



Research Article

EVALUATION OF THE EFFECT OF FELIWAY ON PARAMETERS OF PARASYMPATHETIC ACTIVITY IN CATS

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ABSTRACT

Background: Stress management during consultation, sampling and procedures such as vaccination and deworming, among others, is of utmost importance to make this a less traumatic experience for the cat than for the owner. The objective of this study was to evaluate parameters of the parasympathetic activity in domestic cats during physical handling in an exploration clinic treated with Feliway.

Methods: A total of 12 cats of indistinct sex and older than 6 months of age were examined. The Feliway spray was applied in an examination room and parasympathetic activity were evaluated using a PTA monitor, before, during, and after handling.

Results: The group treated with Feliway showed a final value of parasympathetic activity of 58.50, which was higher than that of the control group ($p < 0.05$). This value of more than 50 confirms the state of comfort in the cats. The cardiac rhythm in the group treated with Feliway showed a significant decrease ($p < 0.05+$) which was different to that of the control group.

Conclusion: The application of Feliway for feline handling during physical examination provided a state of comfort in the patients.

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INTRODUCTION

Cats (*Felis catus*) are appreciated throughout the world as pets.¹ Currently, their popularity as pets is increasing in several countries,² for example, information from the Australian Council of Pet Animals³ reveals that countries such as Australia, the United Kingdom, and New Zealand have proportions of households with a cat of 23%, 26%,⁴ and 35%,⁵ respectively. In Mexico, according to the National Institute of Statistics and Geography,⁶ 57% of households have a dog and 19% have a cat. These data indicate a tendency to choose having a cat as a pet, which is reflected in the increase in the number of cats that come to veterinary consultations. Cats, by nature, feel threatened when they enter a new and captive environment, which reduces their natural behavioural response due to contact with unknown people and animals, generating stress due to negative experiences during the consultation (vaccination, sampling of blood, pain, and physical restraint).⁷ Consequently, many owners do not go to the veterinarian with their cat for prophylaxis with the necessary frequency, due to the stress and fear that this produces in their pet (American Association of Feline Practitioners and American Animal Hospital Association).⁸

Therefore, proper patient management will be of great benefit to alleviate physical or emotional suffering.⁹ However, it is necessary to apply strategies to reduce stress in cats, such as reducing waiting times, performing an examination where the cat feels more comfortable, avoiding sudden noises and movements, and even the use of an assigned consultation room just for feline patients.¹⁰

Conventional methods can be combined with the use of a feline pheromone that has been synthesised from the natural pheromone F3 and is marketed as Feliway (USA, Ceva Santé Animale), available as an aerosol and a diffuser. Pheromones have been isolated from the facial secretions of cats, and it has been determined that they can be deposited on all objects to provide a comfort zone (stress-free environment) in some spaces; it also helps to emotionally stabilise the cat, stimulate their appetite, encourage exploration behaviours, and control the marking of the urine. It is also functional as a possible treatment of behaviours related to stress in cats.^{11,12}

The F3 synthetic pheromone (Feliway, USA, Ceva Santé Animale) was useful for reducing the stress caused by the veterinary consultation in cats.¹¹ However, previous studies on the use of this pheromone are based on the use of the Kessler and Turner cat stress score scale,^{13,14} which varies from completely relaxed to terrified, based only on postural and

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behavioural elements.^{15 16 17} The parasympathetic tone activity monitor (PTA) can be used for recognition of the intraoperative nociceptive equilibrium. Parasympathetic tone activity (PTA) is an index based on the analysis of heart rate variability, which has been recently developed to evaluate the analgesia/nociception equilibrium in anaesthetised animals.¹⁸ In addition, the PTA index evaluated by the monitor can be used to control the comfort of the animals and the stress they show in each consultation.¹⁹ Regarding behaviour, no study to date has used the PTA index to evaluate the when this pheromone is used in the veterinary consultation of cats. Therefore, the objective of this work was to evaluate parameters of the parasympathetic activity in cats when Feliway was applied to the examination room, to verify whether it can reduce stress and facilitate handling during the veterinary examination.

METHODS

A randomised trial was carried out at the Companion Animal Veterinary Clinic of the Autonomous University of the State of Mexico. The clinic has two separate consulting rooms which are similar in size and have the same design and internal furniture. The consultation rooms were kept between 21°C and 24°C at all times during the test using an air conditioning machine. The study was reviewed and approved by the ethics committee of the University Center UAEM Amecameca. In total, twelve cats were included, which had the following characteristics: no clinical problems, female or male, castrated or intact, all breeds, domestic animals, 6 months of age or older, and all individuals had had at least one consultation before the study (table 1 and 2). The sample consisted only of animals that came for vaccination, deworming, and routine screening. All animals presenting a health problem were excluded.

As soon as each cat entered the clinic, its arrival time was recorded as a reference and the waiting time was verified to ensure that it was less than 25 minutes.⁷ While they were in the waiting room, the owners of the cats were informed and provided with an informed consent document for their pets to participate.

The cats that came to the clinic were kept in a waiting room free of noise and other factors that favoured stress.

A convenience sampling was conducted over a period of six hours; only cats that lived inside the house were chosen and a total of 12 cats were used: six (four females and two males) were treated with Feliway (USA, Ceva Santé Animale), and the remaining six (three males and three females) formed the control group. The cats were selected completely randomly. The first group of six cats was examined individually in the consultation room 1. The order of admission to the consultation room was random and designated according to the arrival of the patient. It was determined that patient 1 entered the ward with the treatment, and patient 2 was designated to the ward without treatment, and so on. Inside consultation room 1, the Feliway spray was applied 15 minutes before each patient arrived to each part of the examination room, pressing the atomiser five times per area: on the examination table, floors, walls, and all the objects that were inside the

consultation room. From the moment the patient entered the consultation room, they were allowed to leave their transporter and the observer took the anamnesis and collected the data. Five minutes later, the veterinarian in charge reviewed the patient for a duration of 10 minutes. The same sequence was followed for all cases. General data were collected, as well as the cat's temperament, verified by the Kessler and Turnerscale.^{13 14} This information was recorded by an observer, and the general physical examination was evaluated by the same veterinarian in both groups. The measurement of parasympathetic activity parameters was carried out three times: 5 minutes after the cat came into contact with the pheromone in the consultation room, during handling, and after manipulation. Three electrodes were placed to take measurements of the relevant parameters; The alligator electrodes of the PTA monitor were fixed with a conductive gel to facilitate conduction of the electrocardiographic signals. The PTA index provides an objective value of comfort. It provides a value between 0 and 100 corresponding to the activity of the parasympathetic component of the animal's autonomic nervous system. When the value of the PTA is higher than 50, the animal is comfortable and will be in its comfort zone, free of pain and stress of any kind. When it is less than 50, the animal is in a situation of pain, extreme pain, or stress. It is interpreted as follows: $PTA\ index = tone\ p\Sigma = nociception + psychological\ stress$. After monitoring with the PTA to eliminate residual chemical traces of the stress released by the previous cat, the table was disinfected with an ammonium or alcohol-free disinfectant and paper towels, the floor was cleaned, and the room was ventilated by opening the door for 10 minutes between each consultation. At the end of the consultation with the first group, the other six cats went individually into consultation room 2. Inside this room, the pheromone was not applied during the experiment. The patient was reviewed in the same way as the cats in consultation room 1. As with the first group, to minimise the residual chemical traces of stress released by the previous cat, the table was cleaned with a standard surface disinfectant and paper towels, the floor was disinfected, and the room was ventilated by opening the door between each consultation.

Statistical analysis

The data were initially analysed using the Shapiro Wilk test to determine the distribution, then a linear general model (GLM) was applied to compare the means by treatment for each of the variables: initial parasympathetic activity PTAI, final parasympathetic activity PTAf, initial cardiac rhythm ICR, and final cardiac rhythm FCR, using SAS 9.0 software.

RESULTS

When comparing the initial parasympathetic activity between the treatments (Table 3), it was observed that there was no significant difference in the cardiac rhythm (CR), which indicates that both groups presented a similar level of stress when starting the experiment. Comparison of the final PTA between the treatments revealed a significant difference between the group treated with Feliway and the control group, with a higher PTA value in the Feliway group (58.50). This value of more than 50 confirms a state of comfort in the individual. With regard to the final heart rate, the results

showed a significant difference; the Feliway group decreased their final cardiac rhythm (FCR), whereas in the control group it increased, compared to the initial values.

Table 4 shows the results of the comparison between the initial PTA and the final PTA and demonstrates there was a significant difference between the values for the group treated with Feliway, with an increase from 35.16 to 58.50, which places the Feliway group in the range of comfort. In the comparison of the initial and final cardiac rhythms, both groups presented a significant difference in the values, although in the case of the Feliway group the final cardiac rhythm decreased, whereas in the control group it increased.

Table 1 Characteristics of patients in the group with Feliway treatment

Breed	Gender	Age	Weight (kg)	Owner's perception of the cat's temperament during the examination	Previous visits to the veterinarian	Temperament scale during the examination	Neutering
Mexic and omestic	Female	6 months	1.200	Easily stresses	0	2	No
Siamese	Female	4 years	5.200	It's stressed	4	3	Yes
Mexic and omestic	Male	2 years	4.400	The cat becomes aggressive	2	4	Yes
Mexic and omestic	Female	6 years	2.700	Is stressed during the examination	2	3	No
Mexic and omestic	Female	5 years	4.300	Is stressed during the examination	5	3	Yes
Mexic and omestic	Male	3 years	6.000	It's stressed	2	3	Yes

Table 2 Characteristics of patients in the group without treatment

Breed	Gender	Age	Weight (kg)	Owner's perception of the cat's temperament during the examination	Previous visits to the veterinarian	Temperament scale during the examination	Neutering
Mexic and omestic	Male	4 years	5.500	Aggressive during the examination	4	3	Yes
Mexic and omestic	Male	3 years	6.200	Nervous during the examination	3	2	Yes
Mexic and omestic	Female	5 years	5.200	Nervous during the examination	2	3	Yes
Mexic and omestic	Male	7 months	1.700	Aggressive during the examination	1	4	Yes
Mexic and omestic	Female	6 months	1.200	Aggressive during the examination	1	3	Yes
Mexic and omestic	Female	3 years	3.2	Calm during the examination	3	1	Yes

Table 3 Comparison of means between treatments of the parasympathetic activity and initial and final cardiac rhythm in felines

	Feliway	Control	CV	SEM
PTAI	35.16 ^a	30.83 ^a	33.7	3.21
PTAF	58.50 ^a	44.00 ^b	21.6	3.21
ICR	190.17 ^a	190.00 ^a	30.5	16.74
FCR	153.5 ^b	207.3 ^a	28.5	14.86

^{ab}Rows with different superscript letters present significant differences $p < 0.05$, PTAI = initial parasympathetic activity, PTAF = final parasympathetic activity, ICR = initial cardiac rhythm, FCR = final cardiac rhythm, CV = coefficient of variation, SEM = standard error of the mean.

Table 4 Comparison of means of parasympathetic activity, and initial and final cardiac rhythm in cats treated with Feliway and control cats

	PTAI	PTAF	CV	SEM
Feliway	35.16 ^b	58.50 ^a	30.3	4.10
Control	30.83 ^a	44.00 ^a	35.7	3.86
	ICR	FCR	CV	SEM
Feliway	190.17 ^a	153.5 ^b	41.2	20.48
Control	190.00 ^b	207.3 ^a	12.7	7.31

^{ab}Columns with different superscript letters present a significant difference $p < 0.05$, PTAI = initial parasympathetic activity, PTAF = final parasympathetic activity, ICR = initial cardiac rhythm, FCR = final cardiac rhythm, CV = coefficient of variation, SEM = standard error of the mean.

DISCUSSION

The reduction of stress in cats during consultations has many advantages, for example, cats are easier to handle, which prevents the animal and the doctor from being confronted and makes the physical exam more reliable. Mills *et al.*¹⁰ conducted a study that determined that a 15-minute interval was sufficient to produce changes in the cat's PTA, which caused significant differences in the measurements before, during, and after the treatment. This is consistent with the behavioural study conducted by Pereira in 2016,¹¹ in which Feliway was found to limit cats' aggressive behaviour. In cats treated with Feliway, the PTAI and PTAF showed a significant difference, increasing the value of PTAF, which is indicative of a comfortable, stress-free zone. In the present report, a control group was included and the PTA before and after handling the cats was measured. In addition, the analysis of the group treated with Feliway found a value of PTAF above 50 during the measurements, which indicates that the pheromone was effective and remained active. This was in contrast to cats that did not receive treatment, which had a PTAI and PTAF of no more than 45, indicating that they remained uncomfortable during all three measurements. These results agree with the studies carried out by Griffith *et al.*¹⁵ and Kronen *et al.*¹⁶ who showed that the use of pheromone F3 in a clinical or hospital environment can help reduce stress in cats, producing a calming effect, which was measured with ethograms. The cardiac rhythm can be an indication of stress in animals. In this study, the monitor indicated that cats treated with Feliway remained stable during the measurements, unlike the cats in the untreated group, which showed a higher heart rate during and after the treatment. Pereira and colleagues¹¹ indicated that the most noticeable effect of Feliway on the behaviour of cats occurs within a period of 15 minutes, and they also mentioned that there are no scales that can be used to assess the handling of cats during consultations, therefore, their study developed the "management scale", however, this scale has limitations and requires improvement. In contrast, the measurements made by the PTA monitor are objective and do not depend on the observer's eye, which is important since each observer might have a different opinion. This study supports the effectiveness of the Feliway spray and diffuser to reduce the stress of cats during the test, thus favouring better veterinary management, which helps feline welfare. These results are supported by the use of the PTA monitor, which shows objective measurements.

CONCLUSIONS

Feliway is a functional tool of simple and practical use, without negative effects, that keeps the cat in a comfort zone, free of stress, provides a pleasant environment for all the participants of the consultation, and eliminates negative experiences for the owner and animal. Another important element is that it facilitates the possibility of collecting physiological samples and additional data that accurately represent the state of the health of the cat. The relationship between the client and the veterinarian also improves, since cat owners are often more sensitive than owners of other pets. Funding The authors received no financial support for the research, authorship, and/or publication of this article from the

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