Acute tea tree oil intoxication in a pet cockatiel (*Nymphicus hollandicus*): A case report. *BMC Vet. Res.*, *16*, 1-5.

Volk, J.O., Felsted, K.E., Thomas, J.G., & Siren, C.W. (2011). Executive summary of the Bayer veterinary care usage study. *J. Am. Vet. Med. Assoc.*, *238*(10), 1275-1282.

Wells, D.L. (2006). Aromatherapy for travel-induced excitement in dogs. *J. Am. Vet. Med. Assoc., 229*(6), 964-967. doi:10.2460/javma.229.6.964

Wess, L., Böhm, A., Schützinger, M., Riemer, S., Yee, J.R., Affenzeller, N., & Arhant, C. (2022). Effect of cooperative care training on physiological parameters and compliance in dogs undergoing a veterinary examination–A pilot study. *Appl. Anim. Behav. Sci.*, *250*, 105615.

Efficacia dell'aromaterapia alla lavanda nel ridurre lo stress del cane in un contesto veterinario: uno studio pilota

Ariana Hope Yelverton, Emmanuel Perez, Brittany Hall, Megan Broadway

Università della Louisiana, Monroe, United States

Sintesi

È stato dimostrato che l'aromaterapia fornisce significativi effetti calmanti per le persone, ma sono stati condotti relativamente pochi studi che hanno valutato i possibili benefici per gli animali. Questo studio esamina gli effetti ansiolitici dell'aromaterapia alla lavanda sui cani tenuti in un ambiente veterinario. I cani nel gruppo di trattamento che sono stati esposti all'aromaterapia alla lavanda sono stati osservati sdraiarsi più frequentemente e mostravano più posizioni della testa a livello del suolo, il che indicava uno stato di maggiore calma rispetto al gruppo di controllo. Inoltre, il gruppo di trattamento ha mostrato stati di allerta e tensione significativamente inferiori, nonché livelli di stress percepiti ridotti, evidenziando i potenziali effetti calmanti dell'aromaterapia alla lavanda per i cani in questo ambiente. I risultati suggeriscono che l'aromaterapia alla lavanda può fungere da metodo semplice e non invasivo per alleviare lo stress nei cani durante soggiorni veterinari di breve durata quando il proprietario non è presente e può migliorare il benessere generale. Questo studio si aggiunge alla ricerca limitata sull'uso terapeutico dell'aromaterapia negli animali e suggerisce ulteriori indagini sulla sua efficacia in diverse specie e ambienti.