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Effect of a nepeta cataria oil diffusor on cat behaviour

Simona Cannas[1]*, Med Vet, Specialista in Etologia Applicata e Benessere Animale, PhD, Dipl ECAWBM

Elisabetta Scaglia[1], Med Vet, Specialista in Etologia Applicata e Benessere Animale

Zita Talamonti[1], Med Vet, Specialista in Etologia Applicata e Benessere Animale

Paola Dall'Ara[1], Med Vet, PhD

Clara Palestrini[1], Med Vet, Specialista in Etologia Applicata e Benessere Animale, PhD, Dipl ECAWBM

Introduction and aims - Cats have evolved to develop stress when they perceive that their biological needs are unlike to be met. There is an increasing interest in the development of specific programs to manage different forms of distress. This study aims to examine the effects of nepeta cataria oil diffusor (Felisept®) on signs of stress related behaviour in the household environment.

Materials and methods - 20 cats, divided in two groups, one with Felisept® diffusor plugged in the household and one with a diffusor containing a placebo, took part in this study. Owners were asked to complete a pre-treatment and a post-treatment questionnaire regarding behaviours shown by the animal.

Results and discussion - Based on owner answers, 90% of cats of the therapy group and 40% of cats of the control group showed an improvement ($p \leq 0.05$). Play behaviour increased in the therapy group and decrease in the control one ($p=0.06$). The percentage of cats showing hissing or biting attempts toward other cats and scratching doors decreased significantly in the therapy group ($p \leq 0.05$) and increased in the control one. Similar trend was seen for cats changing room to go away from other animals and we found a statistical difference between the two groups before ($p \leq 0.05$) and post-treatment ($p=0.081$). Even though not all parameters showed statistical changes, there was a general tendency for a decrease in behaviours associated with stress/anxiety/aggression showed by cats after the administration of Felisept® diffusor. Further studies are needed to investigate whether the conclusion drawn from this population can be generalized and if the observed changes are long-term maintained.

Keywords - Cats, behaviour, stress, nepeta cataria.

INTRODUCTION

The number of cats has increased and even surpassed the number of dogs in some countries[1, 2, 3]. Most people prefers cats as pets[4] because they are easier to take care of than dogs and also because they appear to be more independent[5, 6]. In Italy cats are 7,5 million and dogs 7 million[7].

The living environment of domestic cats largely determines their quality of life. Cats kept indoors exclusively can become bored and stressed more easily than cats that can roam around freely outside, especially in the absence of good interactions (feline or human)[8].

There are many different types of event that a cat may perceive as distressing and they seem to give rise to distinct emotional responses with a clearly defined neuro-

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[1] Dipartimento di Medicina Veterinaria (DIMEVET), Università degli Studi di Milano, Via Celoria 10, 20133 Milano, Italia

*Corresponding Author (simona.cannas@guest.unimi.it; simona_cannas@hotmail.com)

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biology in associated emotional system. They comprise anxiety, fear, frustration, pain and attachment/loss[9]. Cats, like all animals, have evolved to develop stress when they perceive that their biological needs are unlike to be met, i.e. when access to the resources they need for survival appear to be threatened (whether this is actually the case). As already noted, severe or persistent stress, may lead to compromise welfare and thus distress[10].

There is an increasing interest in the development of specific programmes to manage the different forms of distress that occur in cats[9].

The most common stressors for a pet cat probably stem from displacement from his territory, physical disruption of its territory, intrusion of another cat or a potential predator, loss of real or perceived security, anything which reduces the cat's subjective sense of control. Only once a cat feels secure within the space it occupies is it able to turn is attention to forming affectionate social relationship, both to people e sometimes to other cats[10].

If the emotional states underpinning their behavioural responses are severe and/or prolonged, they can manifest behavioural problems such as inappropriate toileting, spraying, aggression, over-grooming and, in extreme cases, self-mutilation, with consequent welfare implications[11]. Also, lack of environmental features such as vertical space, hiding places, scratching posts, and opportunity to play and chase are known to contribute to variable combinations of behavioural problems (e.g., aggression, destructive behaviour and excessive grooming) and physical disease such as lower urinary tract disease, upper respiratory disease, inappetence, and obesity[12, 13, 14].

Cats are extremely olfactory-orientated animals, making use of odour cues in intra- and inter-specific communication[15,16,17], hunting[16], feeding[18] and the maintenance of social-cohesion[19]. In addition, recognition of scent, in particular, that of the cat's household communal odour (included that of the individuals living in the house) often conveys messages of identity, familiarity and security[20].

Nepeta (Lamiaceae) is a genus of perennial or annual herbs found in Asia, Europe and North Africa; about 250 species of Nepeta are reported[21]. Nepeta species are widely used in folk medicine because of their antispasmodic, expectorant, diuretic, antiseptic, antitussive, antiasthmatic and febrifuge activities[22,23,24], moreover for treatment of pain and anxiety[25].

Exposure to nepetalactone, that is the main constituent of Nepeta Cataria, increases overall well-being in cats, facilitates play-like behaviour and social interaction and induces calming effects.

Nepeta cataria (Catnip) is the most famous Nepeta species, which has a long history of use as a tea in Europe and the flowering tops of the plant have also been used as sedative drug[26]. Many reports on Nepeta species show that the main constituents of the oil are diastereomeric nepetalactones[27,28]. Nepetalactones are reported to have considerable sedative activity[28]. These compounds are also responsible for their feline attractant or insect repellent properties[29]. In particular the feline attractant effect is seen by active behaviours, including grooming, rubbing and object-play in adult cats[30]. One of the most interesting questions is the physiological nature of the nepetalactone response in felines. Some results indicate a peripheral nicotinic and central muscarinic cholinoceptive and serotonergic facilitation of the catnip response[30]. Oral administration of encapsulated nepetalactone does not induce the response[31]. The nepetalactone response is restricted to simple olfactory stimulation in cats, without involvement of the vomeronasal organ[32]. The response has not been found in other animals and is considered to be specific to Felidae[27]. The nepetalactone odour is highly attractive for various felines (domestic and wild) in a dose dependent manner and even at weak dosages for the domestic cat (0.1-0.01 mg/kg)[33]. Exposure to nepetalactone containing substances increases overall wellbeing in cats, facilitates play-like behaviour and social interaction[20] and induces calming effects[34].

This study aims to examine the effects of nepeta cataria oil diffusor (Felisept® diffusor) on cat behaviour, in particular on signs of stress related behaviour in the household environment.

MATERIALS AND METHODS

Subjects

20 cats, 9 male and 11 female, ranging in ages from 3 months to 13 years, of different breeds, took part in this study. About half subjects of both groups lived with other cats and just 1 cat for both groups lived with other animals. The subjects included were recruited from the general cat population. The owners participated as volunteers and were enrolled through veterinary clinics, private practices and among veterinary students.

The cats were divided in two groups, one with Felisept® diffusor (Quiko GmbH Heimtierprodukte, Bocholt, Germany) plugged in the household (hereafter named "therapy group") and one with a diffusor containing a placebo (hereafter named "control group"). The study was blinded for researchers and for owners.

Owners were asked to complete a questionnaire pre-treatment on cat's signalament and history, as well as on the physical and social environment of the cat. Questions touched on home environment, management, age (current, age at acquisition), sex, reproductive status (entire or neutered/spayed), breed, number of adults and chil-

dren in the household (children older than 18 years were considered adults), source of cat (breeder, pet store, shelter, rescue, family, friends or stray), and number of cats and dogs in the household. Other specific questions about the cat's behaviour, in particular on stress related behaviours, aggressive behaviours, signs of fear or anxiety. The researcher filled in the questionnaires while owner answered the questions posed by the researcher.

20 cats living in home environment, divided in two groups, one with Felisept® diffusor plugged in the household and one with a diffusor containing a placebo, took part in this study.

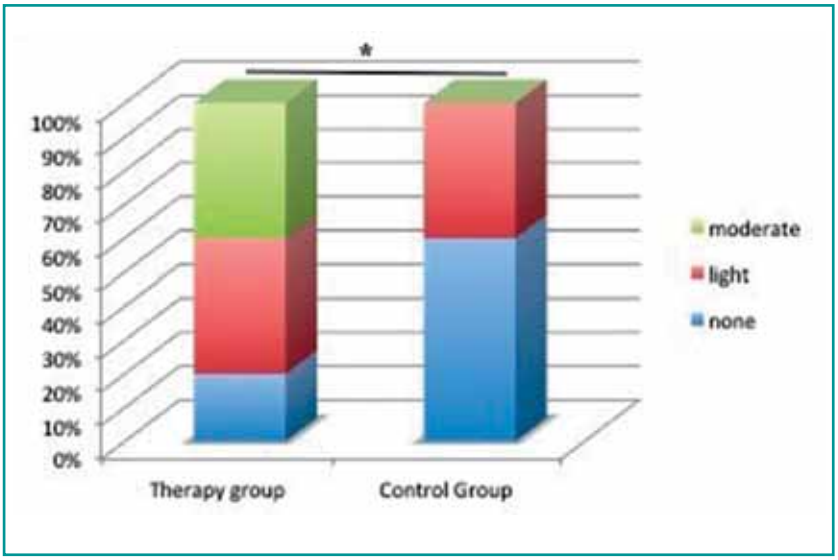

Figure 1 - Percentage of improvement in the two groups; * = p≤0.05

When the diffusor finished, owners were asked to fill out a post-treatment questionnaire regarding the signs shown by the animal, in particular if and how each behaviour registered with the first questionnaire changed and the owner's perception of the eventual animal's improvement.

Statistical analysis

Answers to the questionnaire were scored, absolute and relative frequencies were calculated and expressed as percentage. Wilcoxon test was used to identify differences in signs shown by the animal before and post-treatment. Chi-square test was used to identify differences in the two group of cats (therapy and control). Differences were considered to be statistically significant if $p \leq 0.05$.

RESULTS

Based on owner answers, the 90% of cats of the therapy group showed an improvement, while just 40% of cats of the control group showed an improvement ($p \leq 0.05$).

In particular 40% of the therapy group cats showed a moderate improvement and 40% a light improvement; for the 40% of cats belonging to the control group the improvement was light ($p \leq 0.05$) (Figure 1).

Even if not statistically significant, the percentage of cats that woke up during the night decreased in the therapy group from 70% to 50%, while no changes were seen in the control group. Similar trend was seen for the vocalization during the night: in the therapy group the percentage decreased from 30% to 20% while in the control group increased from 10% to 30%.

According to owners, the number of cats hiding in presence of strangers decreased in the therapy group from 60% to 50% ($p=0.083$), while no changes were observed in the control group. The same trend is recorded for "play with other cats" that increased from 60% to 70% in the therapy group and no changes in the control one. "Play alone" increased in the therapy group and decrease in the control one: according to the answers of the post-treatment questionnaire, 70% of the control group cats played alone as opposed to 100% of the therapy group cats ($p=0.06$).

The percentage of cats bearing veterinary visit ($p=0.083$) increased for the therapy group from 60% to 80% and decreased for the control one from 70% to 60%.

According to owners, the number of cats with inappropriate urine elimination decreased in the therapy group from 40% to 30% ($p=0.083$), while no changes in the control group.

As shown in figure 2, the percentage of cats showing hissing or biting attempts toward other cats decreased significantly in the therapy group from 80% to 50% ($p \leq 0.05$) and for the control one from 60% to 40%. The percentage of cats showing hissing or biting attempts toward people, even if not statistically significant, decrease for the therapy group from 70% to 50% while increased for the control one from 30% to 40%. The percentage of cats showing aggressive behaviour during petting and showing aggression toward other cats, decrease respectively for the therapy group from 30% to 0% ($p=0.083$) and from 60% to 40% and no changes were seen in the control one for both behaviour. The percentage of cats showing teeth in aggressive manner

Owners of cats with Felisept® diffusor plugged in perceived a general improvement of their cats.

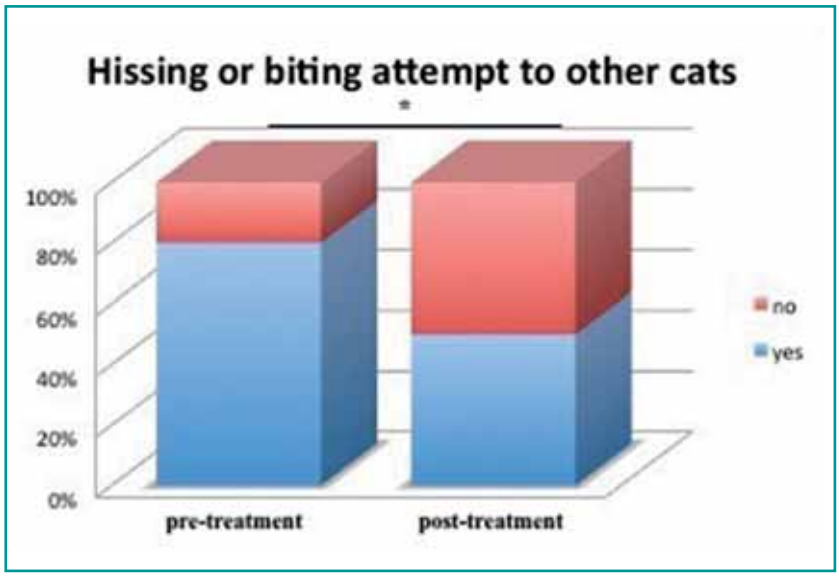

Figure 2 - Changing in "hissing and biting attempts" in the therapy group in pre- and post-treatment questionnaire; * = p≤0,05.

decrease for the therapy group from 50% to 20% (p=0.083) and no changes were seen in the control one. Even if not statistically significant, scratching toward other cats decreased in the therapy group and no changes in the control one: 30% of the control group cats and 70% of the therapy one scratched other cats in the pre-treatment questionnaire; 30% of the control group cats and 50% of the therapy one scratched other cats in the post-treatment questionnaire. Similar trend was seen for cats changing room to go away from other animals in the household: in the pre-treatment questionnaire, the percentage of the therapy group was 80% and for the control one 20% (p≤0.05); in the post-treatment questionnaire, the percentage of the therapy group was 60% and for the control one 30% (p=0.081).

The percentage of cats showing fearful behaviour decreased, even if not statistically significant, for the therapy group from 80% to 60% and no changes were seen in the control one. The percentage of cats showing nervous and shy behaviours, even if not statistically significant, decrease for the therapy group, while increased for the control one. Similar trend was seen for the crouched body postures that decreased from 60% to 40% in the therapy group cats and increased for the control one from 10% to 30%. As shown in figure 3, the percentage of cats that scratched doors decreased significantly in the therapy group from 60% to 40% (p≤0.05) and increased in the control one from 20% to 50%. Even if not statistically significant, 12,5% of cats in the therapy group showed inadequate grooming and after the administration of the Felisept® diffusor, no cats showed this behaviour; as opposed in the control group, were the percentage increased from 10% to 40%.

Figure 3 - Changing in "scratching doors" and biting attempts in the therapy group in pre- and post-treatment questionnaire; * = p≤0,05.

DISCUSSION AND CONCLUSION

As shown in the result section, for the therapy group cats' owners perceived a general improvement of their cats. The tendency in increasing of sleeping, grooming and playing of cats treated with FeliseptÒ diffusor could suggest a general relaxing: in fact sleep, play and normal levels of grooming are driven by positive emotional state and good welfare, and inhibited by acute or chronic stress[35,36].

Behaviours like night-time vocalizations, hiding in presence of strangers and scratching doors increase in stress conditions[35,37]; our results showed a tendency in decreasing of these behaviours that could suggest that the stress level was reduced in the therapy group.

Cats can experience several negative emotional states (eg, frustration, anxiety and fear) that can be induced by a number of common practices and behaviourally express these negative states in one of two ways: actively or passively, depending on the cat's temperament[11]. Cats can display behaviours related to anxiety/fear in a number of way, depending predominantly perhaps on whether the stressor(s) are acute or chronic and how severe the perceived anxiety/fear experience is[35]. A cat's facial expressions,

body postures, behaviour and vocalizations can convey useful information about its underlying emotional state[11]. For example, a cat displaying a flattened posture and dilated pupils, which attempts to hide, cower, hiss, growl or spit when approached, is highly likely to be anxious or fearful[11]. Fearful and aggressive behaviours decreased in the therapy group: the percentage of cats showing teeth in aggressive manner, hissing or biting attempts toward other cats and toward people decreased for the therapy group; also, in the therapy group decreased the percentage of cats showing aggressive behaviour during petting and bearing veterinary visit and the percentage of cats showing nervous and shy behaviours. Moreover, a similar trend was seen for the crouched body postures: body postures seen in an anxious/fearful cat primarily occur to protect the body, particularly vulnerable parts, and include tense musculature, closed crouched body position, dilated pupils and ears flattened[35]. Fear and aggression are moreover expression of anxiety[37,38]. Negative emotions underlying distress comprise of anxiety, fear, frustration, pain and attachment-loss.

This study showed a general tendency for a decrease in behaviours associated with stress showed by household cats after the administration of Felisept® diffusor.

The decrease of changing room behaviour to avoid other cats, is probably related to the decline of aggressive and shy behaviours: in fact, creating distance between themselves and the stressor is a common behaviour exhibited by anxious/fearful cats[35].

According to owners, the number of cats with inappropriate urine elimination tended to decrease in the therapy group; house soiling is frequently expressions of distress and chronic anxiety and fear[35, 39].

These outcomes corroborate previous data regarding the Nepeta effects: certain cats exposed to catnip did show behaviour indicative of improved well-being, for example, increasing play, a behaviour associated with a positive welfare state[20, 40, 41]. Also was found that the addition of catnip to the enclosures of cats (known to have the genetic basis for the catnip response) in a rescue shelter, may have the potential to improve both the short- and long-term welfare of such animals[20]. Rochlitz[36] has highlighted the potential use of olfactory stimulation for confined cats as a means of improving welfare and Ellis and Wells (2010) suggest in particular the effect of catnip. Other authors support the relaxing effect of catnip in cats: in fact, in kittens exposed to a novel environment, Nepeta extract seemed to induce a calming effect and a decrease in interest of surroundings[34].

The study of the effect of nepeta cataria on stress behaviours is interesting: it offers opportunities for innovative therapeutic interventions based on combined behavioural and nutraceutical approaches; such approaches may be integrating or can be used in combination with conventional therapies.

In conclusion, even though not all parameters showed statistical changes over time, there was a general tendency for a decrease in behaviours associated with stress and compatible with aggression and/or anxiety showed by household cats after the administration of Felisept® diffusor. Nepeta cataria may be used as a useful functional ingredient for alleviating stress in cats. Further studies, possibly with a larger sample, are needed to better investigate whether the assumptions drawn from this population can be confirmed and moreover generalized to cats housed in different conditions or affected by different behavioural disorders and if the observed changes are maintained on a long-term basis.

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