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The effects of Feliway on the stress of cats during veterinary examination

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ABSTRACT

The purpose of this study was to examine the effects of Feliway® during veterinary examination. Feliway® contains a synthetic version of the F3 pheromone, secreted from the cheeks of *Felis sylvestris catus* when rubbing against objects in the environment. It is presumed to allow cats to establish a home range to feel secure. A double-blind study was conducted to address the limitations of another study that concluded Feliway® is useful for reducing stress experienced by cats during veterinary examination. The current study found that Feliway® is not useful by itself for adequate stress reduction during feline examinations. It was concluded that Feliway® may be more useful in combination with environmental enrichment and proper handling techniques by the examiner, although future studies are required to empirically assess this possibility.

INTRODUCTION

A review article written by Udell and Shreve (2017) describes pheromones of the order *Carnivora*. *Carnivora* commonly use pheromones as a means of interspecies communication. A member of a species in this order can release a pheromone from various regions of the body that another member of the same species can detect via the vomeronasal organ. The vomeronasal organ is a specialized olfactory organ only found in *Carnivora*. While the vomeronasal organ is found in a broad range of animals, it is specialized to meet the needs of a species. This is because the vomeronasal organ can specifically detect pheromone molecules of the same species, and even unique scent markers of individual organisms. (Udell & Shreve, 2017).

Udell and Shreve (2017) describe the cat pheromones. *Felis sylvestris catus*, otherwise known as the domestic house cat, is a member of the order *Carnivora*. Since cats are solitary creatures, scent is important for the individual to establish a home range, avoiding unnecessary contact with the hunting grounds of other cats. In kittens, the home range is important so that kittens can recognize their mother's pheromones in the nesting area. This translates to adult cats who also use a home range to have a safe area for retreat when they feel threatened. However, it is important to note that cats are not asocial. Pheromones help cats distinguish between unfamiliar and familiar cats (Udell et al., 2017).

When cats detect a pheromone, they display a grimace called the flehmen behavior. This behavior exposes the vomeronasal organ to the environment, allowing detection of the scent molecules. After the vomeronasal organ is stimulated, nerve signals travel through sensory receptors in the nose to the olfactory bulb. From there, the signal travels to regions of the brain that process and interpret scent (Udell et al., 2017). The signal also travels to the limbic system,

allowing cats to express emotions based on automatic processing of specific scents. (Hewson, 2014).

This study focused on one of the five facial pheromones secreted from glands found in the cheeks of cats, called the F3 pheromone. According to Udell and Shreve, "Feliway™ appears to have a calming influence on cats, prevents stress, and exhibits an overall emotionally stabilizing function" (Udell et al., 2017, p.71). This synthetic version of F3 pheromone, called Feliway, mimic the home range of cats, making cats feel safer in an unfamiliar environment, and therefore, less stressed (Udell et al., 2017). A previous double-blind study was conducted using Feliway spray to determine if the spray can reduce the stress of cats during veterinary examination (Pereira et al., 2015). The study found that cats exposed to Feliway® were significantly less stressed during veterinary examination than the cats exposed to a placebo spray. The scoring for stress was based on Kessler and Turners' seven-level cat stress score system (Bradshaw & Casey, 2005).

The purpose of this current study was to address the methodological limitations of Pereira's study (Pereira, et al., 2015). The same Kessler and Turner seven-level stress score system as Pereira's study was used (Bradshaw et al., 2005); however, this study included some additional criteria under the vocalization and activity categories (Beaver, 1980). Also, instead of exposing different cats to only one of the three possible scenarios (spray, placebo, or no spray), each cat was exposed to both the Feliway® spray and the placebo (using a group design) within 1 to 1 ½ weeks apart (using a within-subjects design) to have better control for individual differences. The spray or placebo was also placed inside a carrier instead of the examination table, and the cat was kept in the carrier for ten minutes to maximize the likelihood that the cat detected the scent via the vomeronasal organ. Exposure length was controlled due to evidence

that Feliway® may not affect some cats as well as others if they spend variable lengths of time in the area where Feliway® was applied (Silivia et al., 2017). Nothing in Periera's study suggests that all the cats stayed within the same distance on the examination table where the spray or placebo was applied, so it is possible that there were varying levels of direct exposure to the scent. The final limitation addressed was the variability in stress exposure among the cats. In Periera's study, some cats were exposed to various additional stressors besides the physical examination while others were not, such as vaccinations and nail trimmings. Differential sources of stress among subjects may have resulted in some cats having higher stress ratings. The current study only included a mock veterinary examination for each cat to equalize the amount of stress across subjects.

MATERIALS AND METHODS

This study involved physical examination of nine healthy, neutered adult cats (Fig 1). Adult cats were defined as being at least one year old, when they are closer to social maturity (American Society of Feline Practitioners, 2004). A veterinary examination room was set aside so that only cats participating in the study were examined in the room during the data collection period. Two carriers were sanitized for use of the study. One was labeled A and the other was labeled B for the days that volunteers brought in two cats in one day. Both carriers were large enough for the largest cats in the study to be able to turn a full circle. Owners brought in at least one cat per scheduled visit but could bring up to two cats for one day. The carriers were sanitized with Roccal-D Plus® disinfectant and were given at least a day to air dry between examinations. The examination room was also disinfected with Roccal-D Plus® and mopped with Lysol all-purpose lemon-scented cleaner between examinations. Carrier A and/or B were either sprayed on the bottom of the carrier with ten pumps of Feliway Classic Spray or were

wiped with one wipe soaked in 90 % ethanol. The Feliway Classic Spray was labeled F for Feliway®, and the ethanol wipes were labeled P for placebo. The spray or wipes were applied by a research assistant not involved in the study examinations as to keep it a double-blind study. The research assistant applied either Feliway® or placebo based on a randomization sheet that randomly assigned F and P for each cat for each of the two trials. F or P was applied to the carrier(s) 15 minutes before the volunteer's scheduled time of arrival. Each cat was exposed to Feliway for one trial, and the placebo for the other trial.

Once a volunteer arrived at the clinic, he or she was guided to an area adjacent to the examination room. The cat was moved from its own carrier to carrier A and was kept in carrier A for ten minutes before examination, ensuring that the cat had adequate time to experience the scent. During this ten-minute period, the owner was guided to the examination room and filled out a consent form, the pre-screening questions, and the pre-examination questions. If a second cat was brought in, it placed in carrier B one minute before the start of the first cat's exam to start the ten-minute scent exposure and so that the second cat's exam could immediately begin after the first cat's exam.

Carrier A was placed on the examination table to be filmed at an angle including the view of the cat and examiner and minimized view of the volunteer. The examiner started recording the examination. The front door of carrier A was opened, and the cat was given thirty seconds to exit the carrier onto the examination table. If the cat failed to exit the carrier, the examiner removed the top of the carrier and placed the cat onto the examination table. Examination time was consistent across cats, varying between 3-5 minutes. The examination included recording weight, recording temperature with an ear thermometer, skin and coat palpation, perineal examination, palpation of the submandibular lymph nodes, opening the mouth to examine teeth, examining

eyes, examining the nose, examining the inside of the ears, and listening to the lungs and heart with a stethoscope.

After the examination, the mock examiner stopped recording and placed the cat back into its original carrier. The owner completed the post-examination questionnaire. If another cat was present, the examination room was promptly disinfected and mopped. The cat from carrier B was placed into the examination room after ten minutes of scent exposure and the same examination procedure and post-examination questionnaire was completed.

Cat	Spayed/Castrated	Gender	Age (Years)
Gizmo	Yes	Female	1
Tiger	Yes	Male	16
Sika	Yes	Female	6
River	Yes	Female	8.5
Little Red	Yes	Male	1.5
Juju	Yes	Male	7
Coco	Yes	Male	6
Zelda	Yes	Female	3

Figure 1 - Table showing all the examination subjects along with alteration status, gender, and age.

RESULTS

Each examination video was rated using the Kessler & Turner seven-level Cat Stress Score system (Bradshaw et al., 2005). The Cat Stress Score system was slightly adjusted to include additional cat behaviors and some additional clarification (Beaver, 1980). For vocalization, a “possible trill (greeting call)” was added to stress levels one and two. For every level that included “miaow”, the wording was replaced with “normal meow” for more specification. For every level that included “plaintive meow”, it was defined as a meow with more stress on either the first or last syllable. Also “yowling” was defined as a longer, open-mouthed meow and “growling” was defined as a closed-mouth rumbling sound. “Hissing” was added to vocalization on levels five and six. Under the activity category, “marking” (cat rubbing

against object or handler) was added to stress levels one, two, and three. Observers were also allowed to rate based on half-step increments since cats tended to show body language from a mixture of two adjacent stress levels (Bradshaw et al., 2005). The cat was rated on a baseline stress score after the first thirty seconds, and then rated every thirty seconds after to see if there was an increase or decrease in stress in each body language category. A trained extra observer examined the videos separate from the primary observer to make sure that the cats were rated similarly across time.

Inter-rater agreement was measured using Cohen's kappa coefficient. This statistical analysis suggested that inter-rater agreement was almost perfect ($\kappa = 0.87$). The stress scores for each cat trial were averaged to give the final cat stress scores for each cat in both the Feliway® and placebo categories. For statistical analysis, a two-factor ANOVA with repeated measures on one factor was performed using VassarStats for the video observer ratings, the post-examination owner ratings, and one that compared the sex of each cat to stress score. For all three ANOVA tests, the p values for the between subjects and the within subjects measures were statistically insignificant ($p > 0.05$). (See Fig 2 and Fig 3). Linear regression models were used to see if there was any correlation between stress score to various other factors. There was no linear correlation between stress score and age ($R^2 = 0.3001$). There was no linear correlation between stress score and owner cat drive stress rating ($R^2 = 0.006$). There was no linear correlation between stress score and the owner post examination question rating: "How would you compare your cat's stress levels during this examination compared to his or her usual stress level during a regular veterinary examination?" ($R^2 = 0.2213$).

Two-Factor ANOVA with Repeated Measures on One Variable	Between Subjects p value	Within Subjects p value	Between Subjects x Within Subjects p value
Feliway® vs Placebo Stress Score (Video Observer)	0.65	0.40	0.22
Feliway® vs Placebo (Post-examination ratings)	0.70	0.55	0.67
Stress score vs Gender	0.81	0.39	0.42

Figure 3 - For the video observer test score, the between subjects variables are based on order of spray/wipe application (Feliway first, Placebo second or Placebo second, Feliway first), and the within subject variables are the Feliway spray and placebo wipes. For the post-examination owner ratings, the between subjects variables are the order of spray/wipe application and the within subjects variables are the Feliway spray and placebo wipes. For the stress vs gender analysis, the between subjects variable is the gender (male vs female) and the within subjects variables are the Feliway spray and placebo wipes. The null hypothesis was accepted for every statistical analysis.

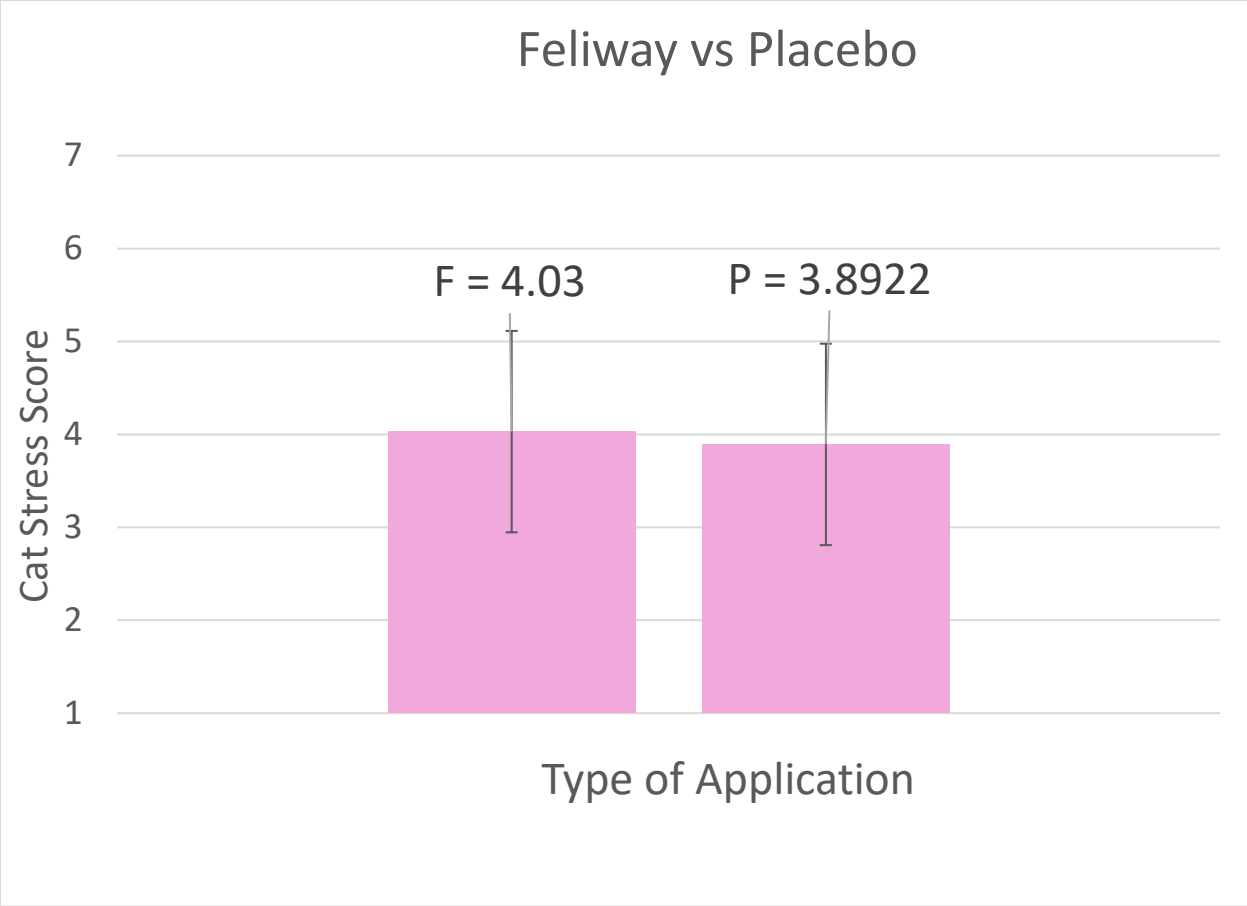

Figure 4 - For all cats that were examined, the mean Feliway cat stress score was 4.03 and the mean placebo cat stress score was 3.8922. The standard deviation bar for Feliway is 1.084 and the standard deviation bar for the placebo is 1.084. There is no statistical significance between the application of Feliway and the application of placebo during veterinary examination ($p = 0.22$).

DISCUSSION

Since there was no statistical significance between the use of Feliway® and the placebo wipes, one cannot reject the null hypothesis. This means that there is no significant difference in stress levels as to whether a cat is exposed to Feliway® before veterinary examination; any differences were due to chance. However, the post-examination question could be improved in future studies. It might be helpful to correlate owner stress ratings and video observer stress

ratings by changing the post-examination question to: “How would you rate your cat’s stress during this examination on a scale of 1 to 10?”. That way, owners rate the cat’s overall stress rather than just a comparison of usual stress. For example, a cat rated as a 10 by the owner might be acting much better than usual during examination, but the cat may have been stressed nonetheless. It may also be more helpful to train owners on how to look for signs of cat stress and to watch the videos as another extra observer to compare scoring on the Kessler and Turner scale. Overall, application of Feliway® spray is not helpful during veterinary examination, and those conclusions do not change when considering additional factors such as age, drive stress, and sex.

One may also consider future studies to determine how long it takes for a cat to be exposed to Feliway®, and how long the Feliway® spray should sit on the applied surface for the subject to show any improvements in stress behavior in various settings. And finally, one may consider various application surfaces for Feliway®.

CONCLUSIONS

This study suggests that Feliway® is not useful for application in the feline veterinary exam. However, perhaps Feliway® is more useful in combination with other stress relievers at the vet clinic. While the F3 pheromone is supposed to help cats feel more comfortable to orient themselves in their environment, it may not be enough by itself to create a secure home range for cats. According to an article (Rodan et al., 2011), the addition of proper handling techniques and environmental enrichment in a vet clinic may convince cats that the environment is truly safe.

Proper handling techniques minimize invasiveness. For example, it is important to touch only the head and neck when possible, to avoid making loud noises, avoiding sudden

movements, and to start with the least invasive procedure first. The veterinary staff should be trained to watch for signs of cat fear and anxiety to react appropriately. It may also be helpful to make the carrier feel like home for the cat by associating the carrier with positive reinforcement, placing a blanket in it with a familiar scent, and including the cat's favorite treat and toys. It is also helpful to bring the cat to the vet for practice visits and for kitten training classes around the socialization period of 2-7 weeks of age (Rodan et al., 2011).

Feliway® may not be effective on its own (Rodan et al., 2011). However, it may be helpful in future studies to see how a combination of Feliway, environmental enrichment, and proper handling techniques may greatly reduce the stress that cats associate with veterinary examinations.

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