

Group Housing Can Improve the Welfare of Domestic Felines Housed in Shelters

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VCSN 653: Capstone Project

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August 1, 2023

Acknowledgements

I would first like to thank my parents for supporting me and encouraging me to pursue my interests in animal behavior and welfare. I would not be where I am today without them. I would also like to thank my fellow classmates and professors, who have made this journey so memorable. Lastly, I would like to thank my mentor, Dr. Jennifer Punt, for aiding me throughout this process.

Introduction

Housing has a direct impact on animal welfare, especially in a shelter environment where cats are subjected to their housing conditions 24 hours a day. Poor quality housing has been identified as one of the greatest shortcomings in animal shelters [1]. Unfortunately, at this time, there are no federal regulations or requirements in place regarding the housing of shelter cats in the United States [1]. Thus, the housing practices of cats in shelters are widely varied and heavily dependent upon vague guidelines and recommendations. In order to improve the welfare of cats in shelters, we must determine the best housing practices on the basis of animal welfare science. The goal of this paper is to examine current housing practices for shelter cats and their effects on welfare, with a specific focus on the benefits of group housing compared to single cat housing.

A wide variety of housing types exist for cats in shelters, with the most common being double compartment housing, quad units, small room housing and group housing [2] (Figure 1). Each housing option has its own advantages and disadvantages in terms of welfare and practicality in a shelter environment. Double compartment housing and quad units are often used for housing cats singly and include portals, which can be opened or closed to section off the cage, thus requiring minimal to no handling of the cats during routine cleaning [2]. Small room housing can be used for a small group of cats (i.e. a queen and her kittens) or for individuals. Small room housing allows the cats more freedom and control over their environment, as they are not confined to a cage. Group housing

often involves several cats in a large room, provided with enrichment, climbing opportunities, and ample resources [3].

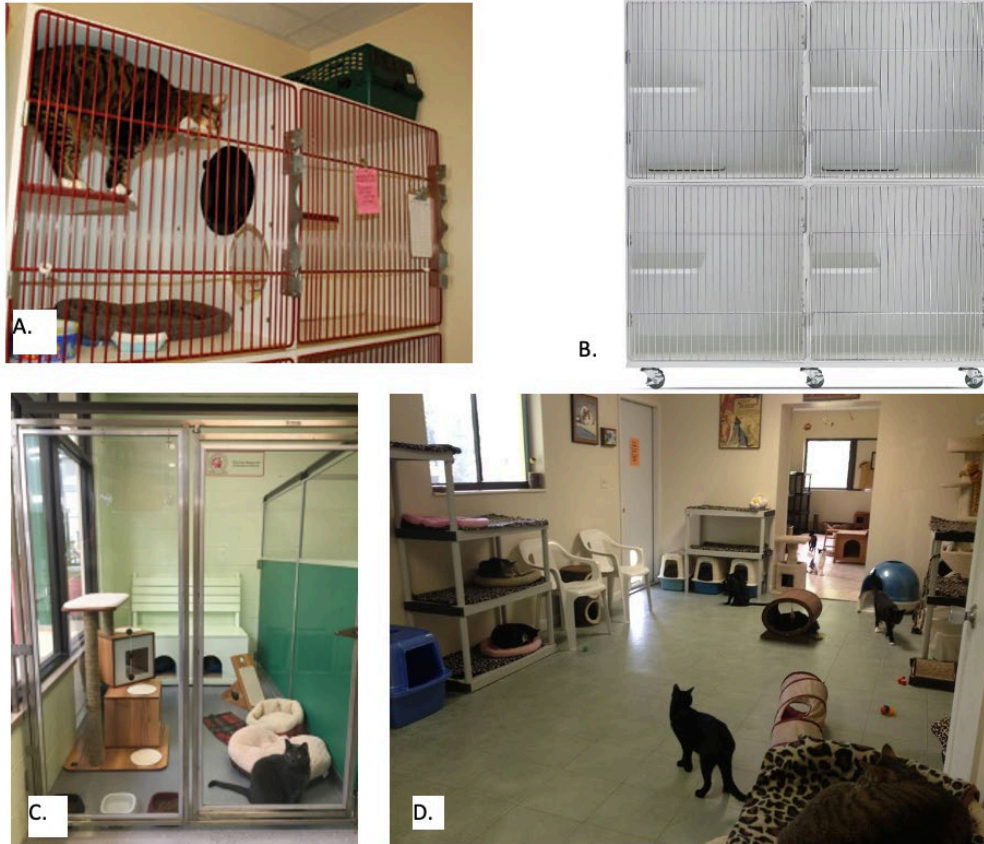


Figure 1: Common housing layouts for shelter cats: double compartment (A), quad unit (B), small room housing (C) and group housing (D).

As previously stated, there are currently no rules or regulations in place for the housing of shelter cats. However, recommendations for shelter cat housing can be found in the literature. For example, Karsten et al. (2017) provides specific minimum space guidelines of 1.02 m² of floor space for individually housed cats and 1.67 m² for group housed cats [4]. In the *Guidelines for Standards of Care in Animal Shelters* (2010), the Association of Shelter Veterinarians (ASV) stresses the importance of vertical spaces as well as horizontal, since cats show a preference for spending

time on raised structures rather than the floor. The ASV also encourages shelters to maximize space between feeding, urination and defecation, and resting spaces in a cat's primary enclosure [1] (Figure 2).

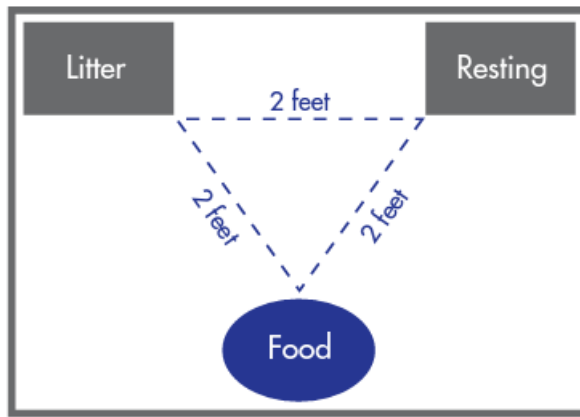


Figure 2: ASV spacing recommendations for cat resources. (Newbury et al. 2010)

There are benefits and drawbacks to both single and group housing of cats in a shelter environment. One of the greatest advantages to single cat housing is the management of infectious diseases. Since cats are not in contact with each other, the risk of disease transmission is greatly reduced [2]. Additionally, single housing systems are generally much easier to sterilize than a large group room, thus reducing the level of pathogens in the environment [3]. The portal system

that is incorporated into single unit housing also reduces the need for routine handling of the cats, which, in turn, may reduce stress [2].

The main benefits of group housing include increased enrichment opportunities and the ability to socialize with conspecifics. A group housing environment not only provides cats with more space for enrichment, but also gives them more choice and control of how they utilize that space [3], thus increasing welfare. Group housing also provides the opportunity for social interactions, which can be beneficial to the welfare of cats who are socialized to conspecifics [5]. The primary concern with group housing is the increased risk of disease transmission, as cats are in direct physical contact with one another and share resources such as litter boxes and food/water bowls [6]. However, careful observation of group-housed cats may be able to mitigate this concern [3].

In order to improve the welfare of shelter cats, we must first establish what positive welfare looks like for cats. Animal welfare is defined as a characteristic of the animal, ranging on a continuum from very poor to very good, which relates to its ability to cope with its environment [7]. Welfare refers to the state of an animal, and is comprised of both physical and cognitive factors, such as health status, mental well-being, and quality of life. Animal welfare can be measured using frameworks such as the Five Domains and the Five Freedoms. According to the Five Freedoms, positive welfare includes the freedom from hunger and thirst, freedom from discomfort, freedom from pain, injury, and disease, freedom from fear and distress, and the freedom to perform natural behaviors [8]. For cats,

natural behaviors may include scratching, playing, investigating, hunting, feeding, drinking, grooming, eliminating, and social interactions with conspecifics [9].

Understanding the social behavior of cats is necessary in order to make informed decisions about the welfare benefits of group housing. Whether cats thrive in social settings is controversial in the literature. Despite originating from a largely solitary ancestor [10], some cats show an affinity for other cats and have been known to form social bonds [11]. Yet some researchers classify cats as non-obligate social animals, who may suffer chronic stress from close proximity to other cats [11]. Others refer to cats as “social generalists” due to their ability to display flexibility in their social behavior, which can be seen in free-ranging cats, who either live solitarily or in groups [12]. However, the occurrence of group living in free-ranging cats is believed to be based on the availability of resources, rather than the need for social interaction [10]. Therefore, social interactions with conspecifics may only improve welfare in cases where the cat’s other survival needs are already being met. Since every cat is different, not all cats will experience the same welfare benefits from social interactions with conspecifics, in fact, for some, the presence of conspecifics may be harmful to their welfare.

In order to assess which housing systems are more beneficial to a cat’s welfare, we also must have a method to measure stress levels of cats in shelters. In animal welfare science a combination of behavioral measurements, physiological measures (such as cortisol levels), health indicators, and assessment of environmental indicators are often used in conjunction to make determinations

about an animal's stress levels [13]. Since physiological measures are not the most practical method for assessing cats in a shelter environment, and may even increase stress levels due to handling, researchers often rely on behavioral, health and environmental indicators when examining stress levels. Behavioral signs of stress in cats are decreased activity, hiding, and a decrease in the performance of maintenance behaviors such as grooming, elimination, and eating/drinking [14]. Physical manifestations of stress in cats can include anorexia, weight loss, diarrhea, vomiting, and upper respiratory tract infections [15]. These behavioral and health indicators of stress are particularly useful signs for shelter workers to assess welfare. However, researchers have developed specific assessment tools which may provide more accurate measures of stress and aid in comparing stress levels between groups.

One of the more commonly utilized assessment tools is the Cat-Stress-Score developed by Kessler and Turner (1995), which relies on both behavioral and postural observations to assess a cat's stress level (see Appendix A). With this assessment method, cats are given an individual stress score ranging from a 1 (fully relaxed) to a 7 (terrorized). The Cat-Stress-Score has become a trusted method of measuring stress in cats because it not only considers activity levels, but also postural observations of the body, head, tail, legs, belly, eyes, ears, pupils, and even whiskers. When using this assessment tool, researchers should also be mindful of other stress indicators, such as health and environmental factors, in order to make the most accurate determination of stress levels.

Direct Comparisons of Single vs Group Housing

The relationship between housing and the welfare of shelter cats has not been thoroughly studied. Over the years, only a few studies have directly observed stress in cats housed in single and group housing. I will summarize, interpret, and discuss the limitations of these studies in order to determine which housing method is most beneficial to welfare.

Study by Kessler and Turner (1997)

One of the first studies to directly compare single vs group housing of cats was performed by Kessler and Turner in 1997. The authors wanted to determine whether cats housed singly, in pairs, and in groups would be able to adapt to the stress of a shelter environment and reach the low stress levels of a control group of cats, which had been housed at the shelter for between 2-16 weeks prior to the start of the study [16]. A total of 140 boarding cats between the ages of 1-15 years were split into three groups: single housing (n=60), pair housing (n=40), and group housing (n=40). The decision to place each boarding cat into single, pair, or group housing was made by the cat's owner. Cats assigned to the single housing and pair housing treatments were placed in accordance with their home living situations, with pairs from the same household being kept together in pairs for the study. The majority of the group housed cats were from single-cat households (30 out of the total 40), while the remaining cats were either originally housed in pairs

or groups. Group housed cats were integrated into pre-existing groups of boarding cats. Control cats were homeless cats who had been acclimating at the shelter for several weeks prior to the study. The 45 total control cats were housed in 6 groups with a mean density of 0.4 animals per m².

Kessler and Turner used their own assessment method, the Cat-Stress-Score, in order to measure stress. The authors found that although the average stress scores of the boarding cats decreased within the two weeks of the study, they did not decrease enough to meet the low level of stress scores of the control group. Additionally, the authors found no significant difference in the stress scores of boarding cats housed singly, in pairs, or in groups on any day of the study.

Interpretation

The findings of this study suggest that the stress levels of the boarding cats were more impacted by the shelter environment itself, rather than the specific housing treatment: stress scores were similar between the three different housing treatments throughout the course of the observation period. Although stress scores of boarding cats decreased during the two week period, they did not decrease enough to meet the low stress level of the control cats, who had more time to adjust to the shelter environment. This suggests that cats may need more than two weeks to adjust to a new environment. Since we know animal welfare is dependent upon an animal's ability to cope with its environment, this study indicates a two week minimum adjustment period may be beneficial to cats in shelters, no matter what type of housing they live in.

Limitations

I found this particular study to be very insightful, as it is one of the first to directly examine stress of cats in different housing treatments in a shelter environment. However, there are a few limitations to this study which may impact the results. For instance, many of the boarding cats used in this study were already familiar with the housing conditions under which they were observed. In reality, cats in shelters come from many different backgrounds and may not have any previous experience in a shelter environment or group/pair housing situation. Additionally, cats experiencing extremely high stress levels may shut down and become inactive [16]. This lack of activity may be misinterpreted as “relaxed” behavior if the observer is not familiar with the cat’s normal behavior patterns, thus leading to inaccurate stress scores. In order to rectify this, it may be beneficial to observe a cat in single housing in order to establish a baseline of normal behavior before moving the cat into group housing.

Study by Ottway and Hawkins (2003)

A 2003 study, by Ottway and Hawkins, also directly compared the welfare of cats housed communally to cats housed in discrete-units, either alone or with familiar conspecifics. The authors observed a total of 72 randomly chosen adult neutered male and female cats, split, and matched equally between the two housing treatments [17]. All cats observed in the study were considered to be

“long-term residents,” as they had resided at the shelter for over one month. The cats in communal housing were housed with unfamiliar conspecifics, with approximately 4 m² of space per cat. The cats in discrete-units were housed alone or with previously familiar conspecifics, such as siblings, offspring, or previous housemates. The authors utilized Kessler and Turner’s Cat-Stress-Score (1997) in order to measure stress. They found that mean stress scores were higher in the communal housing treatment than in the discrete-unit housing treatment, leading them to conclude that cats housed communally experience moderately higher levels of stress than cats in discrete units. The authors also recorded the following behaviors in a ten minute scan sampling interval: “eat”, “drink”, “toilet use”, “self-groom”, “play” (social or object), “sleep/rest in contact with conspecific”, “stereotypic pace”, “agonistic encounters”. They found no difference in stereotypic pacing, eating, drinking, grooming or toilet use between the two housing conditions. However, “play” and “resting/sleeping in close contact” were more prevalent in the discrete-unit housing with previously familiar conspecifics than in communal housing. A higher percentage of cats hiding, and more agonistic encounters occurred in the communal housing group than in the single discrete housing units. There was only one instance of stereotypic pacing, which was observed in a cat housed alone in a discrete-unit.

Interpretation

The results of this study imply that discrete-unit housing, either alone or with previously familiar conspecifics, is better for the welfare of cats in shelters

than group housing with unfamiliar conspecifics. Not only were stress scores lower for cats housed in discrete-units, but the cats also displayed more play behavior, which is indicative of a positive welfare state. On the other hand, cats housed in communal housing had higher stress scores and exhibited more hiding and agonistic behaviors, which indicate poor welfare. Hiding is a way for cats to cope with stress and may temporarily relieve stress and improve welfare in the short-term, but a cat that hides long-term is experiencing a constant state of poor welfare [17]. It is not surprising that more agonistic interactions occurred in the communal group, as the groups were made up of unfamiliar conspecifics, who could not escape each other.

Limitations

One of the main limitations of this study is that the cats housed in discrete-units were housed with familiar conspecifics while the cats in communal housing were housed with unfamiliar conspecifics. In a shelter setting, it is normal to keep littermates, mothers and offspring, or pair-bonded animals together. However, for the purpose of this experiment, comparing cats living in different housing types, it adds another variable. It is expected that cats who are familiar with each other will display more affiliative behaviors such as playing and resting/sleeping in close contact with one another. Therefore, it is not surprising that these behaviors were found more in the discrete-unit treatment with familiar conspecifics than in the communal housing with unfamiliar conspecifics. Additionally, the social background of the cats placed in communal housing was unknown and most

likely varied, with some cats being socialized to conspecifics while others were not [17]. It is likely that the presence of cats not socialized to conspecifics in the communal housing treatment played a role in increasing stress levels. The groups in this study also contained between 33-65 individuals which is much larger than what is typically observed in free-ranging cat colonies [17]. This no doubt contributed to the increase in hiding behavior and agonistic interactions seen in the communal housing treatment.

Study by Gourkow and Fraser (2006)

Lastly, a 2006 study performed by Gourkow and Fraser examined the effects of housing and handling practices on the welfare, behavior, and selection of shelter cats by adopters in an animal shelter in Vancouver, Canada [18]. In this study, 165 adult cats were divided into four treatment groups based on housing type: Basic Single, Enriched Single, Basic Communal, and Enriched Communal. In the Basic Single treatment, cats were housed alone in relatively barren cages and subjected to inconsistent daily handling by staff, reflecting the typical practices of the shelter. The next three treatments each provided more consistent and positive handling with various housing set ups. In the Enriched Single treatment, cats were housed alone and provided with places to perch and hide. The Basic Communal Treatment was a group housing set up with enough room for cats to have personal space. The last treatment group, Enriched Communal, was a group housing set up enriched to encourage play and interaction between cats.

The authors employed Kessler and Turner's (1997) Cat-Stress-Scores, in order to measure the levels of stress for each cat in each treatment group. The authors found that the cats in the Basic Single treatment group had the lowest adoption rates over a 21 day period and higher stress scores when compared to the other three groups. The other three treatment groups did not differ significantly by any measure.

Interpretation

The results of this study indicate a correlation between enriched housing and the welfare of shelter cats. Compared to the three other treatment types, the Basic Single treatment yielded the highest stress scores, lowest adoption rates, and longest time awaiting adoption. The cats in this group were subjected to barren living conditions and inconsistent daily handling, which likely contributed to stress. The lack of enrichment opportunities may have impacted the cats' adoptability rate, as they were not able to perform natural behaviors, which can be appealing to potential adopters. Cats suffering from stress may also become inactive, thus appearing "boring" to potential adopters. The other three treatment groups did not differ significantly on any measure, indicating that Enriched Single, Basic Communal, and Enriched Communal housing all have a relatively similar impact on welfare. Since there was no difference in feline stress among these treatment groups, we cannot determine whether group housing itself or enrichment opportunities had more of an effect on the cats' welfare.

Limitations

Although this study provides valuable insight pertaining to the welfare of shelter cats, it is difficult to ascertain whether the results are due to housing treatment, enrichment opportunities, or handling methods. The cats in the Basic Single housing treatment experienced the most stress and the lowest adoption rates throughout the duration of the study. However, they also had the least amount of enrichment provided and experienced inconsistent handling practices, both of which could have contributed to low stress levels. Therefore, we cannot draw any concrete conclusions about the welfare of cats in single vs group housing based on these results alone. It is likely that a combination of handling practices, enrichment, and housing affect stress levels, but we are unable to determine just how strong of an effect each variable has on feline stress and welfare.

Discussion and Conclusions

This analysis of current studies shows that group housing of shelter cats has the potential to improve welfare, but only under specific conditions. Kessler and Turner (1997) found no significant differences in stress levels of group housed, single housed, and pair housed cats during a two week shelter stay [16]. Gourkow and Fraser (2006) found that, when housed communally in an enriched environment, cats experience less stress than those housed singly in a more basic

environment [18]. On the other hand, Ottway and Hawkins (2003) showed that cats housed in groups with unfamiliar conspecifics appear to experience more stress than those housed in discrete units either alone or with a familiar conspecific [17]. Thus, many factors contribute to the success of group housing in improving the welfare of shelter cats.

The sociability of a cat to conspecifics is an important factor to examine when choosing cats for group housing. A second study by Kessler and Turner (1999) found that there were no significant differences in stress levels of cats socialized to conspecifics, when living in both single- and group-housing situations [19]. On the other hand, cats not socialized to conspecifics had lower stress levels when housed singly than in groups [19]. The presence of cats not socialized to conspecifics in group housing also had a negative impact on other members of the group by increasing their stress levels [19]. Therefore, assessing the sociability of a cat to conspecifics is necessary in order to not only determine which housing type is best suited to the cat, but also which would be best for the welfare of the other cats in the group.

Length of Stay (LOS) in the shelter also plays a role in the decision to utilize group housing practices. For example, cats with a longer predicted LOS, such as older cats or FIV+ cats, should be placed in housing that will minimize long-term stress, as these cats are most likely to be impacted by their housing conditions [19]. In these instances, older cats or FIV+ cats may benefit from being grouped together when possible.

Many authors also recommend small, stable groups when employing group housing methods for cats in shelters [2, 17, 20]. This may be difficult to achieve in a shelter environment, as cats are constantly moving in and out. However, shelters can reduce stress and increase stability by introducing several new cats to the group at one time, thus decreasing the frequency of introductions that occur [17]. Introductions of new cats to the group should also be performed slowly and under supervision in order to minimize stress and decrease the possibility of agonistic encounters [14]. Knowledge and awareness of a cat's personality and level of sociability is also important to ensure that the cat will be a suitable fit for the group. Therefore, upon intake into the shelter and prior to grouping, a behavioral assessment should be performed on the new cat [1].

Overall, group housing has the potential to increase cat welfare in a shelter environment, as long as certain conditions are met. The groups must be relatively small and stable [2, 17, 20]. There should be ample resources available so that each cat has undisturbed access to a resource, as well as adequate space to allow cats to avoid unwanted interactions [5, 14]. Cats selected for group housing should be sociable to other cats in order to minimize the potential for agonistic encounters and stress [19]. Lastly, groups should be monitored daily [5] in order to ensure that cats are not experiencing stress or discomfort. If a cat is showing signs of stress or fear in the group, it should be placed into single housing instead [14]. More research is needed to determine the best housing practices for improving welfare of shelter cats, however it seems likely that the solution is not

one size fits all. Therefore, decisions about housing cats in shelters should be made on a cat-to-cat basis in order to ensure the best welfare possible.

Appendices

Appendix A: Kessler and Turner Cat Stress Score (1995)

Table 2 Seven-level Cat-Stress-Score (a further development of the Cat-Assessment-Score by McCune 1994).

Score	Body	Belly	Legs	Tail	Head
<i>1 Fully relaxed</i>	<i>i</i> : laid out on side or on back <i>a</i> : not applicable	exposed, slow ventilation	<i>i</i> : fully extended <i>a</i> : not applicable	<i>i</i> : extended or loosely wrapped <i>a</i> : not applicable	laid on the surface with chin upwards or on the surface
<i>2 Weakly relaxed</i>	<i>i</i> : laid ventrally or half on side or sitting <i>a</i> : standing or moving, back horizontal	exposed or not exposed, slow or normal ventilation	<i>i</i> : bent, hind legs may be laid out <i>a</i> : when standing extended	<i>i</i> : extended or loosely wrapped <i>a</i> : tail up or loosely downwards	laid on the surface or over the body, some movement
<i>3 Weakly tense</i>	<i>i</i> : laid ventrally or sitting <i>a</i> : standing or moving, back horizontal	not exposed, normal ventilation	<i>i</i> : bent <i>a</i> : when standing extended	<i>i</i> : on the body or curved backwards, may be twitching <i>a</i> : up or tense downwards, may be twitching	over the body, some movement
<i>4 Very tense</i>	<i>i</i> : laid ventral, rolled or sitting <i>a</i> : standing or moving, body behind lower than in front	not exposed, normal ventilation	<i>i</i> : bent <i>a</i> : when standing hind legs bent, in front extended	<i>i</i> : close to the body <i>a</i> : tense downwards or curled forward, may be twitching	over the body or pressed to body, little or no movement
<i>5 Fearful, stiff</i>	<i>i</i> : laid ventrally or sitting <i>a</i> : standing or moving, body behind lower than in front	not exposed, normal or fast ventilation	<i>i</i> : bent <i>a</i> : bent near to surface	<i>i</i> : close to the body <i>a</i> : curled forward close to the body	on the plane of the body, less or no movement
<i>6 Very fearful</i>	<i>i</i> : laid ventrally or crouched directly on top of all paws, may be shaking <i>a</i> : whole body near to ground, crawling, may be shaking	not exposed, fast ventilation	<i>i</i> : bent <i>a</i> : bent near to surface	<i>i</i> : close to the body <i>a</i> : curled forward close to the body	near to surface, motionless
<i>7 Terrorized</i>	<i>i</i> : crouched directly on top of all fours, shaking <i>a</i> : not applicable	not exposed, fast ventilation	<i>i</i> : bent <i>a</i> : not applicable	<i>i</i> : close to the body <i>a</i> : not applicable	lower than the body, motionless

i = inactive, *a* = active

Score	Eyes	Pupils	Ears	Whiskers	Vocalization	Activity
<i>1 Fully relaxed</i>	closed or half opened, may be blinking slowly	normal	half back (normal)	lateral (normal)	none	sleeping or resting
<i>2 Weakly relaxed</i>	closed, half opened or normal opened	normal	half back (normal) or erected to front	lateral (normal) or forward (normal)	none	sleeping, resting, alert or active, may be playing
<i>3 Weakly tense</i>	normal opened	normal	half back (normal) or erected to front or back and forward on head	lateral (normal) or forward	meow or quiet	resting, awake or actively exploring
<i>4 Very tense</i>	widely opened or pressed together	normal or partially dilated	erected to front or back, or back and forward on head	lateral (normal) or forward	meow, plaintive meow or quiet	cramped sleeping, resting or alert, may be actively exploring, trying to escape
<i>5 Fearful, stiff</i>	widely opened	dilated	partially flattened	lateral (normal), forward or back	plaintive meow, yowling, growling or quiet	alert, may be actively trying to escape
<i>6 Very fearful</i>	fully opened	fully dilated	fully flattened	back	plaintive meow, yowling, growling or quiet	motionless alert or actively prowling
<i>7 Terrorized</i>	fully opened	fully dilated	fully flattened back on head	back	plaintive meow, yowling, growling or quiet	motionless alert

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