



Analysis of motivations and challenges to responsible pet ownership

Análisis de motivaciones y desafío hacia la tenencia responsable de animales de compañía

Edgar David Parrales Zambrano

Msc. Universidad Agraria del Ecuador edgar.paredes@uae.edu.ec,
<https://orcid.org/0000-0001-7912-5284>

William E. Rosas Carrera

Msc. Universidad Agraria del Ecuador William.carrera@uae.edu.ec
<https://orcid.org/0000-0002-1128-6062>

Israel E. Márquez Cabrera

Msc. Universidad Agraria del Ecuador, Israel.marquez@uae.edu.ec
<https://orcid.org/0009-0004-9874-9518>

Cesar Carrillo Cedeño

Msc. Universidad Agraria del Ecuador, cesar.carrillo@uae.edu.ec,
<https://orcid.org/0000-0003-0369-5154>

ABSTRACT

The objective of this study was to evaluate the impact of physical environmental enrichment on the agonistic behavior of 30 cats housed in the "Rescue Mission" shelter. In the pre-enrichment period, a significant increase in agonistic behaviors was observed, such as 205 paw swipes and 184 vocalizations. After implementing crates and shelves as enrichment, a gradual reduction of these behaviors was recorded. Comparison of the two types of enrichment revealed that the cats preferred the 282 boxes over the 170 shelves. As for the relationship between enrichment and sex, age and body condition of the cats, statistically significant relationships were found. Taken together, these results point to the significant influence of sex, age, and

body condition on cats' environmental enrichment preferences. These findings highlight the importance of environmental enrichment in improving the welfare of cats in shelters and homes, and provide relevant information for decision making in the management of these animals. It is concluded that the implementation of effective environmental enrichment strategies can reduce stress and improve the behavior of cats, promoting a more harmonious coexistence among felines.

RESUMEN

Este estudio tuvo como objetivo evaluar el impacto del enriquecimiento ambiental físico en el comportamiento agonístico de los 30 gatos alojados en el refugio "Misión Rescata". En el periodo pre-enriquecimiento, se observó un aumento significativo de comportamientos agonísticos, como 205 golpes con una pata y 184 vocalizaciones. Tras implementar cajas y estanterías como enriquecimiento, se registró una reducción gradual de estos comportamientos. La comparación de los dos tipos de enriquecimiento reveló que los gatos prefirieron las 282 cajas en lugar de las 170 estanterías. En cuanto a la relación entre el enriquecimiento y el sexo, la edad y la condición corporal de los gatos, se encontraron relaciones estadísticamente significativas. En conjunto, estos resultados apuntan a la influencia significativa del sexo, la edad y la condición corporal en las preferencias de enriquecimiento ambiental de los gatos. Estos hallazgos destacan la importancia del enriquecimiento ambiental para mejorar el bienestar de los gatos en refugios y hogares, y proporcionan información relevante para la toma de decisiones en el manejo de estos animales. Se concluye que la implementación de estrategias efectivas de enriquecimiento ambiental puede reducir el estrés y mejorar el comportamiento de los gatos, promoviendo una convivencia más armoniosa entre los felinos.

Keywords / Palabras clave

animal welfare, agonistic behavior, environmental enrichment, cats, shelter

Bienestar animal, comportamiento agonístico, enriquecimiento ambiental, gatos, refugio

Introduction

The definition of environmental enrichment, as expressed by Ellis, Molinero and Vatos (2022), is any addition to the environment in which an animal is found to produce an improvement of the environment by adding an assurance of animal welfare. Dare (2021) defines environmental enrichment as the set of dynamic activities that are designed to improve the mental and physical health, and meet the ethological and psychological needs of an animal, highlighting the importance of the process of environmental suitability in creating an overall welfare that meets the natural behavioral needs of animals.

Behavior is an organism's response to stimuli. Salonen (2020) indicates that this behavior is variable among individuals and consists of different traits, such as aggressiveness, fear, among others. Implying that it is usually influenced by genes, the behavior of an individual is also manifested through environmental factors. In the specific case of cats, as described by Alley Cat Allies (2017), their behavior has two main sources: instinctive and learned. It is complex to clearly differentiate these two behaviors, given that this species constantly adjusts its behavior through learning and observation.

In this context, Toscano and Menor (2020) point out that an animal shelter is a public or private place that aims to provide protection, control and care for companion animals that do not have a permanent home. These establishments provide facilities to house animals and promote their adoption, as well as veterinary care services, adequate food, and recreational space. Wagner, Hurley, and Stavisky (2018), emphasize the importance of shelters and rehoming centers, as they contribute to population management and facilitate the rehoming of species that are homeless or have lost their homes. These institutions play a valuable role in animal welfare and in finding new homes for those animals in need.

Domestic cats have become popular as pets, however, Liu, Paterson, Camarri, Murray, and Phillips (2020) report that many are surrendered to shelters or welfare organizations, or at worst abandoned on the streets or in parks. In a specific approach to the research, cats have become very popular for adoption as pets, however, there is a high rate of cats on the streets, either due to abandonment, loss or escape, among others. In a specific approach to the situation in Ecuador, Lopez (2021) points out that animal abandonment has increased significantly due to the COVID-19 pandemic. This increase

has led to shelters being in a chronic situation, having to house a considerable number of animals, ranging from 20 to 100, which represents a challenge for the capacity and resources of these shelters.

In 2019, Lingna conducted research entitled "Enrichment strategies that modify cat behavioral pattern: their applications in improving welfare". The aim of her study was to apply effective short- and long-term environmental enrichment strategies, focusing on assessing the preferences of scratcher types (corded or cardboard) and their influence on cats' scratching behavior.

Their research findings indicated that feline stimulants, such as catnip, were effective in increasing scratching and other interactions between cats and scratchers. The use of these stimuli was helpful in redirecting scratching behavior and provided a form of environmental enrichment that promoted increased activity and variety of behaviors in the cats.

In research titled "Exploring improvements in the welfare of shelter cats through environmental enrichment options," conducted by Ellis, Stryhn, Spears, and Cockram in 2017, various forms of environmental enrichment were examined with the purpose of identifying those that generate greater welfare in cats housed in shelters. The study sought to determine which types of enrichment are best suited to meet the specific needs of these animals in such environments.

Different types of enrichment were implemented, including a no-stimulus control group, a toy simulating prey, perches, and hide-and-seek boxes. Through quantitative data recording and behavioral observation, it was observed that the cats showed a significant preference for the hide-and-seek boxes compared to the other types of enrichment used. In addition, it was noted that cats frequented these enrichments more during the light period than during the dark period.

De Toni (2020), through his study of "Environmental enrichment for domestic cats (*Felis catus* Linnere, 1758): Applications of techniques to improve feline welfare", highlights the relevance of environmental enrichment. The results of their study revealed that, one week after applying the enrichment program, the cats' behaviors returned to the pattern observed prior to implementing enrichment. This suggests that, in order to develop an effective program, it is crucial to create an environment with enrichment on an ongoing basis, taking into account the observed behaviors. That is, enrichment must be in line with the cats' natural needs and behaviors to achieve a lasting impact on their well-being.

Research by Lingna (2019), Ellis and colleagues (2017) and De Toni (2020) have concluded that the application of environmental enrichment in cat shelters has a positive impact on their behavior. By studying feline responses to different types of environmental enrichment, information is gained about the cats' preferences and needs, which in turn significantly improves their well-being. These studies demonstrate that appropriate enrichment can be a valuable tool for promoting a more enriching and satisfying environment for cats in shelters.

A shelter, according to Lopez (2021), is a place with the purpose of offering protection and care to animals that have been rescued or received after being abandoned or mistreated in their previous homes. These shelters provide temporary shelter to animals until they are adopted, giving them shelter and a sense of security and peace of mind. People who decide to adopt an animal from these shelters must take responsibility for caring for the animal's needs to ensure its optimal well-being.

When designing a shelter, it is important to consider several key factors. The National Veterinary Academy (2021) highlights that these crucial aspects include the welfare of the animals, the safety of the staff, and the needs of those caring for the animals in the shelter. In addition, it emphasizes the need to establish a protocol for each stage of the process, from rescue or admission of the animal to its subsequent adoption. This would include aspects such as quarantine, vaccination and establishment of daily routines for the care of the animals. These elements are essential to ensure a safe and healthy environment for the animals, as well as to facilitate the adoption process and their overall well-being.

Internationally, guidelines for the care of animals in shelters have been approved. Muñoz (2020), emphasizes that these guidelines were established by the Association of Shelter Veterinarians with the purpose of providing a reference adaptable to each specific environment and situation, focusing mainly on animal welfare.

Figuerola (2021), defines Animal Welfare as the capacity in which an animal species adapts to the environment and its conditions, which implies that the animal is in a healthy state, adequately nourished, comfortable, without fear or pain, safe and expresses its natural behavior. In the planning and operation of a shelter, it is essential to put animal welfare as a priority.

Toscano (2020), considers that an environment in the shelter that does not have appropriate conditions, adding a deprivation of stimuli, damages the normal behavioral patterns of the animals, manifesting stress and consequently stereotyped behaviors, together with other manifestations of discomfort.

According to the research conducted by Ellis and Wells (2017), the importance of the principle of freedom of expression in the welfare of animals in shelters is highlighted, especially for felines. In addition, the principles of freedom from fear and distress are mentioned, as well as freedom from physical or thermal discomfort, which are also fundamental to ensure adequate environmental enrichment. Knowledge of species-specific behaviors is crucial to avoid potential problems and negative consequences.

Animal welfare is a topic of great importance and has been the subject of several research studies. One example is the study by Mariti et al. (2020), in which a detailed observation of environmental and behavioral changes in cats housed in shelters that received different forms of human contact was conducted. This research sought to understand how human contact affects the welfare of cats in a shelter environment.

On the other hand, Barnett et al. (2018) conducted a study on environmental enrichment for adult cats, evaluating the effects of two treat-based methods on feline welfare. This type of research is relevant to identify which approaches can improve the quality of life of adult cats in captive environments, such as shelters or homes.

For Toscano and Menor (2020), it is of utmost importance to understand the environmental elements that can have a negative impact on the behavior of cats in confined spaces, affecting their overall well-being. These environmental needs are divided into two categories: the macroenvironment and the microenvironment. The macroenvironment refers to the external environment that cats perceive from their cage, either the room around them or the area in which they are located. On the other hand, the microenvironment refers directly to the cage itself in which they are housed, considering both its physical conditions and the objects present inside. It has been shown that, by improving the environment through environmental enrichment, it is possible to reduce negative behaviors related to stress in these felines.

Environmental needs in the feline species, as noted by Bennett, Paterson, and Walker (2020), play a crucial role in the well-being and quality of life of shelter cats. The provision of an enriched environment and a routine-based care program can have a significant impact on the physical and mental health of these animals.

An enriched environment for cats involves providing a variety of stimuli and opportunities that meet their natural needs. Ellis and Carney (2021), stress, this can include the availability of climbing and hiding spaces, interactive toys that encourage physical and mental activity, and areas for scratching and nail sharpening. In addition, an enriched environment can allow cats to explore and express their natural hunting and foraging behavior. However, Toscano and Menor (2020) indicate that through domestication, cats have become more closely related to humans and to their own species and can live together with them, i.e., they have become social beings. With this, it has become possible to relate cats with other cats in a shelter and they structure a certain hierarchy that maintains respect among felines.

The authors explain that cats, regardless of the number of individuals in the group, usually show signs of stress between week one of entering the shelter compared to other cats that have been housed in this place for between two to sixteen weeks, so it is evident that the adaptation period upon entering a shelter takes approximately two weeks. Toscano and Menor (2020), indicate that it has been found that cats have an inclination towards a microenvironment that offers heights and places of concealment, such as boxes or cages. By having this type of enrichment in their immediate environment, cats tend to exhibit a calmer attitude and show less reluctance to interact with humans. They are also observed to exhibit caring and closeness behaviors.

The microenvironment plays a crucial role in the well-being of cats in shelters, according to Bennett, Dowling, and Casey (2018). This concept refers to the closest and most direct environment in which felines find themselves, i.e., the physical space of the cage or assigned area in the shelter. To enhance the well-being of cats in this environment, it is essential to provide elements that enrich their experience, such as heights, hiding places, interactive toys, and suitable substrates. These elements allow cats to express their natural behaviors, such as climbing, hiding, exploring and playing, which reduces the stress and anxiety associated with shelter confinement. In addition, ensuring proper cleanliness and organization of the microenvironment is also essential to promote the health and well-

being of the cats while they are waiting to be adopted or reunited with their owners.

In addition to studying cats' preferences for a microenvironment, Toscano and Menor (2020) state that it is important to consider both the microenvironment and the macroenvironment when enriching the cat's environment. If only the microenvironment is enhanced without attention to the macroenvironment, cats are likely to show greater apathy and adopt more apathetic, avoidant and agonistic behaviors. Conversely, when both the macroenvironment and microenvironment are enriched, cats exhibit self-care behaviors and show greater affiliation.

The macroenvironment, as mentioned by Carney, Little, and Brownlee-Tomasso (2019), plays a significant role in the behavior of cats toward humans and other felids in environments such as shelters and homes. This concept encompasses the broader environment that cats perceive from their cage or designated space, i.e., the outdoor environment surrounding them. The design and organization of the macroenvironment can influence cats' socialization, affecting how they interact with people and other feline companions.

An enriched macroenvironment can include socialization zones, where cats have the opportunity to interact with other members of their species in a controlled and safe environment. It can also provide opportunities for interaction with humans, which builds the cats' confidence and sociability. In addition, a well-planned macroenvironment can provide sensory stimulation, such as outdoor sights, interesting sounds and smells, which keeps cats engaged and stimulated. Environmental enrichment for Desforges (2021), is the importance of improving the species' living environment through environmental enrichment by providing elements and provisions that support animal welfare. By enriching the environment, benefits are achieved both physically, mentally and socially, allowing animals to exhibit species-appropriate behaviors in a natural way.

Environmental enrichment is a crucial practice to improve the welfare of refugee cats, especially during their recovery period after becoming lost. According to Serafini, Bassi, and Faverzani (2018), environmental enrichment consists of providing these felines with a series of elements and provisions that enrich their environment and satisfy their physical and psychological needs. In a temporary shelter environment, it is critical to provide cats with opportunities to express

their natural behaviors, such as scratching, exploring, hunting, and maintaining social interactions with other individuals. By ensuring an enriched environment, the activity, curiosity and general well-being of shelter cats are encouraged, allowing them to better adapt to their new situation and facilitating their recovery process.

To enrich a cat's environment, Foreman and Farnworth (2019), emphasize the need to understand the preferences and actions that cats typically perform in their natural outdoor environment in order to enrich their environment. These actions include scratching, climbing or climbing, hunting, exploring, hiding, inquiring, foraging, and socializing with other individuals. Understanding these behaviors is essential to ensure optimal welfare and to allow cats to express their innate behaviors in the place where they are housed.

Ellis, et al. (2022), stress the importance of having a meticulous approach when applying environmental enrichment. To achieve this goal, it is recommended to employ an enrichment plan that has been previously analyzed and approved, which can be applied in a generalized manner for all cats. This will allow prioritization of a wide variety of behaviors in meeting the needs of the animals.

In relation to this, Yupa (2018) emphasizes that an environmental enrichment plan should have a solid foundation in the physical environment, considering factors such as available space, objects intended for play and feeding, as well as the cat's social structure and interaction with humans. To ensure successful implementation of environmental enrichment, it is essential to study the specific behavioral needs of each cat species and provide materials that simulate the conditions they would encounter in a natural, free environment.

Shelter environmental enrichment programs, as outlined by Bremhorst, Tighe, and Starling (2019), play an essential role in the welfare and successful adoption of cats. These programs are designed to enhance the living environment of felines in shelters by providing physical and mental stimulation that encourages natural and positive behaviors.

By implementing environmental enrichment programs, shelters can offer cats a variety of activities and opportunities to explore, play and socialize. This can include the availability of interactive toys, climbing and hiding structures, and socialization areas where cats can interact with other feline companions and humans.

Clinical ethology according to Zhukova, et al. (2021), focuses on the study of animal behavior, with the purpose of understanding the formation of similar behavioral patterns between different species. Comparisons of these patterns are also carried out both between species and between individuals. In addition, the relationships that individuals establish with others of the same species, with different species and with the surrounding environment are analyzed.

Zailema (2021), the ethogram is presented as a valuable tool that involves an exhaustive record, both in descriptive and experimental terms. Its objective is to identify and describe various categories of behaviors expressed by an individual or a group of individuals in their natural habitat. With the help of the ethogram, it is possible to classify the natural behaviors exhibited by animals, considering both acts that are mutually exclusive and those that are carried out collectively.

Materials and Methods

The study included a quantitative descriptive field research that is presented with a quantitative nature, since it was determined through data collection, analysis and interpretation how many times agonistic behavior patterns were presented when applying two physical environmental enrichment techniques.

The research design was non-experimental, because the study will be conducted through observation and description, since the aim is to determine whether the application of physical environmental enrichment techniques promotes the increase or decrease of agonistic behavioral patterns that are mostly presented as a problem at the level of a shelter and the preference between the two techniques to be used.

Data were recorded by means of tables made in Microsoft Excel. The data collection for the evaluation of the agonistic behaviors presented was given by means of Excel record sheets for a period of the day where the cats show the most activity (Annex 1) that include the listed agonistic behavior categories that were based on the search and research of articles and theses, that have applied an ethogram with categories of agonistic behavior according to this species, for each one that presented a behavioral pattern were recorded with a +1, and then counted how many +1 were recorded by putting the total in the corresponding cell, in case no behavioral pattern was recorded it will be recorded with a - . They were recorded by means of a program made in order not to feed the animal's boredom by carrying a monotonous

enrichment. For the measurement of the agonistic behavioral patterns of the pre-enrichment environmental observation were also evaluated with a similar table, excluding the enrichments applied, the pre-enrichment evaluation days will be 5 days (Annex 2).

An ethogram (Annex 3) was also used to evaluate the numerical and percentage total of agonistic behavior patterns presented before the enrichment and during the application of the enrichment.

Finally, for the evaluation of the preferences of the cats according to sex, age and body condition data, towards the two techniques to be maneuvered on the physical environmental enrichment, which are boxes and shelves, a table of preference records was used indicating the data mentioned by each cat of the study (Annex 4), for the total of the records divided by the categories according to the biological data (sex: male, female; age: juvenile, adult; CC: 1-9) frequency tables were made of the total summations by each category (Table 7, Table 8, Table 9). For the evaluation of the preference between boxes and shelves, the results of the same table (Annex 4) were used excluding data on sex, age and body condition, i.e., only the number of cats that used these objects regardless of their biological data was counted.

Results

In the case of relating the age of the cats (Juvenile-Adult) to the type of environmental enrichment, the associated p-value (0.000016) was less than the margin of error (0.05). Consequently, significant statistical evidence was found indicating a relationship between the age of the cats and the type of environmental enrichment used.

Finally, when relating the body condition of the cats (CC:3, CC:4, CC:5, CC:6, CC:7) to environmental enrichment, the associated p-value (0.0000000000213) was less than the margin of error (0.05). Therefore, he found sufficient statistical evidence to affirm a significant relationship between the body condition of the cats and the type of environmental enrichment used.

In this work, a detailed initial evaluation of the behavior of the cats housed in the "Rescue Mission" shelter was carried out. Through the use of ethograms and direct camera observations, relevant behavioral patterns were identified, specifically agonistic behaviors. This initial phase allowed us to establish a solid basis for investigating the impact of physical environmental enrichment in reducing such behaviors and improving the welfare of felines in shelters.

First, it was observed that during the pre-physical environmental enrichment phase, cats exhibited significant agonistic behaviors, such as paw tapping (205 times) and vocalizations (184 occasions) over a five-day evaluation period. These results are consistent with previous findings by Gajdos et al. (2023), who also found that striking with a paw and vocalizations were the most frequent agonistic behaviors in cats. On the other hand, with the implementation of physical enrichment in the form of boxes and shelves, a marked reduction in agonistic behaviors was observed. In the first week of enrichment, one-paw swipes decreased to 83 presentations, vocalizations to 52 and fighting to 2 presentations. These results are consistent with the study by Dantas et al. (2017), examined the relationship between agonistic behavior and environmental enrichment in shelter-housed cats. Their results suggest that the introduction of a puzzle feeder as enrichment did not lead to an increase in aggression due to competition for resources. This supports the idea that environmental enrichment can provide opportunities for exploratory behaviors and improve welfare in groups of cats housed long-term in shelters or multi-cat environments, as also demonstrated in the present research. Comparing the results of this research with the study by Zailema (2021), which evaluated the behavior of cats in a shelter, there is a similarity in the presence of agonistic behaviors in felids in both situations. This suggests that shelter cats in both our study and Zailema's study may experience behavioral problems related to aggression, in both the most presented agonistic behavior was vocalizations. This could indicate the importance of implementing environmental enrichment strategies to improve welfare and reduce agonistic interactions in shelters and similar environments.

The results obtained where two types of physical environmental enrichment were compared show that the cats in the study exhibited different behavioral patterns in relation to the use of boxes and shelves as forms of environmental enrichment. In the case of boxes, most cats (mode) used them approximately 12 times, with a mean value of 9.4 times. Some cats showed no interest in the boxes (minimum), while others used them up to 22 times (maximum). The data revealed a dispersion in relation to the mean of about 5.46, a variance of 29.77 and a standard deviation of 5.46. On the other hand, in the case of shelving as a form of enrichment, the results indicate that many cats played around 6 times, as reflected in the mode. The mean was 5.7 times, which points to an overall average of use. The standard deviation of 4.10 suggests moderate variability in the data, while the median of 5.5 indicates an even distribution of frequency of use. Based

on these results, it can be concluded that cats showed a slightly higher preference for the use of boxes as a form of environmental enrichment compared to shelves. However, it is important to note that the variability in the data suggests that some cats may have preferred shelves at certain times or circumstances. These findings are consistent with the results of Ellis et al. (2017), who also found that cats showed greater interaction with enclosed, covered spaces, such as boxes (median:55%), compared to toy interaction (median: 2%). From an ethological perspective, this preference for boxes may be related to the natural behavior of felines to seek shelter and safe spaces for resting and protection. In addition, these results suggest that boxes may be a more effective and beneficial option as physical environmental enrichment for cats housed in shelters, as evidenced in the "Rescue Mission" shelter.

The results of the chi-square statistical analysis provide valuable information on the relationships between the different types of physical environmental enrichment and variables such as sex, age and body condition of the cats. First, when evaluating the relationship between the sex of the cats and the type of enrichment (Box-Rack), the associated p-value (0.000033) indicates that there is a significant association between these two variables. This suggests that the preference for a specific type of enrichment varies according to the gender of the cats, which could be due to differences in their natural behaviors or individual preferences. When examining the relationship between cat age (Juvenile-Adult) and enrichment type, the associated p-value (0.000016) points to a statistically significant connection. This finding suggests that the choice of environmental enrichment is also influenced by the cats' life stage. Younger and adult cats may have different needs for stimulation and exploration, which could influence their preference for certain types of enrichment. Finally, when relating the cats' body condition to environmental enrichment, the extremely low p-value (0.0000000000213) suggests a strong relationship between these two variables. This indicates that preference for one type of enrichment may be linked to the cats' body condition. It is possible that cats with different body conditions have specific enrichment preferences, which could be related to their activity levels, mobility and comfort.

It can be interpreted that the variation in enrichment preference between genders of cats could be related to inherent aspects of their individual behavior and preferences. Cats, as a species, may exhibit gender-based behavioral differences due to biological and hormonal

factors. Males and females may have different patterns of exploration, social interaction, and response to environmental stimuli. For example, in the wild, males may be more likely to explore wider areas in search of resources, while females may focus more on rearing and caring for young. These differences may influence how they interact with different types of enrichment. Some males may prefer more active activities or stimuli that mimic hunting, while females may opt for more relaxed environments to rest and care for their well-being.

On the other hand, interpreting the finding of a significant relationship between cat age and environmental enrichment choice implies that cats' different life stages play a crucial role in their enrichment preferences and needs. Younger cats, such as kittens and adolescents, tend to be more active and curious compared to adult cats. They are in a learning and developmental phase, which makes them more likely to seek novel stimuli and explore their environment more energetically. In this regard, they may show a preference for enrichments that provide opportunities for play, interaction and active exploration, such as shelves that allow them to climb and jump. On the other hand, adult cats, especially those in later stages of life, may have a more relaxed attitude and may seek out enrichments that provide comfort, relaxation and resting options. Boxes, for example, might offer them a quiet, cozy space to rest, hide, and feel safe.

The finding of a significant relationship between cats' body condition and preference for a particular type of enrichment suggests a close interaction between cats' physical condition and their enrichment choices. Cats with a leaner body condition (CC:3) may be more active and have higher energy levels to explore and participate in stimulating activities. They may seek out enrichments that allow them to move, climb and play more intensely, such as shelves that offer opportunities for jumping and climbing. On the other hand, cats with a heavier body condition (CC:5-7) may prefer enrichments that provide comfort and rest, as they may have reduced mobility or may be less inclined to engage in strenuous physical activities. Boxes might provide them with a cozy, protected space where they can relax without the need to exert themselves physically. The connection between enrichment preference and body condition could also be related to stress levels and well-being. Cats with higher body condition may experience more stress in their daily lives, which could influence their preferences for enrichments that reduce stress and provide them with a safe haven.

Comparing these results with those of other studies reviewed, such as Ellis et al. (2017), Foreman and Farnworth (2019), and De Toni (2020), there is convergence on the importance of environmental enrichment for cat welfare. Enrichment provides felids with opportunities to express natural behaviors and satisfies their physical and mental needs. The preference for enclosed structures, such as boxes, and the importance of the enriched environment in the long term, as mentioned by De Toni (2020), is also confirmed in our results.

On the other hand, Lingna's (2019) study highlights the effectiveness of sensory enrichment in modifying unwanted behaviors, such as inappropriate scratching, in cats. This suggests that, in addition to physical structures, strategies that stimulate cats' senses should also be considered to improve their well-being. By integrating this knowledge with our results, it is possible to design more comprehensive and effective enrichment programs for cats in shelters and homes, addressing both their physical and emotional needs.

The results of this study provide relevant information for improving the welfare and behavior of cats housed at the "Rescue Mission" shelter. Boxes stand out as a more effective and preferred option for cats compared to shelves. Understanding how the gender, age, and body condition of cats influence their physical environmental enrichment preferences provides valuable insights into optimizing their well-being. By considering gender differences, we can tailor enriched environments to meet the particular needs of males and females, taking advantage of their natural behaviors and preferences. In addition, by adjusting enrichment options according to the cat's life stage, whether juvenile or adult, we can encourage active participation and appropriate stimulation. Finally, by taking into account body condition, we can provide enrichments that align with their activity and comfort levels, helping to reduce stress and improve their emotional well-being. Strategic implementation of physical environmental enrichment based on these variables can enrich cats' experiences, promoting an active and healthy lifestyle that supports their individual needs and contributes to their overall happiness.

The results corroborate and align with previous research that has found that cats prefer enclosed, covered spaces such as boxes, suggesting an innate need to seek shelter and protection. These findings are of relevance to improving the care and attention of cats in shelters and homes. Providing appropriate environmental enrichment options, such as crates, can help reduce stress, aggression, and other

behavioral problems, improving overall feline well-being. Differential attention to physical environmental enrichment in refugee cats has a profound impact on their well-being. By considering preferences based on sex, age and body condition, an environment is created that aligns with their individual needs. This can result in reduced stress levels, more natural behaviors, and a greater sense of security, which ultimately promotes their emotional and physical well-being in the shelter environment.

In terms of public health, this personalized approach to physical environmental enrichment can generate significant positive effects. Shelter cats that exhibit more balanced and healthy behaviors are more likely to successfully adapt in adoptive homes. In addition, by demonstrating an active commitment to animal welfare and implementing specific strategies based on scientific evidence, shelters can strengthen their image in the community and foster a culture of responsible animal care. This, in turn, can increase adoption and societal involvement in the protection of shelter cats, generating a positive impact on overall public health.

This study and its comparison with other research highlights the importance of providing adequate enrichment for cats in shelters and homes. Reducing stress and improving the well-being of cats can have positive effects on human-animal coexistence, which could reduce the likelihood of abandonment and promote responsible ownership. In addition, an enriched environment for cats may prevent behavioral problems and aggression, contributing to safer and healthier interactions between felines and the community at large. Taken together, these results and their comparison with previous studies provide a solid basis for the implementation of effective environmental enrichment strategies aimed at cat welfare and their positive impact on both veterinary and public health.

Conclusions

In the development of the present study, significant results were obtained that allow drawing relevant conclusions about the behavior and environmental enrichment in cats housed in the "Rescue Mission" shelter.

Regarding the first objective, which sought to evaluate the agonistic behavior of the cats before and during the implementation of physical environmental enrichment techniques, it was found that physical

environmental enrichment had a positive impact on the reduction of agonistic behaviors. During the pre-enrichment phase, a high level of agonistic behaviors, such as paw tapping (205 times), vocalizations (184 times), and staring (135 times), was observed. However, after the implementation of physical environmental enrichment (boxes and shelves), a significant decrease in agonistic behaviors was evident. Paw tapping decreased to 83 times, vocalizations to 52 times, and staring to 41 times in the first week. These results suggest that physical environmental enrichment is an effective strategy to reduce aggression in shelter housed cats.

Regarding the second objective, which was to compare two types of physical environmental enrichment (boxes and shelves), it was found that cats showed a clear preference for boxes and shelves as forms of enrichment. Boxes were used on a total of 282 occasions, while shelves were used on 170 occasions. These numerical data indicate that boxes were the enrichment option most often chosen by the felids housed in the shelter. This preference may be due to the fact that boxes provide a safe and secure shelter space, which meets the cats' natural behavioral needs.

In the third objective, which sought to evaluate the relationship between types of physical environmental enrichment with sex, age and body condition, interesting results were found. The relationship between type of enrichment and sex of cats ($p = 0.000033$) highlights that preferences may vary according to differences in natural behaviors and individual preferences between males and females. The statistical relationship between the age of the cats and their choice of enrichment ($p = 0.000016$) points to a clear influence of life stages on the selection of environmental stimuli. Specifically, it highlights how preferences for certain types of enrichment may be influenced by different stimulation and exploration needs in young and adult cats. The highly significant relationship between cats' body condition and their enrichment preferences ($p = 0.0000000000213$) is a highly relevant finding. It indicates that the choice of enrichment may be directly related to the physical condition of the cats. Speculatively, it could be inferred that cats with different body conditions might favor certain types of enrichment due to their specific mobility, comfort and activity levels.

The results obtained in this study support the effectiveness of physical environmental enrichment as a strategy to reduce aggressiveness in cats housed at the "Rescue Mission" shelter. In addition, a clear

preference was found for boxes and shelves as forms of enrichment, with boxes being the option most used by the felines. These findings suggest the importance of providing an enriched environment adapted to the needs of the cats, considering their preferences and individual characteristics to improve their well-being and quality of life in the shelter.

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