Aromatherapy for travel-induced excitement in dogs

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Objective—To evaluate the efficacy of the ambient odor of lavender as a treatment for travel-induced excitement in dogs.

Design—Clinical trial.

Animals—32 dogs with a history of travel-induced excitement in owners' cars.

Procedures—Each dog was studied during travel in the owner's car to a familiar walking site during 2 conditions of olfactory stimulation. The first condition was a control condition, during which dogs were exposed to no odor other than that arising naturally from the environment. The second condition was an experimental condition during which dogs were exposed to the ambient odor of lavender. Dogs' behavior was recorded during the car journey for 3 consecutive days under the control condition and for 3 consecutive days under the experimental condition. The percentage of time spent moving, standing, sitting, resting, and vocalizing in each condition of olfactory stimulation was quantified for each dog.

Results—Dogs spent significantly more time resting and sitting and less time moving and vocalizing during the experimental condition. There was no significant relationship between dogs' behavior and sex, castration status, day, or the order of exposure to each olfactory condition.

Conclusions and Clinical Relevance—Traditional treatments for travel-induced excitement in dogs may be time-consuming, expensive, or associated with adverse effects. Aromatherapy in the form of diffused lavender odor may offer a practical alternative treatment for travel-induced excitement in this species. (*J Am Vet Med Assoc* 2006;229:964–967)

The value of odors for promoting psychologic well-being is well documented in the human medical literature. Results of research suggest that both mood[1–3] and behavior[4–6] can be influenced by odors. The scents of lavender, chamomile, and sandalwood, for example, reduce anxiety and encourage positive affect,[3,7,8] whereas those of peppermint, jasmine, and rosemary have been reported to improve alertness and enhance cognitive performance.[9–11]

Recently, research attention has been directed toward the potential value of odors for influencing the well-being of animals. The value of olfactory enrichment has been studied in multiple species including cats,[12–15] mice,[16–19] and pigs.[20] In many of those studies, changes were reported in the behavior or physiologic state of animals exposed to various aromas, including herbs, spices, essential oils, and the excrement or body odor of potential prey.

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Dogs have also been reported to benefit from exposure to certain odors. Dogs housed in a rescue shelter responded to the introduction of diffused lavender and, to a lesser extent, chamomile, by spending more time displaying behaviors suggestive of relaxation such as increased resting and decreased barking.[21] Diffused odor of peppermint and rosemary, in contrast, encouraged greater activity and vocalization, behaviors that were more suggestive of agitation.

The purpose of the present study was to determine the effect of olfactory stimulation with lavender on the behavior of dogs in the confined setting of the automobile. Many dogs are prone to travel-induced excitement, which often arises from the prospect of going for a walk. Typical signs of overexcitement in the car include excessive barking, hyperventilation, and hyperactivity. Not only do those behaviors have implications for the dogs' welfare because they may result in injury, but also they can be a serious distraction to the driver. Traditional treatments for travel-induced excitement have typically relied on counterconditioning or systematic desensitization (eg, taking the dog for a short car journey in the absence of the usual reinforcers), application of antibarking devices,[22] and administration of psychopharmacologic drugs[23] such as β-adrenoreceptor blockers and benzodiazepines. However, these treatments can be time-consuming, expensive, and associated with unwanted effects such as drowsiness.

The present study investigated the effect of exposure to the ambient odor of lavender, an herb known for relaxant properties, on the behavior of dogs traveling in cars to establish whether this type of olfactory stimulation has merit as an alternative treatment for travel-induced excitement in dogs. It was hypothesized that lavender would have a calming effect on dogs.

Materials and Methods

Dogs—Thirty-five dogs that had been referred to the Canine Behavior Centre at Queen's University Belfast by veterinary surgeons in Northern Ireland because of unruly behavior in the car were initially considered for inclusion. All dogs had undergone physical examination to decrease the likelihood that the problem behavior was physiologic in origin. Dogs were considered to be healthy and suitable for participation in the study.

All methods used in the study adhered to the Association for the Study of Animal Behavior/Animal Behavior Society Guidelines for the Use of Animals in Research. Ethical approval for the study was given by The Research Ethics Committee, School of Psychology, Queen's University Belfast.

Inclusion criteria—A complete history was obtained for each dog to determine suitability for participation in the investigation. This consisted of a 30-minute-long interview with the owner during which information was collected

regarding the dog's living conditions and care routines. The nature of the dog's travel-related behavior problems was detailed, and owners were asked to specify what types of behaviors dogs had in the car and what practices they used to control the nuisance behavior. Two car trips were also taken with the owner and dog (1 trip to the location at which the animal was usually walked and 1 trip to a location unfamiliar to the animal) so that the motivation underlying the dog's behavior problem (eg, fear, anxiety, overexcitement, or travel sickness) could be established by the investigator. For the purposes of the study, it was assumed that dogs prone to travel-induced excitement (as opposed to a fear of traveling in the car, for example) would only display unruly behavior during travel to the accustomed walking site, whereas dogs prone to general overexcitement or nervousness while in the car would engage in nuisance behavior on both trips, regardless of destination.

Dogs were considered for participation in the study if they had been referred to the Canine Behavior Centre by a qualified veterinary surgeon and had undergone physical examination, the behavior was triggered by a specific stimulus (ie, traveling in the car), the behavior was suggestive of underlying overexcitement from anticipation of arriving at a certain location for a walk (as opposed to fear, anxiety, or travel sickness), the dog typically traveled in the owner's car for 20 to 30 minutes to the walking site, the owner had adequate time to participate in the investigation, and the dog had no comorbid behavioral problems.

Olfactory stimulation—Two conditions of olfactory stimulation were used for the study, including a control condition (in which there was no olfactory stimulation other than what existed naturally in the environment) and an experimental condition, during which dogs were exposed to the ambient odor of lavender (*Lavandula angustifolia*). For olfactory stimulation with lavender, 5 mL of lavender oil was sprayed evenly (approx 0.001 mL/cm^2) with a new aerosol diffuser onto both sides of a sterilized 0.5 × 0.5-m flannel cloth. All cloths were handled with plastic gloves and stored in sealed plastic bags immediately after impregnation with lavender oil to minimize contamination from external odors. This method of odor presentation has been used in studies involving other species, including black-footed cats[15] and chimpanzees.[24] No other olfactory devices (eg, air fresheners) were used in owners' cars 1 week before or at any point during the study.

Procedures—All dogs were studied in each of the 2 conditions of olfactory stimulation. For the experimental condition, 2 lavender-impregnated cloths were draped over the backseats of the vehicles 30 minutes prior to testing. Windows were kept closed to prevent loss of odor. The odor was perceptible to both the owners and investigator from all locations in the vehicle at the start of testing. Two cloths identical to the lavender-impregnated cloths but without odorants were draped over the backseats of the cars during the control condition. Dogs were studied for 3 consecutive days under the control condition and for 3 consecutive days under the experimental condition, for a total of 6 testing days/dog. Freshly impregnated cloths were used on each day of the experimental condition. New cloths were used for each car journey for both experimental and control conditions.

During testing, each dog was placed in the car by its owner and driven to the usual walking site. The same route to each site was taken for both conditions of olfactory stimulation, and owners were requested to drive in as similar a manner as possible on all occasions. Tests were conducted at the same time of day the dog would typically have been taken for its daily walk. Dogs' behavior in the car was recorded by use of a mounted video camera[a] from the moment the owner started the vehicle engine to the moment the destination was reached and the engine was stopped.

To control for the effects of order, half of the dogs were studied in the control condition first and the experimental condition second (control-first group), and the other half was studied in the experimental condition first and the control condition second (experimental-first group). An interim period of 2 weeks elapsed between each testing condition. Owners in the experimental-first group were requested to flush the odor from the car during the interim period by opening windows at every opportunity. The scent of lavender was not apparent to the investigator or any owners in the experimental-first group at the beginning of those individuals' control conditions.

Videotapes were analyzed, and the percentage of total driving time that each dog spent moving (eg, walking, running, or jumping around in the car), standing (ie, supported upright by all 4 limbs), sitting (ie, supported by the 2 forelimbs in extension and the 2 hind limbs flexed), resting (ie, reclining in a ventral or lateral position), and vocalizing (eg, barking, whimpering, or whining) was calculated. Behaviors that occurred simultaneously (eg, barking and sitting) were counted independently. Visual cues such as owner clothing and weather made it difficult for the investigator to be blinded to the treatment conditions during review of the videotapes.

Statistical analysis—All individual behaviors (eg, moving, standing, and sitting) were combined by use of commercial software[b] to create a general dependent variable of "behavior." A multivariate ANOVA[25] was conducted for the between-subjects factors of sex (male vs female), castration status (neutered vs sexually intact), and order of testing (control-first group vs experimental-first group) and for the within-subjects factors of odor condition (control vs experimental) and day of observation (day 1 vs day 2, day 2 vs day 3, and day 1 vs day 3) to determine whether dogs' behavior was influenced by olfactory stimulation. Univariate tests were conducted to assess for significant effects. Retrospective power calculations were performed, and values of $P < 0.05$ were considered significant. The assumptions underlying parametric analysis were met with regard to population normality, sample independence, and homogeneity of variance (population normality and sample independence were assessed by use of the Kolmogorov-Smirnov test, and homogeneity of variance was assessed by use of the Mauchly sphericity test).

Results

Thirty-five dogs (15 males and 20 females) of mixed breed and mean ± SE age of 5.5 ± 0.5 years were initially considered for participation in the study. Of those, 2 were eliminated because they had travel sickness (eg, vomiting) rather than overexcitement in the car on both of the initial journeys, and 1 dog was not included because of owner reluctance to participate, leaving 32 dogs (15 males [11 castrated and 4 sexually intact] and 17 females [9 spayed and 8 sexually intact]) with a mean ± SE age of 7.0 ± 0.5 years that met the inclusion criteria and were included in the study.

The effect of olfactory condition on the combined dependent variable of dog behavior was significant ($P < 0.001$). Results of univariate analysis with a Bonferroni adjusted α of 0.01 indicated that olfactory stimulation significantly ($P < 0.001$) influenced the behaviors of resting, moving, vocalizing, and sitting. No significant effect of olfactory condition on standing ($P = 0.62$; power = 0.08) was observed.

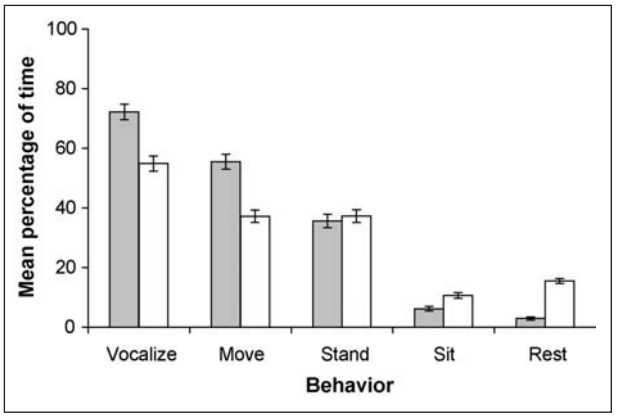

Figure 1—Mean ± SE percentage of travel time that dogs (n = 32) were observed vocalizing, moving, standing, sitting, and resting according to condition of olfactory stimulation (control, gray bar; lavender, white bar).

A post-hoc Newman-Keuls test on the significant behaviors indicated that dogs spent significantly ($P < 0.001$) more time resting and sitting and significantly ($P < 0.001$) less time moving and vocalizing during the experimental versus the control condition (**Figure 1**).

No significant effects of sex ($P = 0.42$; power = 0.29), castration status ($P = 0.98$; power = 0.08), order of testing ($P = 0.96$; power = 0.09), or day of observation ($P = 0.38$; power = 0.38) on dogs' behavior were observed.

Discussion

Findings suggested that the ambient odor of lavender may be useful as a treatment for travel-induced excitement in dogs. The dogs in this investigation spent significantly more time resting and sitting and less time moving and barking during periods of exposure to lavender, compared with the control condition period. Similar findings have been reported in a study[21] of dogs housed in a rescue shelter. Together, results of these studies suggest that lavender has a calming effect on dogs and may have value as a treatment in this species, regardless of sex, castration status, environmental setting, or underlying motivational state. It must be acknowledged that these 2 studies examined the effect of odors on discrete (eg, barking), rather than combined (eg, barking and moving simultaneously), patterns of behavior. Exploring combinations and sequences of behavior in response to odors may yield more useful information on the effect of olfactory stimulation on the severity or intensity of various conditions.

The mode of action by which lavender affects dogs is unclear. Likewise, the mode of action of essential oils in vivo remains unknown.[26] Given the sensitivity of the canine sense of smell,[c] it is possible that aromatic compounds in ambient lavender trigger a neural mechanism via the olfactory system. Alternatively, lavender may have acted as a form of environmental enrichment that distracted the dogs from their usual surroundings and habitual patterns of behavior. Enrichment strategies involving olfactory stimulation can result in habituation,[15] but this was not observed in the present investigation. Graham et al[21] reported no signs of habituation in kenneled dogs exposed to the ambient odor of lavender over a period of 5 days. Whether exposure to the odor of lavender can serve as an alternative treatment for travel-induced excitement in dogs for longer periods (eg, on longer single trips or during multiple trips) remains unclear and requires further investigation.

In the present study, only the effect of lavender on travel-induced excitement was investigated. Dogs can, however, have many other types of travel-related problems, including motion sickness and fear. Although it has not been studied to the author's knowledge, it is possible that lavender would also aid treatment of those conditions. It has been reported,[20] for example, that both the incidence and severity of physical symptoms associated with travel sickness in pigs (ie, oral cavity foaming, retching, and vomiting) are significantly decreased by exposure to lavender-scented straw. Further work is needed to explore the range of underlying ailments that could be remedied or influenced by odors that have relaxant or other properties.

Although the purpose of the present investigation was to assess the effect of lavender on dogs, many owners also reported decreased anxiety during exposure to the odorant. Owners' decreased level of anxiety may have been an indirect consequence of the pets' calmer behavior; barking and overactivity are nuisance behaviors that can be highly stressful, particularly if the owner is concentrating on something else. It is also possible that the odor of lavender had a direct influence on the owners. The herb has long been associated with relaxant properties in humans and reportedly[27–29] decreases feelings of fatigue, anxiety, and stress. Owner anticipation of the odor's effect may also have had an influence, perhaps leading to calmer client behavior. This, in turn, may have facilitated greater relaxation in the animals. Further work is needed to ascertain the mechanisms underlying the actions of lavender in reducing travel-induced excitement in dogs. It would be useful to study whether lavender had an effect on owners' perceptions or behavior and whether owners' behavioral reactions to odors influenced the behavior of their pets.

Findings suggested that olfactory stimulation in the form of ambient odor of lavender had a partial relaxing effect in dogs and may be a useful treatment for travel-induced excitement in this species. Further work is needed to determine the long-term impact of this odorant on canine behavior and welfare and the range of underlying motivational states that may be influenced by it.

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b. SPSS for Windows, version 13.0, SPSS Inc, Chicago, Ill.
c. Schoon GAA. *The performance of dogs in identifying humans by scent*. PhD thesis, Department of Criminalistics and Forensic Science, University of Leiden, Leiden, The Netherlands, 1997.

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