SUSTAINABLE DIY CAT FURNITURE: MEETING FELINE BEHAVIORAL NEEDS WHILE ENGAGING OWNERS IN ECO-FRIENDLY DESIGN *

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Abstract

This study investigates how domestic cats adapt their behavior in limited living spaces and how these behaviors affect human-cat coexistence. Employing a mixed-methods research design, it combines longitudinal behavioral observation and owner surveys to assess 30 pet cats across 24 households over a 120-day period. Behavioral data were categorized into five major types—elimination, resting, shedding, entertainment, and scratching—and analyzed using descriptive statistics via SPSS.

Key findings reveal that while 98% of cats used litter boxes consistently, 12.5% exhibited inappropriate elimination in fixed household locations, indicating environmental or psychological influences. Resting behaviors varied with temperature and furniture material, and 90% of cats avoided designated pet beds. Notably, 95% of cats responded positively to interactive play, yet 41.67% continued to damage household furniture despite having scratching posts, highlighting a need for material-based furniture design optimization.

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This research demonstrates that environmental factors significantly affect feline behavioral expression and emotional security in small spaces. It provides practical design recommendations, including vertical expansion, multi-functional furniture, and biophilic material selection. The results offer a theoretical and empirical foundation for sustainable, behavior-responsive pet furniture design and improve understanding of feline adaptability in dense urban living.

Keywords: Cat behavior, limited space, household habits, pet furniture design, human-cat coexistence, behavioral observation

Introduction

In contemporary society, rising living standards and the pursuit of emotional fulfillment have made pet ownership, particularly of cats, an increasingly popular lifestyle. The so-called “cat craze” has grown alongside digital media platforms like Facebook and TikTok, contributing to a surge in pet cat ownership. According to the China Pet Industry White Paper (2019, 2020), the number of pet cats in China rose from 44.12 million in 2019 to 48.62 million in 2020. The pet-owning demographic is also shifting younger, with 36.8% of owners born after 1995 by 2022.

Many young owners live in small apartments, especially in large urban centers, where limited space directly affects human-cat interaction and highlights the need for functional pet furniture. Optimizing such environments is essential to support natural feline behaviors and foster harmonious coexistence.

This study investigates the behavioral characteristics of domestic cats in confined living spaces, focusing on patterns such as feeding, resting, playing, scratching, and elimination. While prior research (Weiss et al., 2015) has explored environmental impacts on feline behavior, comprehensive observational studies remain scarce. To address this gap, this study employed real-time behavioral

observations of four cats between January and April 2023, aiming to provide theoretical and practical references for designing pet-friendly environments.

Findings suggest that cats possess a keen awareness of their home environment, shaped by spatial perception, olfactory memory, and emotional security. When exposed to open household doors, cats responded with cautious exploration, using scent and sound to assess risk. While bolder cats observed from a distance, more timid individuals retreated quickly. Over time, all cats developed familiarity with household boundaries and consistently retreated indoors when sensing danger, indicating a strong spatial and emotional connection to their domestic environment.

These insights emphasize the importance of stable, enriched home settings in shaping feline security and adaptability—an understanding critical to improving living conditions and furniture design in small urban spaces.

Objectives

1. Analyzing Household Behavior Patterns of Cats in Limited Spaces
2. Exploring Cats' Perception of "Home"
3. Providing Data Support for Pet-Friendly Furniture Design.

Literature Review

1. Feeding Behavior and Habits

Cats rely on their highly developed sense of smell to locate food and can precisely identify its position. Studies indicate that 60% of cats unintentionally scatter food outside their bowls while eating, and these cats often refuse to consume the scattered food in subsequent meals. Additionally, 40% of cats exhibit burying motions with their front paws after drinking or eating, a behavior that may be linked to their instinctive survival habits in the wild. These

findings align with Wang Qianrui et al. (2023), who explored the foraging behaviors of cats.

2. Sleeping Behavior and Habits

According to previous literature, the deep sleep duration of cats is approximately 4 hours (Wang, 2014). However, this study found that adult cats typically sleep for 12–14 hours per day in total. Additionally, their sleeping locations change with temperature variations: cats prefer warmer places (such as sofas, beds, and chairs) in colder conditions, while in hotter temperatures, they choose cooler spots (such as floors or areas near air conditioning vents). Wang Qianrui et al. (2023) also highlighted that environmental factors significantly affect feline resting time.

3. Play Behavior and Habits

Play behaviors in cats exhibit individual differences and are highly environment-dependent. This study found that 95% of cats show a strong interest in interactive toys provided by their owners, such as cat wands and laser pointers. Regardless of their current activity, they would pause and engage with the toy upon encountering it.

Additionally, cats in multi-cat households tend to interact through chasing and play-fighting, whereas solitary cats are more likely to engage in self-directed play, often using sound-emitting objects to simulate hunting scenarios. These behavioral patterns are consistent with the findings of Zhuo Yuer (2022), who studied feline entertainment needs based on scenario theory.

4. Scratching Behavior and Habits

Scratching is an instinctive behavior in cats, closely linked to their territorial instincts and physiological needs. This study observed that 95% of cats use their claws to scratch objects, and 98% actively use scratching posts to fulfill this need. However, 41.67% of cats still scratch furniture, such as sofas and beds, leading to damage.

This phenomenon suggests that although scratching posts can partially satisfy cats' scratching needs, certain individuals may prefer scratching specific materials or surfaces due to texture or scent preferences. Gan Yan (2023) also emphasized the importance of furniture safety in feline-friendly home environments, suggesting that furniture design should accommodate feline behavioral traits to minimize unnecessary damage.

5. Elimination Behavior and Habits

All observed cats in this study were spayed or neutered, resulting in relatively stable elimination behaviors. The three-month observation revealed that 98% of cats consistently used litter boxes, demonstrating strong environmental adaptability. However, 12.5% of cats occasionally eliminated in fixed household locations outside the litter box, such as sofas or corners of rooms. This behavior may be linked to scent marking habits or a lack of environmental security. Research suggests that limited living space may influence feline elimination habits, and improper litter box placement or litter type may be key factors contributing to inappropriate elimination behaviors (Sun, 2022).

Methodology

1. Materials and Methods

This study employed observation and data analysis methods, conducting a detailed examination and documentation of the behavioral habits of 30 cats in limited living spaces over a period of 120 days, from February to May 2023.

1.1 Experimental Background

The subjects of this study were cats and their owners living in small residential spaces ranging from 20 to 30 square meters. The observed living spaces included:

(1) Open-plan rooms

(2) Duplex apartments

(3) Rooms without balconies

Each pet owner's living environment varied slightly in layout, furniture arrangement, and external surroundings, providing a diverse observational background for the study.

1.2 Observation Subjects

The study observed 30 cats of various breeds, aged between 3 and 15 years old. All cats had undergone spaying or neutering procedures. Activity levels: Approximately 60% of the cats were highly active, but their activity levels gradually decreased with age.

Social behavior: Around 90% of the cats displayed affection toward their owners, while 10% exhibited unstable emotional responses to their owners.

1.3 Feeding and Care Management

During the observation period, owners did not impose any restrictions on their cats' movement. To ensure continuous monitoring, the research team installed surveillance cameras to record the cats' activity range and daily habits 24/7. Additionally, owners interacted with their cats during leisure time, allowing researchers to observe behavioral patterns and emotional responses more comprehensively.

Researchers combined video surveillance data with owners' observational records to systematically document and analyze the cats' behaviors throughout the study.

2. Behavioral Sampling Methods

Over the 120-day period from February to May 2023, this study collected daily behavioral data on cats living in limited spaces using a monitoring system and owner observations. The collected data was then systematically categorized and analyzed.

2.1 Data Collection and Statistical Analysis

All observed feline behaviors were classified into five major categories:

(1) Elimination behavior

(2) Resting behavior

(3) Shedding behavior

(4) Entertainment and hunting behavior

(5) Scratching behavior

The proportion of each behavior in the cats' daily activities was recorded and analyzed. A comparative analysis was conducted based on breed differences and age variations to examine behavioral habits and adaptability in confined spaces.

All data were processed using SPSS statistical software, and descriptive statistical analysis was applied to extract key findings, identifying behavioral patterns and trends.

2.2 Results and Analysis

In limited spaces, harmonious cohabitation between humans and cats requires mutual adaptation and the resolution of behavioral challenges. While some aspects of feline behavior are influenced by the owner's habits, cats are instinct-driven animals, and their psychological needs are often difficult to modify through simple training.

Therefore, this study collected large-scale observational data through long-term monitoring, providing an extensive dataset to analyze feline household behaviors and habits. These findings offer practical insights into how cats and their owners can coexist more harmoniously and how external elements can be optimized to enhance human-cat interaction in limited living spaces.

3. Conceptual Framework

The theoretical framework of this study is built upon animal behavior science, environmental psychology, human-animal interaction theory, and ecological and environmental design. The research focuses on exploring how cats adapt and adjust their behaviors within limited spaces, considering factors such as spatial constraints, human-cat interactions, and environmental influences. This

framework provides theoretical support for analyzing feline household behavior while also offering scientific guidance for optimizing cat-friendly living environments.

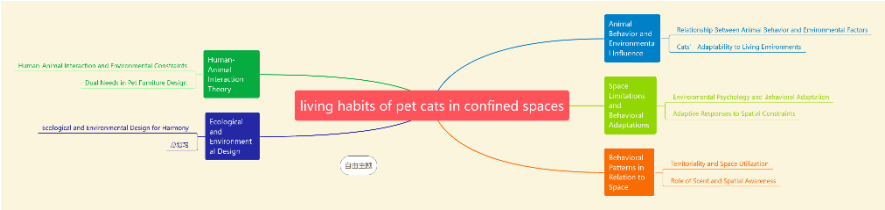

Figure 1 Conceptual Framework (Source: Constructed by the researcher)

Results

1. Feline Behavior and Spatial Adaptation — An Integrated Study of Behavioral Ecology, Human-Animal Interaction, and Environmental Design

1.1 Animal Behavior and Environmental Influence

This study is based on animal behavior theories to explore how domestic cats interact with their living environment. The research by Weiss and Zawistowski provides fundamental theories on the physiological and behavioral characteristics of domestic cats. Studies indicate that feline behavior is influenced by spatial size, the presence of the owner, resource availability (such as food and resting areas), and social interactions.

Behavioral ecology research suggests that animals adjust their behavioral strategies according to their surrounding environment. Cats' foraging, resting, territorial, and play behaviors are all shaped by external factors. Furthermore, Gorman & Trowbridge emphasized that olfactory signals and spatial cognition play a crucial role in feline territorial behavior, which is essential for cats in establishing a sense of security at home.

1.2 Spatial Constraints and Behavioral Adaptations

Since urban pet owners typically live in small-sized residences, this study integrates environmental psychology theories to explore how cats adapt their behaviors in confined spaces. Research findings suggest that restricted space may lead to adaptive behavioral changes in sleeping patterns, play behavior, and territorial marking.

Regarding animal adaptation to environmental stress, Wang Qianrui's study found that limited spaces may trigger changes in activity patterns, stress levels, and spatial preferences. Additionally, Zhuo Yuer's research indicates that modular and flexible spatial designs can effectively mitigate the negative impact of small spaces on pet behavior. This theoretical perspective supports this study's objective of optimizing small-space cat furniture design, aiming to enhance cats' comfort and well-being through improved spatial solutions.

1.3 Territorial Behavior and Spatial Cognition

This section integrates theoretical perspectives on territoriality, resource distribution, and spatial cognition to examine how cats behave in confined domestic environments. Research indicates that cats rely heavily on scent marking, spatial orientation, and cognitive mapping to explore, understand, and manage their surroundings. These behavioral mechanisms are crucial for developing a sense of security, familiarity, and ownership within their home territory.

Observational studies have shown that cats exhibit strong site fidelity, often returning to familiar spaces for rest, play, or observation. Any significant alterations in the home environment—such as furniture rearrangement, changes in human activity patterns, or unexpected stimuli—may disrupt this familiarity and trigger stress-induced behaviors. These include excessive grooming, inappropriate elimination, or hiding.

Within this context, the study further investigates how spatial constraints influence three key behavioral patterns. First, resting behavior is shaped by factors such as temperature, noise levels, and perceived safety, affecting where

cats choose to sleep. Second, exploratory behavior is guided by sensory input—especially olfactory and visual cues—which cats use to navigate and establish spatial awareness. Third, scratching behavior serves dual purposes: marking territory through scent and visual cues, and maintaining claw health. A deeper understanding of these behaviors is vital for designing spatially adaptive, cat-friendly environments that align with feline instincts and promote well-being.

1.4 Human-Animal Interaction (HAI) Theory

The Human-Animal Interaction (HAI) theory emphasizes the social dynamics between domestic cats and their human companions, particularly in how these relationships shape feline behavioral patterns in indoor environments. Scholars such as Wang Mei (2013) and Wang Yi (2016) have noted that a cat's social needs—especially the need for companionship, affection, and interaction—are deeply intertwined with environmental stimuli. In small urban dwellings, where spatial freedom is limited, this interaction becomes even more significant.

Unlike free-roaming cats, indoor cats depend heavily on their owners for mental stimulation and emotional fulfillment. Thus, play sessions, feeding routines, and shared resting spaces are central to maintaining a cat's psychological health (Wang, 2023). Moreover, pet-friendly furniture design has increasingly focused on creating multi-functional spaces that allow for shared use by both humans and cats.

In compact living conditions, the owner's daily habits and lifestyle exert a direct influence on feline behavior. Feeding routines, for example, shape eating patterns and expectations. Interaction patterns—such as play frequency and quality of companionship—significantly affect a cat's emotional state. Similarly, how owners facilitate environmental adaptation can ease feline stress and promote comfort. Guided by HAI theory, this study explores strategies for

optimizing human-cat shared spaces, ultimately aiming to improve the cohabitation experience and enhance mutual well-being.

1.5 Ecological and Environmental Design

This study also draws on ecological and environmental design principles to explore ways of improving the domestic environment for both cats and their human counterparts. Building on the work of Dai Yu and Zhuo Yuer, the research highlights the growing importance of biophilic and pet-centric design elements in residential spaces.

Several key strategies emerge from ecological design frameworks. First, the vertical dimension of space should be fully utilized through climbing structures such as cat trees, wall-mounted platforms, and elevated walkways. These additions help expand the usable territory for cats, reducing spatial stress. Second, the integration of multi-functional furniture—such as bookshelves with cat tunnels or chairs with concealed nesting areas—supports both aesthetic coherence and feline needs.

Third, careful material selection enhances both safety and durability. Eco-friendly, non-toxic, and scratch-resistant materials not only protect the furniture but also ensure a secure environment for cats. Finally, incorporating sensory-rich elements—such as varied textures, scents, and tactile surfaces—stimulates feline curiosity and engagement, mirroring their natural instincts.

Through these environmentally conscious and human-centered design strategies, this study seeks to promote a more harmonious cohabitation model. The aim is not only to elevate the living quality for pets but also to foster deeper emotional bonds between cats and their human companions in contemporary urban households.

2. Analysis of Household Behavioral Habits of Cats

Through observation and data analysis of 30 cats living in confined spaces, this study identified the following key behavioral characteristics:

2.1 Elimination Behavior

98% of the cats actively used the litter box for elimination. However, 12.5% of the cats, even after being spayed or neutered, still chose to eliminate in fixed areas such as on sofas and in room corners. It is speculated that this behavior may be related to habits or psychological factors—such as a need for scent marking—developed prior to spaying. This phenomenon indicates that even after surgery, cats' behavioral habits may still be influenced by their previous experiences.

2.2 Resting and Sleeping Behavior

The average daily sleep duration of cats is between 12 and 14 hours, with elderly cats sleeping up to 20 hours per day. The majority of cats (90%) did not choose the cat beds provided by their owners; instead, they preferred harder surfaces such as floors, beds, and chairs, especially when the ambient temperature was high. This pattern is closely related to cats' spatial adaptability and the influence of environmental temperature.

2.3 Shedding Behavior

Shedding in cats was found to be very stable. In this study, 83.3% of the cats exhibited significant shedding, while 12% of the cats shed very little. Shedding is primarily influenced by seasonal molting and the hair growth cycle, and it is not significantly related to the breed. This finding, which is linked to the physiological cycle of cats, indicates that seasonal factors play a decisive role in feline shedding.

2.4 Play and Hunting Behavior

95% of the cats showed a strong interest in interactive toys, such as cat wands and laser pointers, pausing their current activities to engage with the toy. Cats living alone typically entertain themselves by seeking sound sources or through other self-directed activities, whereas cats in multi-cat households tend to engage in chasing each other as their primary form of entertainment.

2.5 Scratching Behavior

98% of the cats used scratching posts; however, 41.67% of the cats still scratched sofas and beds, mainly because these furniture items—often made of fabric or leather—offer a more appealing texture for scratching. This result suggests that when designing cat-friendly furniture, material selection should be carefully considered to minimize the risk of furniture damage.

Overall, by observing the behavioral patterns of 30 cats in confined spaces, this study summarizes the core behaviors of elimination, sleep, play, and scratching, and explores how environmental factors influence these habits. The results indicate that aspects such as space size, furniture design, and interaction methods affect cats' adaptability and behavior patterns. Based on these findings, recommendations have been proposed to optimize cats' living environments, including improvements in cat accessories, furniture design, and human-cat interaction, all aimed at enhancing the quality of life for cats in limited spaces. Future research should consider expanding the sample size and conducting long-term behavioral tracking to obtain more comprehensive conclusions.

Discussion

Through a three-month observation of 24 pet owners and an analysis of survey data, this study found that the 30 observed cats exhibited similar general behavioral habits, though individual differences were evident in certain details. For example, while the duration of sleep was largely consistent (at least 12 hours per day), the preferred sleeping locations varied among cats. In terms of elimination behavior, although most cats used the litter box, a small number chose to eliminate in other locations. Survey responses revealed that certain behavioral issues were common among the observed cats, affecting the living environment of the owners. These findings contribute to a deeper understanding of feline household behavior in limited spaces and how these behaviors interact with the daily lives of owners.

However, like all studies, this research has limitations. Due to the sample size and the limited duration of observation, the findings may not be fully generalizable to all cat-owning households. Additionally, while questionnaire responses and observational data provide valuable qualitative insights, these findings require further comparison with existing literature to confirm their applicability across different contexts, topics, and disciplines. To gain a more comprehensive understanding of feline household behavior and its influencing factors, future studies should include follow-up interviews and larger-scale sample analyses.

1. Implications for Pet-Friendly Product Design

This study highlights the need to consider feline behavioral habits and natural instincts in pet-friendly product design. In confined spaces, cats' daily behaviors directly affect harmonious coexistence between owners and pets. The observational and survey data collected in this study further validate the importance of feline behavioral habits in designing pet furniture and living spaces, especially in small residential environments. The stronger emotional bond between pet owners and their cats heightens the demand for well-designed furniture.

From a qualitative data collection perspective, this study provides theoretical support for further exploration of harmonious human-cat coexistence. In limited living spaces, feline behavior places higher demands on furniture in terms of functionality, adaptability, comfort, and sustainability. The study suggests that as the emotional bond between owners and their pets grows, owners tend to offer more interpretative responses, underscoring the impact of behavioral habits on spatial design.

2. The Influence of Interior Furniture Design on Feline Behavior

Findings from this study indicate that the key to harmonious coexistence between cats and owners in limited spaces lies in interior furniture design. Pet

furniture design must balance elements such as concealment, coexistence, and engagement, ensuring that it meets the needs of both humans and pets. The study emphasizes that in shared living spaces, furniture should effectively accommodate both the owner and the pet, a principle that serves as a guiding framework for this research.

Wang Yi's analysis of pet furniture design highlights the importance of space sharing and multifunctionality, reinforcing the idea that design should simultaneously address the needs of both pets and owners. Moreover, pet furniture should adhere to pet-friendly design principles, ensuring that it not only meets the behavioral needs of pets but also integrates seamlessly with the owner's living environment.

Recommendation

1. Recommendations for Improving Cat Behavior

To improve feline well-being in limited living spaces, this study suggests optimizing elimination, resting, scratching, and play behaviors through environmental adjustments. Providing a variety of litter box types and litter textures can help reduce inappropriate elimination by accommodating individual sensory preferences. Enhancing sleeping comfort with soft materials and temperature-adaptive options supports better rest and lowers stress. To address furniture damage from scratching, durable materials and attractive scratching alternatives—such as vertical or sloped scratchers with catnip—should be provided. Additionally, enriching a cat’s daily routine through interactive toys and human-cat playtime (15–30 minutes daily) not only satisfies natural hunting instincts but also strengthens emotional bonds and reduces anxiety, especially for indoor cats.

2. Recommendations for Furniture Design in Limited Living Spaces

In response to spatial constraints, this study recommends developing multi-functional furniture that integrates climbing, resting, scratching, and storage into compact designs. Vertical expansion, such as wall-mounted shelves and suspended beds, can greatly increase usable space for feline movement and reduce stress related to space limitations. Furthermore, thoughtful spatial zoning—separating feeding, resting, and litter areas—enhances comfort and behavioral consistency. The integration of ecological materials and biophilic design principles also contributes to creating a safe, enriching, and harmonious cohabitation environment for both cats and their owners.

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