

ABSTRACT

Our interests focus on indoor cats and how living with humans affects their behaviors. Outdoor cats (*Felis catus*) typically follow a diurnal and nocturnal pattern of behavior where they are active both during the day and the night. We wondered if indoor cats would follow a similar pattern of day/night behavior to their outdoor counterparts or if they would follow the patterns of their human diurnal companions and sleep at night. We were also interested to see if artificial light, a mimic of moonlight, would impact their night activity. In this experiment, we focus on the behavior of indoor cats and how their nighttime activity is affected by artificial light. For our project, a total of 3 cats, an adult male, an adult female, and a six-month-old male kitten, were observed in a home. During the first month, the cats were exposed to light each night, and their activities were recorded by a small 4K camera in a short sequence of time-lapse videos from 12:00 am to 9:00 am. During the second month, cats were similarly filmed without artificial light. The presence or absence of certain behaviors and the time spent sleeping by each cat were recorded and used to compare the cats' activity during the two light conditions. We observed that fewer activities were performed by each cat, and they spent more time sleeping without artificial light. Our results show indoor cats can pattern their nighttime behaviors based on different light conditions. This suggests to us that the nocturnal behavior of outdoor cats may be learned in response to natural light from the moon. Our research may also help cat owners wanting to decrease their cats' nocturnal activity. Their cats will be less active if they keep their homes dark.

INTRODUCTION

The topic of this research project is focused on to what extent the activity of indoor cats is influenced by artificial light. The goal is to determine if artificial light can mimic the moonlight during hunting hours for indoor cats (*Felis catus*) and make them show more activity as their outdoor brother and sisters. All three subjects were monitored closely in the environment, they lived at least half of their lives, and nothing was changed in their routine except the artificial light exposure. According to a study done by NASA Earth Observatory on outdoor nocturnal animals, outdoor nocturnal animals around the area of Chicago were less active in the presence of artificial light (Patel, 2019). Florida Fish and Wildlife Conservation Commission stated that there are three ways how artificial light can affect nocturnal and diurnal animals: They can be attracted (such as natural predators), repel them as is considered a form of habitat loss, or alters the day and night patterns and reproductive cycles causing a shock on the body (FWC). In their study, cats were considered nocturnal, but cats aren't nocturnal or diurnal. Their behavior is explained as crepuscular. They are most active when the sun rises or sets, during low-light times. The dawn and dusk periods are their natural hunting and feeding times (Finn, 2022). That brings us to the point of the experiment. Many studies have been done on the effects of artificial light on nocturnal wildlife animals. Still, we wanted to observe if indoor cats, which grew up with artificial light, are also affected by it. The approach of choice was observation and detailed monitoring of the cats' activity inside a home every night for two months. The artificial light was on for the first month of the experiment, then off for another month (the month was considered 31 days). The monitoring times were strategically chosen to fit the researcher's schedule while still monitoring subjects during their prime hunting time. The crucial research problem was to take their crepuscular behavior into a consideration instead of focusing primarily on nighttime. Turning the light off after sunset and ending the recording after sunrise avoids confusion with their crepuscular behavior, but it rather clearly monitors the behavior during those times. The findings follow in the graphic form and include a conclusion, comparisons, and any potential reasons for improvement and next steps.

RESEARCH DESIGN AND QUESTION

The question asked was to what extent artificial light affects the circadian rhythm of cats and whether it can fully replace their crepuscular behavior. Hence, they adapt to the diurnal behavior of humans?

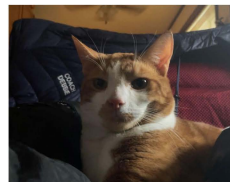
Circadian rhythm is physical, mental, and behavioral changes that follow a 24-hour cycle and respond to light and dark (Shmalberg, 2020). We specifically focused on behavioral changes in the rhythm to see how their activity is affected by artificial light and if it can replace natural light. We recorded behavior nightly and then observed the behavior of each cat separately because gender and age can potentially play a role in the amount of activity.

METHODS

In attempting to conduct this research experiment, three fully domesticated indoor cats were observed in their natural habitat. Cats were specifically chosen to have a variety of genders and ages. Their activity was closely monitored and recorded on a small 4K GoPro Camera each night. The data were reviewed each day and recorded into a table in Excel Spreadsheet. Cats were allowed to move freely around the apartment, and nothing else was changed in their day-to-day routine. The duration of the experiment was two months, where the artificial light was on for a month and off for another.



Wall-E, kitten unneutered male

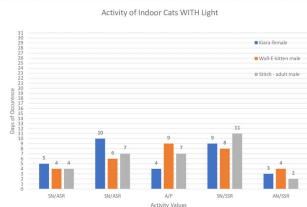


Stitch, an adult neutered male



Kiara, an adult spayed female

RESULTS

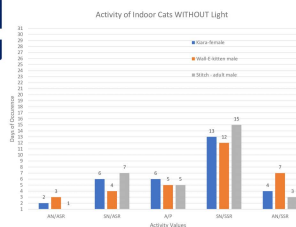


Legend

- AN/ASR** – Active at night/active at sunrise
- SN/ASR** – Asleep at night/active at sunrise
- A/P** – Active/passive (napping)
- SN/SSR** – Asleep at night/ asleep at sunrise
- AN/SSR** – Active at night/asleep at sunrise

Table 2 shows the activity of three cats with the artificial light absent. There was an overall decrease in activity at night for all three subjects and a significant increase in sleep during the night and sunrise. Adult males slept during the night for almost half a month. All three subjects added approximately a week on their result with the lights on. The male kitten does not have as many bursts of energy mixed with short naps but sleeps at night and at sunrise. Adult female cat activity at sunrise also decreased.

In this table, we can see the activity of Kiara, Wall-E, and Stitch with the artificial light present and how many times they were asleep or lying down, or active during the first month of the experiment. Their crepuscular rhythm is considered by separating the activity into the night and sunrise (refer to a legend). The table shows that an adult female cat slept at night for 19 nights out of 31, and an adult male slept for 18 nights. The male kitten was taking naps followed by bursts of energy throughout the night. Comparing the activity at sunrise, all three cats were more active than sleeping during sunrise, corresponding to their crepuscular behavior.



There is a switch of activity during sunrise as all three subjects sleep more during sunrise when they are active at night.

CONCLUSION

In conclusion, the results show that light affected the activity of indoor cats significantly. All three subjects slept during the night and sunrise when the artificial light was absent, which can be interpreted as adapting to the human diurnal rhythm or correlates with the theory about nocturnal animals' activity. Moreover, their activity during sunrise was much lower when they stayed up all night, and the lights were off. It can signify the intensity of the activity. The results support that their activity is much more intense if they are active at night, to the point that they are sleeping during their natural feeding times. On the other hand, the switch in activity at sunrise while active at night supports the assumption that cats have connected artificial light with human activity. The dark room during sunrise signals them that no human activity is happening. The results of the overall activity of all three subjects also support the theory since they were more active during the night and sunrise with the artificial light present. Results show that age difference also plays a role in night activity. It can be compared to child behavior as children also take quick naps and must release energy. The observed male kitten was very active during the day and sunrise with the artificial light present and had the most significant change in activity when the light was turned off. According to the results, the activity of kitten male cats is affected most significantly by artificial light. The results didn't prove to have the same effect as moonlight on any of the subjects and seem to be seen as a human activity.



DISCUSSION

There is not much research on the effect of artificial light on the activity of Indoor cats. This experiment can be evolved and improved to show cats' adaptation to human lifestyles and schedules. To validate this experiment's results, I plan to repeat the experiment numerous times and see how the values correspond. Other conditions during the experiment weren't considered, such as noise levels of the environment, human presence or absence, and just the presence of the other cats in a small space can influence the activity of one individual cat. To develop a theory, the conditions must be standardized and repeated, involving cats of all genders and ages individually and then as a group. There is a need for a lot more data comparisons.

We used the same device throughout the experiment, and all the subjects had the same feeding times and a routine they were used to, making the results reliable. This experiment helped me to become aware of the correlation between the activity of cats and circadian rhythm and the extent of it. I'm planning to monitor the cats closely during a year span to see if seasons affect the activity of cats and repeat the experiment during each season to see how much influence artificial light has on cats during different seasons. To standardize the conditions, I will get more cameras and place them in different spots around the room to have a clearer view of the intensity of the activity.

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