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Cat Color Theory: Can Cat Color Being Accurately Used To Predict Behavior

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Abstract

Is there scientific backing for "Tortie-tude" or "Orange Cat Behavior"? Many cat owners swear by these claims. Can coat color predict cat personality? If coat color is an accurate way to predict personality, the cat adoption process could be smoother. Also, veterinarians can be better prepared to avoid cat scratches and bites if they know a color is more likely aggressive. We made and distributed two surveys to determine the perception of personality by color and the actual personalities of cats. The first survey, "Cat Perception," was given to people who work with cats and, therefore, have interacted with a large number of different cats and asked how they perceived cats of each color (black, white, orange, gray, brown, bicolor, and tricolor). We gave the other survey to cat owners and asked about their cats (color, personality, and outside influences). Results. In conclusion, we found that personality is affected by coat color.

Keywords: coat colors, behavior, genes, personality, cats

Introduction

Cat owners, veterinary professionals, and anyone around cats have probably heard the terms tortie-tude, orange cat behavior, and black cat bias. Leaving the question of whether the personality and behavior of cats can be accurately predicted using coat color. As well as what other effects coat colors have on cats. This study looks at coat color genes, cat personality, people's perception of cat color's effect on behavior, outside influences on behavior, coat color's effect on lifetime, and the concept of black cat bias.

The primary genes involved in cat color are the red and black x-linked genes. This means that males can have the black or red gene while females (or males with an extra x chromosome) can have two red genes, two black genes, or one of both. Tricolor cats are cats with both black and red genes. The black gene can be diluted in two different ways. The first is the recessive version of the black gene, which creates the color brown. The black gene can also be diluted through the addition of the dilution gene, creating the color gray. While the red gene can also dilute to a lighter red, this was not looked at since it is still red. All these colors can have the added white spotting gene, agouti gene, or both. The white spotting gene adds spots of white (unpigmented fur). These cats are considered bicolor, with a base color and white spots or tricolor. The agouti gene adds stripes, making these cats a tabby, often called the tabby gene. Solid white cats have a mutation that prevents the color from presenting, meaning that solid white cats are a different color cat in disguise. Black Cat Bias refers to the idea that people have negative and even fear towards black cats, resulting in them having higher euthanasia rates and lower adoption rates. We hope to disprove the inaccurate practice of grouping bicolor cats together instead of with their base colors, resulting in vague or even inaccurate information.

There have been two primary studies looking at similar information. The first is The Relationship Between Coat Color and Aggressive Behaviors in the Domestic Cat, by Elizabeth Stelow in 2015. This study looked at what colors were more likely to be aggressive. They found increased aggression in females, especially sex-linked orange females, with the award of most aggressive going to tricolors. There was also a correlation with the bicolors: black and white and gray and white (Stelow, 2015). We expected to see increased aggression scores with the orange gene. The study suggests higher aggression scores in females and cats with the white-spotting gene. However, we do not expect to see this. The other study is Human Perceptions of Coat Color as an Indicator of Domestic Cat Personality, by Mikel Delgado in 2015. This study looks at the relationship between cat color and personality, similar to this study. Delgado found that adjectives were more likely to be assigned to specific colors; for instance, orange cats are more likely to be described as friendly and less likely to be described as aloof or shy.

Stelow's aggression study looked at aggression in cats under arguably stressful circumstances, handling and veterinary visits, and every day. While the study did see an increase in aggression in females and some bicolors overall, the numbers were very similar, making any slight difference seem significant. With 1,274 participants only looking at aggression, their aggression scores should be more accurate since they looked at nothing else. While Delgado's study answered the question of whether cats of a specific color are more likely to have certain characteristics, the answer being yes. That study had 189 participants and only looked at the colors orange, black, white, bicolor, and tricolor. We plan to look at orange, white, black, gray, brown, bi-colors, tricolors, and combinations of these colors. We also plan to have a much higher number of participants. Delgado's study used the Likert Scale with ten terms (active, aloof, bold, calm, friendly, intolerant, shy, stubborn, tolerant, and trainable). While we based our terms on

the Likert Scale, we used 20 terms instead of 10. We changed a few slightly to receive better results (introverted, extroverted, calm, friendly, curious, social, crazy, aggressive, confident, sweet, aloof, lazy, high energy, mischievous, stubborn, demanding, affectionate, mysterious, dumb, intelligent). This study hopes to examine why certain colors are more likely to behave in a specific way. We believe the cause is the genes that create the colors and hope to rule out other variables. Are orange cats more likely to be friendly because of the orange gene, or since most of them are males, or outside influences that affect orange cats in a more significant proportion?

Overall, this study plans to take a much broader look at whether cat color affects personality and, more importantly, why. Taking a broad look and including more variables will give a more precise answer. At its core, this study plans to look at how coat color affects personality. This study believes that cat color will affect personality more so that these traits can be traced back to the genes (red, black, tabby, or white-spotting), showing a genetic reason for the differences. People's perception of cat colors will also be similar to the data. In other words, there will not be an overall perception of a color that does not match the data. Also, this study expects to see a more substantial effect from outside influences (age, sex, and lifestyle) on personality. We will then compare how these outside influences break down by color. For example, suppose elderly cats are more likely to be grumpy and aggressive. In that case, we will see if a color has a larger population of elderly cats. Therefore, the color may have a stronger association with grumpy and aggressive, but that is not because of the color.

We also predict that female cats will be more likely to have demanding and high-maintenance-related traits while males have lazy and relaxed traits. We expect this because female-dominated colors like tricolors are demanding and challenging, while male-dominated colors like orange are friendly and relaxed. We expect cats with the red gene (orange, orange and

white, and tricolors) to have higher aggression scores. In the cat community, it has long been believed that orange cats are more likely to be aggressive. Along this line of thinking, we also expect that tabby cats (any color with the tabby gene) will have higher scores of active, high energy, and related descriptions. We believe that solid white cats (cats with a pigment mutation, not the white spotting gene) will be lazy and challenging due to their increased rates of deafness. On a related note, there will likely be a relation between coat colors and related health effects that can be seen through the age data. For example, orange cats are believed to be more aggressive than other cats. They are known to have higher instances of FIV, Feline immunodeficiency virus, a fatal disease spread primarily through aggressive contact with other cats (Pontier, 1998). Because of this, we expect to see a decrease in the number of orange cats with age. On a related note, black cats are believed to be less likely to get FIV (*Seven,* PetMeds), so we expect to see an increase in black cats with age. We believe we will see an increase in females and a decrease in males as age increases, as males are prone to getting into trouble that females do not.

This study expects to disprove the theory of Black Cat Bias, the theory that people have negative feelings toward black cats. This theory is strongly believed due to black cats having higher euthanasia rates and lower adoption rates. While this is true, we believe this is not due to people's feelings towards black cats but the actual number of black cats compared to other colors. This study expects to disprove the idea of grouping bicolor cats as a group. We expect to see that, for example, black and white cats behave more like black cats than orange and white cats. In other words, the behavior associated with the base color is stronger than the white spotting gene.

The experiment is two surveys with similar questions administered to different populations. The primary survey looks at a cat's personality, which the owner takes. This survey asks not only about the color and personality of the cat but also its age, sex, and lifestyle (indoor, outdoor, or both). The second survey asks about the perception of different colored cats by people who interact with many different kinds and colors of cats (veterinarians, vet techs, vet students, animal shelter workers, and others) to see if any color has a perception that is inaccurate to their actual personality. If people believed gray cats to be very active, but the data on gray cats does not show an increased active score, there would be a difference in the perception of gray cat behavior and the actual behavior. The results from the perception survey will be the control group, comparing the data from this study to others to see if the data is consistent.

Methods

Study Design

This study aims to answer whether cat color affects personality and why. To answer this question, we designed a cross-sectional study with qualitative data looking at Domesticated felines of any sex or age. All data was gathered through two online surveys through the website Survey Planet. We shared the links to our two surveys through Facebook groups. We removed incomplete surveys or ones with conflicting information, leaving 2822 cats from 31 countries (complete list in Appendix D). Both surveys ran from October 2023 through March 2024.

Participants

The first survey, Cat Perception (Appendix B), was sent to veterinary clinics and shared through online Facebook groups of veterinary students and veterinary technicians. We also contacted

some animal shelters, cat cafes, and cat-specific vets. The second survey, Cat Personality (Appendix A), was shared through a local veterinary hospital and in online communities of cat owners like Crazy Cat Lovers, Tabby Cats!, and Cute Cat Lovers Association (complete list in Appendix C).

Materials

All of the data came from our surveys. Cat perception had 15 questions; after we removed incomplete and conflicting surveys, 449 participants were kept. This survey asked people who see many different types of cats what their perception of personality was for an overall color. The survey asked two questions for each color of cat (black, white, orange, brown, gray, bicolor, and tricolor) and which one of ten choices they felt most accurately described that color, also if the participant could tell the difference in sex of that color (i.e., if a male orange cat and a female orange cat were in a room could you tell which is which by behavior alone). The goal was to get an idea of the perception for each color to see if they were accurate to the actual data found. In other words, to see if any color had a perception different from its actual personality. The primary survey, Cat Personality (Appendix A), had six questions and looked at the personalities of individual cats by those who know them best, their owners. We asked questions about the color and personality traits as well as the sex, age, and lifestyle of the cat. After removing incomplete or conflicting surveys, we had a total of 2822 cats.

Analysis

The collected data is color, genes, sex, age, and lifestyle and how these interact. The genes we are looking at are the red gene, black gene, white spotting gene, tabby gene, and dilution gene. This study focuses primarily on outliers of the categories that are higher or lower than the rest. The significance of the number was broken down into categories: most/ least likely

and likely or unlikely. The average and range were calculated for each trait in each category. We then found half and a third of the range, and these numbers were added and subtracted from the average. Any number higher than the average plus half the range was most likely, while anything lower than the average minus half the range was least likely.

In the same way, anything higher than that average plus a third of the range is likely, and less than the average minus a third of the range is unlikely. This study expects each variable (color, age, sex) to have at least one characteristic that is higher or lower than average, showing that color influences personality. The measurements show how much is in each category. The data was compiled using Survey Planet's built-in software and transferred to Excel to calculate the average, range, and outliers.

A problem that arose was owners not inputting their cats in the correct categories. This is believed because the data for the tricolor section had a statistically impossible percentage of males, with our data having 12.1% male tricolor cats when the expected percentage was 1%. While we asked owners to input their cats' information to the best of their ability, we did not check them in any way. Most mistakes were limited to the tricolor section, as the other sections were more straightforward. For example, one participant said they would input their Siamese cat as a Tricolor. As this comment was made after the surveys had been launched and several hundred participants had already taken it, it was too late to change the surveys. Since these instances are minimal and almost exclusively in the tricolor category, the large number of data points makes this inconsequential. If this study is repeated, a verification step could fix this problem; however, it would be almost impossible to implement and drastically decrease the number of participants. Five spreadsheets were used for the survey on Cat Personality. As this study believes that the category bicolor is inaccurate, all bicolor cats were recorded in both the

bicolor category and the category of their base color, i.e., a white and black cat would be under bicolor and black. Because all categories have different amounts of data points, the percentages were compared, not the raw numbers. The first spreadsheet looks at personality by color, and the chosen characteristics are entered into each color column. The second sheet looked at the genes responsible for the colors (red, black, white spotting, tabby, and dilution). For example, a tortoiseshell tabby would have the characteristics listed in the red, black, and tabby columns. The last three sheets examined outside influences on personality, sex, age, and lifestyle. For sex, the chosen characteristics were documented under the cat's sex, male or female. For the age, there were five groups: kitten (0-1yr), younger adult (1-4yrs), adult (5-8yrs), older adult (9-12yrs), and elderly (13+yrs). The color was also listed with each age group to see if any age group had a significant amount of a specific color; for this, we excluded the bicolor category and listed bicolor cats as their base color. Lastly, we looked at lifestyle, specifically whether the cat lives indoors, outdoors, or both, with the characteristics listed and the color and sex of each lifestyle.

Results

Our study found that females were 12.8% more likely to be labeled introverted, while males were 9.2% more likely to be labeled extroverted. Also, males are 10.6% more likely to be labeled friendly, 10.2% social, and 8.7% affectionate. Tricolored cats are, on average, 99% female; in this study, we found the tricolor number to be 88% female, which is still the majority. Orange cats, which should be 80% male, were found in our study, and 77% were male. This is because single-color categories like orange are less complicated, causing fewer problems. Tricolored cats were 13.6% more introverted than extroverted, while. Orange cats were 7.2% more extroverted than introverted. Black, brown, and gray were predicted to be 75% male, but

we saw 56%, 54%, and 54% respectively. White cats were expected to be 50-50 male and female and were 56-44%. White, black, gray, and brown differed between 0.6% and 5.2%.

For age, we found that the category of kitten (1 year or less) has little to no correlation. Presumably, kittens have not developed their entire personality, and their owners are still getting to know them. The highest score for kittens was curious, with 77.6%, and the lowest was lazy, at 3.5%. The categories extroverted, friendly, curious, crazy, high energy, and mischievous saw a decrease with age. In contrast, calm and stubbornness increase with age. The number system showed each color as having an outlier age; for instance, blacks were higher than average in the older adult category. That said, the most significant difference was between oranges and kittens, with 2.3%, so all these percentages were insignificant.

The lifestyles are indoor, outdoor, and both. While most cats are indoors, this is not necessary by choice. Of the three lifestyles, cats in both categories had the most choices. Most outdoor cats need to stay outside the home for one reason or another. Most cat owners keep their cats indoors since it is safer and has fewer predators, vehicles, and other dangers. These indoor cats were most likely to be friendly, curious, crazy, sweet, high-energy, mischievous, demanding, and affectionate, while outdoor cats were least likely to have the same traits and confidence. Outdoor cats were most likely to be mysterious. This inverse relationship is more dependent on where the owners are. Indoor cats, when they want to play or burn off energy, rely on their owners and homes, while outdoor cats can do what they want when they want. This is why indoor cats are seen as curious, high-energy, demanding, and crazy, while outdoor cats are not. Cats indoors and outdoors are seen as confident, demanding, and not mysterious.

When looking at which colors are more likely to have what lifestyle, we look at both because, as previously mentioned, they are the cats with choice over where they go. In both, we see an

increase in white and gray, a decrease in black and brown, and no change in orange and tricolors. The increase in the number of light-colored cats outside is likely because they survive better in the wild, and the opposite is true for dark-colored cats. There were 5% more male than female cats in total. So it is unsurprising that all lifestyles had a higher percentage of males. Males were only 1% higher in indoor cats, while both were 20.3% higher, and outdoor was 18%. They show a more significant percentage of male cats being outdoors some or all of the time.

While we expected an increase with the age of black and a decrease with orange, this was not seen. However, from older adults to the elderly, we see a slight increase in black cats and a slight decrease in orange cats. This shows that the idea that color and related personalities may affect age is not a significant percentage. We also predicted that with age, there would be an increase in females and a decrease in males. Females were lower than average at the kitten age (under a year old), and males were higher than average. For the elderly (over 13 years), we saw a significant increase in females and a significant decrease in males. Which shows the idea that women live longer than men includes cats.

As predicted, the bicolor category had no significant findings, with no most likely, least likely, or even unlikely traits. Bicolor cats are likely to be crazy, confident, and mischievous, which does not have a clear direction. Showing that if the white spotting gene affects personality, it does so less than the base color. Overall, the color grouping of bicolor cats is unhelpful when looking at behavior, and therefore, bicolor cats should be looked at as their base color. However, a study examining the effect of coat color and pattern on adoption found that bicolor cats, specifically tuxedo cats, had the longest length of stay for any pattern. (Brown, 2014)
Black cats were most likely to be high energy and stubborn and least likely to be crazy or mysterious. Furthermore, the perception of black cats showing them to be curious and active, not

aggressive and grumpy, does not seem to have strong negative feelings towards black cats. As we predicted, Black cat bias, or the belief that people's negative feeling toward black cats causes them to have a higher euthanasia rate and lower adoption rate, is false. We found that dark-colored cats have the most extended stay, an average of 71.2 days (Brown, 2014), and the highest euthanasia rate; they also have the most significant overall percentage. Our study shows black cats make up 33% of cats, with the next highest group being orange at 21%. Light-colored cats had the shortest stay, 63.6 days, and an average of 3% for white cats and 21% for gray cats. While the euthanasia rate is higher for black cats, there are more black-colored cats than any other color. Combined with the fact that this study found no negative feelings towards black cats, implies that the increase in euthanasia rate has nothing to do with people's attitudes towards black cats and is more about the prevalence of them.

Solid white cats were most likely to be called aggressive, lazy, demanding, and likely calm. They were least likely to be called curious, mischievous, and unlikely to be called crazy, sweet, or intelligent. We predicted solid white cats to be labeled difficult because of the correlation between solid white pigment mutation and deafness. 17-22% of white cats with non-blue eyes are born deaf, 40% if the cat has one blue eye, and 65-85% of solid white cats with both eyes blue are deaf (*Ask Elizabeth,* 2018). These cats are less curious, mischievous, or intelligent because they cannot hear what is happening around them. Interestingly, the perception of white cats was most likely confident and calm at 20% and least likely to be demanding and high energy or mischievous and determined at 2% and 3%, respectively.

Gray cats had no strong outliers but were unlikely to be described as high-energy. Brown cats were most likely to be crazy, confident, sweet, and high-energy. Likely to be calm, friendly, curious, mischievous, and intelligent. All black, gray, and brown cats had a perception of being

curious and active and not aggressive and grumpy. The combination of black, gray, and brown cats is overall very similar. Black cats were most likely to be high-energy and stubborn. While brown cats were also high energy, gray cats were unlikely to be high energy.

Orange cats were least likely to be described as introverted and intelligent, unlikely to be aloof, high energy, demanding, or mysterious, and likely to be dumb. The perception showed that orange cats were most likely to be friendly and extroverted, with the highest percent, 49%, and least likely to be seen as aloof and shy. Tricolored cats were least likely to be extroverted, friendly, social, affectionate, or dumb but were most likely to be aloof and mysterious. Likely to be introverted and unlikely to be calm or lazy. The perception was aggressive and grumpy at 42% and least likely to be any answer containing the words friendly or calm. Tricolor cats with the tabby gene or torbies had the shortest length of stay in shelters. (Miller, et al, 2019)

We also looked at these traits and their correlation by gene. Cats with the orange gene (orange, bicolor orange, tricolors) were most likely to be aggressive and were least likely calm, sweet, or demanding. They were unlikely to be introverted, curious, lazy, affectionate, or intelligent. A study found that orange cats were more likely to be infected by feline immunodeficiency virus (FIV) and less likely to get feline leukemia virus (FeLV) (). This is because FIV is spread through aggressive contact while FeLV is spread through social contact, meaning that cats with the orange gene were more likely to get into fights than other colors.

Cats with the black gene (black, gray, brown, bi-colors, and tricolors) were most likely introverted, stubborn, intelligent, and likely aloof and mysterious. They were least likely to be dumb and unlikely to be friendly, lazy, or affectionate. Black cats are less likely to be infected with FIV because they are less aggressive. Cats with the White spotting gene (bi-colors and calicos) were least likely to be crazy and mischievous and most likely to be sweet.

They are likely calm, affectionate, and unlikely to be extroverted, aggressive, confident, high-energy, or stubborn. There is no real direction other than calm, which again shows that the category of bicolor is unhelpful and that bicolor cats should be placed in their base color. Lastly, cats with the tabby gene were most likely calm, friendly, curious, social, confident, high energy, mischievous, affectionate, and likely sweet and dumb. Moreover, they are least likely to be aloof, stubborn, or mysterious and unlikely to be introverted. Showing the active and high-energy traits we expected from the tabby group.

Tables

Table 1. Personality Traits for Male versus Female Cats

Characteristics for Males and Females

Characteristics	Female	Male
Most Likely	Introverted	Extroverted Curious Social Affectionate
Likely	Aloof Stubborn Mysterious Intelligent	
Least Likely	Extroverted Curious Social Affectionate	Introverted
Unlikely		Aloof Stubborn Mysterious Intelligent

Note: Table 1 examines the relationship between personality traits attributed to female or male cats.

Table 2. Percentages for the Introverted versus Extroverted by Color

Introverted vs. Extroverted by Color

Trait	Tricolor	White	Black	Gray	Brown	Orange
Introverted	37%	33.7%	33.8%	34.9%	33.5%	16.2%
Extroverted	23.4%	31.5%	28.6%	30.1%	34.1%	23.4%

Note: Table 2 looks at the relationship between introverted and extroverted traits and color, ordered by most females to the left and most males to the right.

Table 3. Percentages of Color for Male versus Female Cats

Sex by Color

Sex	Tricolor	White	Black	Gray	Brown	Orange
Male	12.1%	56.2%	55.8%	53.8%	53.5%	77.1%
Female	87.9%	43.8%	44.2%	46.2%	46.5%	22.9%

Note: Table 3 looks at the relationship between sex and color, ordered by most females to the left and most males to the right.

Table 4. Personality Traits Across Ages of Cats

Characteristics by Age

Traits	Kitten	Young Adult	Adult	Older Adult	Elderly
Most Likely	Extroverted Friendly Curious Social Crazy Confident Sweet High Energy Mischievous Affectionate	Mysterious			Calm Intelligent
Likely		Dumb	Aggressive Dumb	Aloof Lazy	Aggressive Stubborn Demanding
Least Likely	Introverted Aggressive Aloof Lazy Stubborn Demanding				Dumb
Unlikely	Calm	Intelligent	Affectionate	Curious Aggressive Confident Aloof	Friendly Curious Crazy High Energy

				Mischievous Intelligent	Mischievous Mysterious

Note: Table 4 looks at the relationship between age and personality traits, with the categories Kitten (0-1 yrs), Young Adult (1-4 yrs), Adult (5-8 yrs), Older Adult (9-12yrs), Elderly (13+ yrs).

Table 5. Percentages of Female versus Male Cats Across Age

Age vs Sex

	Kitten	Young Adult	Adult	Older Adult	Elderly
Male	54.9%	52.4%	54.1%	53%	49.7%
Female	45.1%	48.6%	45.9%	47%	50.3%

Note: Table 5 looks at the relationship between age and Sex

Table 6. Personality Traits by Lifestyle

Characteristics by Lifestyle

	Indoor	Outdoor	Both
Most Likely	Friendly Curious Crazy Sweet High Energy Mischievous Demanding Affectionate	Mysterious	Confident Demanding
Least Likely		Friendly Curious Crazy Confident Sweet High Energy Mischievous Demanding Affectionate	Mysterious

Note: Table 6 looks at the relationship between lifestyle, indoors, outdoors, or both, and personality traits. Looking at most likely (1/2range+average) and least likely (1/2range-average)

Table 7. Percentage of Lifestyle by Color of Cats

Lifestyle by Color

Color	Indoor	Outdoor	Both
Black	31.9%	36.2%	28.2%
White	3.4%	2%	5.1%
Brown	7%	5%	2.6%

Gray	21%	17.9%	28.2%
Orange	20.3%	22.6%	20.5%
Tricolor	16.4%	16.3%	15.4%

Note: Table 7 looks at the relationship between lifestyle and sex.

Table 8. Percentage of Lifestyle for Male versus Female Cats

Lifestyle by Sex

Lifestyle	Male	Female
Indoor	50.5%	49.5%
Outside	59%	41%
Both	60.2%	39.8%

Note: Table 8 looks at the relationship between lifestyle and sex

Table 9. Total Percent by Color

Total Percent by Color

Color	Percent
Black	32.7%
Orange	20.7%
Gray	20.5%
Tricolor	16.4%
Brown	6.6%
White	3.2%
Total	2822

Note: Table 9 looks at the overall percentage for each color

Table 10. Personality Traits by Color of Cat

Characteristics by Color

Trait	Black	White	Orange	Brown	Gray	Bicolor	Tricolor
Most Likely	High Energy Stubborn	Aggressive Lazy Demanding		Crazy Confident Sweet High Energy			Aloof Mysterious
Likely	Crazy Mysterious	Calm	Dumb	Calm Friendly Curious Mischievous Intelligent			Introverted
Least Likely		Curious Mischievous	Introverted Intelligent				Extroverted Friendly Social Affectionate Dumb
Unlikely		Crazy Sweet Intelligent	Aloof High Energy		High Energy	Crazy Confident Mischievous	Calm Lazy

			Demanding Mysterious				

Note: Table 10 looks at the relationship between color and personality traits

Table 11. Perception of the Personalities Based on the Color of Cats

Perception of Color

Color	Most Likely	Least Likely	Can you tell the difference in sex
Black	Curious and Active- 25%	Aggressive and Grumpy- 1% Lazy and Sweet- 2%	40%
White	Confident and Calm- 20%	Demanding and High Energy- 2% Mischievous and Determined- 3%	21%
Orange	Friendly and Extroverted- 49%	Aloof and Shy- 1%	68%
Brown	Curious and Active- 22%	Aggressive and Grumpy- 2%	37%
Gray	Curious and Active- 16%	Aggressive and Grumpy- 6%	36%
Bicolor	Curious and Active- 16% Friendly and Extroverted-	Aggressive and Grumpy- 3%	38%
Tricolor	Aggressive and Grumpy- 42%	Lazy and Sweet- 1% Confident and Calm- 2% Affectionate and Calm- 2% Friendly and Introverted- 3% Friendly and Extroverted- 3%	49%

Note: Table 11 looks at the perception of cats by color and if the participant believed they could tell a difference in sex by behavior.

Table 12. Personality Traits by Gene

Characteristics by Gene

	Black	Red	Tabby	White-Spotting
Most Likely	Introverted Stubborn Intelligent	Aggressive	Calm Friendly Curious Social Confident High Energy Mischievous Affectionate	Sweet
Likely	Aloof Mysterious		Sweet Dumb	Calm Affectionate
Least Likely	Dumb	Calm Sweet	Aloof Stubborn	Crazy Mischievous

		Demanding	Mysterious	
Unlikely	Friendly Lazy Affectionate	Introverted Curious Lazy Affectionate Intelligent	Introverted	Extroverted Aggressive Confident High Energy Stubborn

Note: Table 12 looks at the relationship between the genes that produce coat color (Black gn) and personality traits

Discussion

We believed that cat color and the genes that dictate those colors would affect personality. More specifically, we believed that people fairly accurately perceive the personality of cats, that outside influences would have a more substantial effect on personality than color, and that there would be a correlation between specific colors and lifespan, which we did. This study expected to see female cats with more high-maintenance traits and male cats with more relaxed traits, which the data did not show. We expected red cats to have higher aggression scores, tabby cats to have higher active traits, and white cats to have more difficult traits, which the data backed up.

We hoped that with clear patterns regarding color and behavior, we could better match people and pets. One of our main goals has always been to make the adoption process more efficient for cats. We hope that by predicting what their cat will be like, we can increase adoption and decrease relinquishments. The other goal was to find a connection between color and aggression in the hopes that veterinarians, veterinary technicians, and anyone who deals with cats could predict which color of cat is more likely to be aggressive. Cat bites, because they can seem minor, are often ignored. However, these bites tend to get infected because of cats' sharp, needle-like teeth. We hoped to see a correlation between specific colors of cats and a longer lifespan so we could look more into why that might be. While we did not see a correlation

between age and color, this sample may have been too small to see patterns over five age ranges.

Based on other studies like Delgado's study, we believed that color does affect personality, but we wanted to know how and why. All previous studies looked only to answer whether cat color affects personality. We wanted to know why and rule out false positives by examining how outside factors affect behavior. Because of the added information, each data point contains multiple pieces of data to be examined together and separately (color vs personality, age vs personality, age vs color, and others). This process took significant time, and comparing and finding outliers were done by hand. Initially, all data was inputted by hand before a better way was found. Because of this, our data was collected once by hand and twice through a program. Because of this, we are confident that there is little to no inputting errors.

This study examined whether color affects personality and how to rule out outside factors. While a few studies have examined color and behavior, none examine the genetic level or rule out outside factors. For example, Delgado's study looked at whether behavior is affected by color, yes or no. They did not look at the genetics of these cats or outside factors. Stedlow's study of aggression and color looked at aggression and color in arguable stressful circumstances. Furthermore, the numbers were very similar across the colors. In the future, a study like this could be completed with proof of genetics so we know that the traits are ascribed to the right genes. We saw several owners struggle with the right colors and told them to pick what they felt was the closed answer. We can be more accurate with proof like a photo; however, it will take longer and limit the number of data points that can be reasonably used. The data from this project will be presented and defended to an honors council, and the paper will be submitted to the LMU Institutional Repository.

Overall, the question is, does cat color affect behavior? We want to help cats find more suitable homes and decrease the number of cat-related injuries to veterinary staff.

Conclusion

Regarding outside influences, this study expected to see a strong correlation with outside influences on lifestyle, sex, and age. While sex and age seemed to have a heavy effect on personality, since no color was skewed strongly by age, this did not affect the data overall. Some colors were skewed regarding sex. Specifically, orange cats are mainly male, and tricolor cats are mainly female. We did see that Orange were mostly males and skewed more extroverted, while tricolors, primarily female, were more introverted. The other colors with less dramatic distribution in sex (white and shades of black) did not lean in any direction. While we predicted that female cats would have more high-maintenance traits and males would have relaxed traits, this was not seen. We predicted that female cats would have longer lifespans than male cats, showing an increase in older adult and elderly percent for females and a decrease in males. This was backed by the data, with the female's lowest score being kitten and the male's lowest score being elderly. It showed that after 12 years, there is a significant change in the population. Lifestyle does not affect personality, as cats have little to no influence on their lifestyle. It was noticed that cats that live both indoors and outdoors are slightly more likely to be light-colored and less likely to be dark-colored.

In the end, this study aimed to answer the question of whether cat color affects personality. We believe that it does. Solid white cats, as predicted, were also seen as problematic. We found no proof supporting the concept of Black Cat Bias, which is the theory that people

have negative feelings toward black cats. We also found that grouping cats into the category bicolor was pointless since the behavior associated with the base color is stronger than the white spotting gene. We also believed that tricolored cats would have more difficult traits, and that was seen. In the same way, orange cats were more friendly. A correlation between the tabby gene and active descriptions was seen as expected. Cats with the red gene did have higher-than-average aggression scores.

In the end, we have found a correlation between personality, cat color, and the genes that create those colors. We hope the knowledge that cats with the orange gene are more likely to be aggressive will lessen cat-caused injuries for veterinary staff. Most of all, this data can and will be used to help cats be placed in suitable homes for them and their owners and stay there.

Acknowledgments

First and foremost, I would like to thank everyone who took or shared my survey. I could not have done any of this without data. I would also like to thank Indian Ridge Animal Hospital for sharing my surveys. Most importantly, I would like to thank my family, who now know more about coat color than they ever wanted to. Lastly, I would like to thank my father, Dr. Matt Mears, for sharing his love of veterinary medicine with me and being the reason I am where I am now.

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Budget

Personnel:

- Survey designer and overseer (6 months): $10
- Data analyzer (3 months): $20
- Advertising director (1 month): $5
- Project Manager (6 months): $10

Justification: Several jobs are needed for this project, and different amounts of time and effort are required. The survey designer and overseer create the surveys and monitor their progress. They fix any problems that may arise. The overseer will watch the surveys for the entire time they are live, which is six months. The Data analyzer will analyze the data after the surveys are complete. They will have three months to analyze the data from both surveys. While this job is shorter, it is more labor intensive. The advertising director will create all the posters and advertising for the surveys, including reaching out to the clinic and promoting the surveys online. This job is cheaper since it is for a short time and it is not very labor intensive. The last job will be Project Manager, overseeing all other personnel and fixing any problems that may arise.

Equipment:

- Computer (preowned): $0
- Printer (preowned): $0

Justification: Because everything is online, the most essential equipment is a computer. The surveys are conducted through Survey Planet's website, and all advertising is done through Facebook. The data was collected and put into tables that we printed and analyzed by hand.

Supplies:

- Printer ink: $20
- Printer paper: $10
- Calculator (preowned): $0

Justification: Supplies were needed for the analysis portion of the project. Data was compiled into many tables (color vs trait, sex vs color, etc.) These tables included the data, the average, the range, and half and a third of the range. Finding the boundaries was done by hand on paper using this information.

Services:

- Survey program with data analyzer: $180
- Advertising platform: $0
- Microsoft Excel, Publisher, Presentation, Word: $100
- Advertising: $11

Justification: The most important services are the survey website and the Microsoft Office programs. The website Survey Planet creates surveys and fundamental data analyses. Excel will be used for more complex Analyses. The printed tables were created in Word, and the posters were created in Publisher.

Publications:

- Unknown Publication Fees: $300

Justification: This paper is being submitted to the LMU repository for free. However, additional publication is possible; some funds were left for that.

Contingency:

- Contingency Fund (5% of total budget): $33

Justification: A contingency fund is included to account for unexpected expenses, equipment repairs,

or unforeseen challenges during project implementation, ensuring flexibility and adaptability to Changing circumstances.

Total Budget: $699

Appendix

Appendix A

Cat Personality Survey

1. I have a _____ colored cat.

    [ ] Orange

    [ ] White

    [ ] Black

    [ ] Gray

    [ ] Brown

    [ ] Bicolor: White and Orange

    [ ] Bicolor: White and Black

    [ ] Bicolor: White and Gray

    [ ] Tricolor: Tortoiseshell

[ ] Tricolor: Calico

[ ] Hairless

2. My cat is:

[ ] A Tabby

[ ] Not A Tabby

3. My cat is a:

[ ] Male

[ ] Female

4. My cat is ____ years old

[ ] Kitten: 0-1

[ ] Young Adult: 1-4

[ ] Adult: 5-8

[ ] Older Adult: 9-12

[ ] Elderly: 13+

5. My cat is:

[ ] Indoor

[ ] Outdoor

[ ] Both

6. I would describe my cat's personality as: (choose between 3-15 choices)

[ ] Introverted

[ ] Extroverted

[ ] Calm

[ ] Friendly

[ ] Curious

[ ] Social

[ ] Crazy

[ ] Aggressive

[ ] Confident

[ ] Sweet

[ ] Aloof

[ ] Lazy

[ ] High Energy

[ ] Mischievous

[ ] Stubborn

[ ] Demanding

[ ] Affectionate

[ ] Mysterious

[ ] Dumb

[ ] Intelligent

Appendix B

Cat Perception Survey

1. I:

   [ ] Work with cats

   [ ] Have cats

   [ ] Have family who have cats

   [ ] Have never seen a cat

2. I view orange cats as:

   [ ] Friendly and Introverted

   [ ] Friendly and Extroverted

   [ ] Aggressive and Grumpy

   [ ] Confident and calm

   [ ] Demanding and High Energy

   [ ] Aloof and Shy

[ ] Lazy and Sweet

[ ] Curious and Active

[ ] Affectionate and Calm

[ ] Mischievous and Determined

[ ] I Don't Know

3. I do/do not see a difference in orange male and female cats:

[ ] Do

[ ] Do Not

4. I view white cats as:

[ ] Friendly and Introverted

[ ] Friendly and Extroverted

[ ] Aggressive and Grumpy

[ ] Confident and calm

[ ] Demanding and High Energy

[ ] Aloof and Shy

[ ] Lazy and Sweet

[ ] Curious and Active

[ ] Affectionate and Calm

[ ] Mischievous and Determined

[ ] I Don't Know

5. I do/do not see a difference in white male and female cats:

   [ ] Do

   [ ] Do Not

6. I view black cats as:

   [ ] Friendly and Introverted

   [ ] Friendly and Extroverted

   [ ] Aggressive and Grumpy

   [ ] Confident and calm

   [ ] Demanding and High Energy

   [ ] Aloof and Shy

   [ ] Lazy and Sweet

   [ ] Curious and Active

   [ ] Affectionate and Calm

   [ ] Mischievous and Determined

   [ ] I Don't Know

7. I do/do not see a difference in black male and female cats:

   [ ] Do

[ ] Do Not

8. I view gray cats as:

   [ ] Friendly and Introverted

   [ ] Friendly and Extroverted

   [ ] Aggressive and Grumpy

   [ ] Confident and calm

   [ ] Demanding and High Energy

   [ ] Aloof and Shy

   [ ] Lazy and Sweet

   [ ] Curious and Active

   [ ] Affectionate and Calm

   [ ] Mischievous and Determined

   [ ] I Don't Know

9. I do/do not see a difference in gray male and female cats:

   [ ] Do

   [ ] Do Not

10. I view brown cats as:

    [ ] Friendly and Introverted

    [ ] Friendly and Extroverted

[ ] Aggressive and Grumpy

[ ] Confident and calm

[ ] Demanding and High Energy

[ ] Aloof and Shy

[ ] Lazy and Sweet

[ ] Curious and Active

[ ] Affectionate and Calm

[ ] Mischievous and Determined

[ ] I Don't Know

11. I do/do not see a difference in brown male and female cats:

    [ ] Do

    [ ] Do Not

12. I view bicolor cats as:

    [ ] Friendly and Introverted

    [ ] Friendly and Extroverted

    [ ] Aggressive and Grumpy

    [ ] Confident and calm

    [ ] Demanding and High Energy

    [ ] Aloof and Shy

[ ] Lazy and Sweet

[ ] Curious and Active

[ ] Affectionate and Calm

[ ] Mischievous and Determined

[ ] I Don't Know

13. I do/do not see a difference in bicolor male and female cats:

[ ] Do

[ ] Do Not

14. I view tricolor cats as:

[ ] Friendly and Introverted

[ ] Friendly and Extroverted

[ ] Aggressive and Grumpy

[ ] Confident and calm

[ ] Demanding and High Energy

[ ] Aloof and Shy

[ ] Lazy and Sweet

[ ] Curious and Active

[ ] Affectionate and Calm

[ ] Mischievous and Determined

[ ] I Don't Know

15. I do/do not see a difference in tricolor male and female cats:

[ ] Do

[ ] Do Not

Appendix C

Facebook Pages
Crazy Cat Lazy Group
International Cat Lovers
Cats International
Tortoiseshell and Calico Cats
RESPONSIBLE Cat Owners
Crazy Cat Lovers
Gray Cats ONLY!!!!!
Cat Lovers Worldwide
Dog and Cat Lovers
Tabby cats!
Worldwide Cat lovers
Cat Lovers worldwide
Cat owners private page
Grumpy Cats & Cat Lovers & Owners
Cute Cat Lovers Association
CAT LOVERS CLUB
Cat Lovers
Cat Lovers
Cat Lovers International
Cat Owners Group
Cat Lover World
Cat Lovers Community In USA
Cat Lovers
Cat Lovers Community
Purrfectly Cats & Kittens
Pet Lovers: A Community for Dogs and Cat Owners
Cat Lovers Family
KITTEN and CATS of the world

Kitten Lovers

Appendix D

America
Australia
Austria
Belgium
Canada
Czechia
Denmark
Finland
France
Germany
Gibraltar
Hong Kong
Ireland
Itlay
Japan
Malaysia
Malta
Mexico
Montenegro
Nambia
Netherlands
New Zealand
Norway
Peru
Philippines
Portugal
Romania
South Africa
Sweden
Turks + Caicos
United Kingdom