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Human Perceptions of Coat Color as an Indicator of Domestic Cat Personality

Mikel M. Delgado,[*] Jacqueline D. Munera[†] and Gretchen M. Reevy[*]

[*]Department of Psychology, California State University, East Bay, California, USA

[†]Department of Psychology, New College of Florida, Florida, USA

Address for correspondence: Mikel M. Delgado, Department of Psychology, University of California at Berkeley, Room 3210, Tolman Hall #1650, Berkeley, CA 94720-1650, USA. E-mail: mikeldelgado@berkeley.edu

ABSTRACT Associations between mammalian coat color and behavior have been investigated in a number of species, most notably the study of silver foxes by the Institute of Cytology and Genetics at the Russian Academy of Sciences. However, the few studies conducted regarding a potential relation between coat color and domestic cat personality have shown mixed results, even though many people believe that differently colored cats have distinct personalities. Understanding how humans might perceive personality in relation to coat color may have important ramifications regarding whether cats are relinquished to shelters or adopted from them. In order to assess human perceptions of differently colored cats, we conducted an anonymous, online survey, using a 7-point Likert scale and 10 terms describing personality traits that were chosen based on previous studies of animal personality. This survey examined how people assigned these given terms (active, aloof, bold, calm, friendly, intolerant, shy, stubborn, tolerant, and trainable) to five different colors of cats (orange, tri-colored, white, black, and bi-colored). There were significant differences in how participants in this study chose to assign personality terms to differently colored cats. For example, participants (n = 189) were more likely to attribute the trait "friendliness" to orange cats, "intolerance" to tri-colored cats, and "aloofness" to white and tri-colored cats. No significant differences were found for "stubbornness" in any colors of cats. White cats were seen as less bold and active and more shy and calm than other colors of cats. While survey respondents stated that they placed more importance on personality than color when selecting a companion cat, there is some evidence that they believe the two qualities are linked. We anticipate our findings will be relevant to further study in domestic cat personality and to those who work in animal rescue, particularly in how shelters promote differently colored cats and educate potential adopters.

Keywords: cat personality, coat color, domestic cats, human attitudes, temperament

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Archeological findings suggest that domestic cats (*Felis catus*) are most likely descended from the African wild cat (*Felis silvestris*), and have been living with humans for an estimated 4,000 to 9,500 years (Bradshaw et al. 1999; Vigne et al. 2004). Research suggests that domestication of the cat occurred primarily according to localized human need, coinciding with the advent of agriculturally based societies (Cameron-Beaumont, Lowe and Bradshaw 2002). Historically, humans have exerted little influence on the cat's reproductive or movement patterns, and domestic cats have faced very little active selection to coexist with humans (Izawa and Doi 1994). It is only recently that cats have been selectively bred in accordance to recognized breed standards that provide guidelines for the externally observable qualities of the animal such as appearance, movement, and temperament.

Temperament, personality and behavioral style are all terms for 'those characteristics of individuals that describe and account for temporally stable patterns of affect, cognition, and behavior' (Gosling 2008, p. 986). Regardless of the terminology used, evidence indicates that domestic cats do have personality. A review of animal behavior literature in general (Gosling and Vazire 2002; Sih et al. 2004), and reviews of cat behavior literature in particular (e.g., Lee et al. 1983; Feaver, Mendl and Bateson 1986; McCune 1995; Lowe and Bradshaw 2001; Siegford et al. 2003), suggest that non-human animals, including cats, demonstrate individual temperament and personality.

Coat color is one factor that may influence a cat's individual temperament and personality. Associations between mammalian coat color and behavior have been found in a number of species, both in wild and laboratory populations (e.g., Belyaev 1979; Cottle 1987; Trut 1999; West and Packer 2002; Trapezoz, Trapezova and Sergeev 2008; Amat et al. 2009; Kim et al. 2010). However, studies of domestic cats have shown mixed results regarding a potential relation between coat color and personality.

There have been multiple studies of the social organization (Natoli 1985) and reproductive tactics (e.g., Macdonald and Apps 1978; Natoli and De Vito 1988; Natoli 1990; Natoli and De Vito 1991; Crowell-Davis, Curtis and Knowles 2004; Crowell-Davis 2005) of urban and rural feral cats. Based on these and earlier studies regarding differences between the non-agouti (solid colored, non-tabby striped) and blotched tabby genes (Robinson 1977) and their distributions in urban and rural habitats (Todd 1977), Pontier, Rioux and Heizmann (1995) theorized that orange male cats may have difficulties in tolerating proximity of other males. An unpublished study on feline reactions to novelty (Ledger and O'Farrell 1996) showed that kittens with red (more commonly known as orange in the United States) and cream coat colorings reacted more aggressively than other colors of kittens when held by an unknown human. A more recent study (Munera 2010) examined the possible relationship between selected coat colors (black, orange, brown, tortoiseshell), the same set of coat colors but with white patches (black with white, orange with white, brown with white, calico), and cat personality. This correlational study utilized a standardized animal shelter assessment and matchmaking program (ASPCA 2011) designed to assess the responses of shelter cats to novelty and handling by a strange person. One hundred and thirty cats who were available for adoption in a Florida animal shelter were assessed in this study. No significant differences were found between any of the coat color groups on either aspect of behavior.

Cats tend to have a reputation among the general public as solitary and independent individuals, indifferent to the whims of the humans with whom they cohabit, and tolerant of affection only when it suits their own needs. This perception has been promoted in popular

literature on cats, as seen in oft-cited quotes such as "Dogs have masters, cats have staff," Mark Twain's statement that "of all God's creatures there is only one that cannot be made the slave of the leash. That one is the cat," and Rudyard Kipling's poem "The Cat That Walked by Himself" (catsinfo.com n.d.; Kipling 2010). To date, this common perception is not supported by the scientific literature. In reality, domestic cats have adapted to myriad living conditions ranging from sparsely populated rural open spaces, to densely inhabited urban city landscapes and indoor habitats of varying suitability (e.g., Bernstein and Strack 1996; Liberg et al. 2000; Macdonald, Yamaguchi and Kerby 2000; Bernstein 2005; Pontier et al. 2009). Additionally, cats can be found cohabiting and closely bonded with humans and a wide variety of species kept by these human caretakers (Bernstein 2005). This successful adaptation to vastly different life situations is the primary reason domestic cats are one of the most popular companion animals in the world, with approximately 93.6 million owned cats in the United States alone (American Pet Products Manufacturers Association 2010).

Despite the cat's current number one ranking on the pet popularity scale in the United States (American Pet Products Manufacturers Association 2010), well over a million cats enter US shelters every year (National Council on Pet Population Study and Policy 1997) for a number of different reasons, including a lack of human commitment, cost of care, and behavioral challenges (New et al. 2000; Pet Health Inc. 2007; Casey et al. 2009). Although the reasons may appear variable, the overall theme is that the relinquished cat does not match the expectations or lifestyle of the human family. Generally, few impounded cats are reclaimed by their owners and often the majority of them are euthanized (Lepper, Kass and Hart 2002; Bartlett et al. 2005). Statistics indicate that it is vital for cats to be initially placed in the most appropriate home and kept out of the animal shelter if possible.

For cats in need of a home, there are a number of factors predicting the likelihood of being chosen either for adoption or euthanasia. Some of these factors include the cat's age, sex, personality, and appearance, such as coat color (Podberscek and Blackshaw 1988; Lepper, Kass and Hart 2002). For example, Lepper, Kass and Hart (2002) found that both brown cats and black cats were the least likely to be adopted from one California shelter. Podberscek and Blackshaw (1988) found that personality and general appearance were both important reasons people liked their cats, regardless of how they obtained them. However, participants generally indicated that their cat's appearance was more important than personality as a basis for choosing that specific cat. To contrast, Neidhart and Boyd (2002) found that personality is the primary reason reported for owner's satisfaction with their cat after adoption. Neidhart and Boyd also indicated that cat adopters were more inclined than dog adopters to describe their companion animals using personality terms such as being nice, friendly, loving, and affectionate. While color may help a cat be adopted, it appears that personality helps keep a cat in the home.

There is little or no published information on how humans may perceive a cat's personality based on coat coloring. Regardless of genetic differences that may contribute to both coat color and temperament, the genetics of feline coloration are complex. It is often not possible to distinguish between a genetically homozygous and heterozygous coloration based on physical appearance alone, as dominant genes may mask other color genes. For example, a cat with one dominant white (W) gene will appear white, regardless of their genotype (Robinson 1977; Wright and Walters 1980).

While there is a strong likelihood, based on previous studies linking coat color and behavior, that genes may contribute to cat personality, we chose to focus strictly on how humans may perceive cats based on coat color, rather than on potential genetic differences. Human

perceptions may or may not reflect actual, measurable differences between cats. People may have biases acquired from personal experiences with cats or from ways in which cats are portrayed in the media. Thus, the goal of this study was to determine whether there were patterns of perceptions that might be reflected across a group of participants.

In order to assess attitudes to differently colored cats, we conducted an anonymous, online survey, with a 7-point Likert scale, on 10 terms describing personality traits (active, aloof, bold, calm, friendly, intolerant, shy, stubborn, tolerant, and trainable). These terms were chosen and adapted from previous studies that indicated they were useful to describe cats. Participants were asked to indicate their level of agreement that each of these terms described five different colors of cats (orange, tri-colored, white, black and bi-colored). We also wanted to investigate if respondents considered personality and color to be important qualities when selecting a new cat for adoption. Based on literature supporting personality variations in animals of different coat colors and adoptability of cats based on appearance, such as coat color, we anticipated that a large-scale survey would show differences in how humans perceive the personalities of differently colored cats.

Methods

All materials and procedures used in the study were approved by the Institutional Review Board at California State University, East Bay.

Questionnaire Development

The questionnaire utilized a 7-point Likert scale assessing beliefs about the presence of ten characteristics (active, aloof, bold, calm, friendly, intolerant, shy, stubborn, tolerant, and trainable) that may exist as personality traits in cats (heretofore referred to as "terms" or "traits") and the extent to which they could be attributed to five colors of cats (orange, tri-colored, white, black, and bi-colored). Five colors of cats were chosen for simplicity of research design and for ease of identification by participants. In particular, black, white, and orange cats were chosen because they are likely to be easily conceptualized by most people familiar with cats. We chose tri-colored cats to explore whether anecdotal information about the personalities of tortoiseshell and calico cats might be reflected in the results. Finally, questions about bi-colored cats would show whether the presence of white patches might impact attitudes to cat personality.

To prevent influencing perception of cat personality by the survey itself, we did not provide any imagery of cats for the survey respondents. We provided the following descriptions of tri-colored and bi-colored cats: "Tri-colored (tortoiseshell and calico)" and "Bi-colored (colored fur with white patches)."

We used 10 adjectives that reflected opposing aspects of five general categories of personality traits as assessed in animals in previous research: activity level, confidence, friendliness to humans, tolerance and trainability. Six of the personality terms (active, calm, aloof, friendly, bold, and shy) developed for the questionnaire were based on behavior patterns classified in domestic cats in studies by Feaver, Mendl and Bateson (1986) and Meier and Turner (1985). Feaver, Mendl and Bateson (1986) studied female laboratory-raised cats and concluded that behavior characteristics of cats could be clustered into three groups: alertness (including activity and curiosity), sociability (including sociability with humans and timidity), and equability (primarily measured as agreeableness with other cats), and that these patterns could be reliably assessed between multiple observers. Meier and Turner (1985) investigated the personalities of outdoor, owned male and female cats and found they could classify cats into

two types: shy and trusting. For our survey we represented these personality types through terminology we expected to be familiar to the participants.

Fogle's (1992) survey of cat breeders found that they perceived differences in tolerance levels between Domestic Shorthair and Siamese cats, and on this basis the terms "tolerant" and "intolerant" were included in the survey. The last two terms (trainable and stubborn) were based on the trait "responsiveness to training" that was extrapolated from a meta-analysis on 51 empirical studies of dog personality (Jones and Gosling 2005) and were included based on popular stereotypes of cats as stubborn and untrainable.

Participants were asked to indicate how strongly they agreed or disagreed with statements, or if they were neutral (1 = strongly agree, 2 = agree, 3 = agree a little, 4 = neutral, 5 = disagree a little, 6 = disagree and 7 = strongly disagree). Statements were phrased as such: "Orange cats are active," "Tri-colored cats are friendly," and "Black cats are aloof."

Pilot Study

A pilot study was conducted in order to assess content validity of the developed questionnaire and to determine whether any differences could be found in survey responses that would justify conducting further investigation of perceptions about coat color as an indicator of cat personality. The pilot study consisted of 25 participants (3 males, 23 females) recruited through two Tampa Bay, Florida area animal-related e-mail groups that one author of this paper had professional associations with (Tampa Bay Animal Friendly Trainers and the Courteous Canine Dog Training facility). The survey was conducted online through Kwik Surveys (www.kwiksurveys.com). Participants were predominantly Caucasian (85%) and educated beyond high school. Thirteen (52%) participants worked professionally with animals. The majority of respondents lived with a cat at the time of the survey (58%) or had lived with a cat for longer than one year (81%).

Participants provided a moderate number of neutral responses in regards to the relations between coat color and personality; specifically, between 35% to 65% of participants' responses on all questions was "4" (neutral) for any given trait term. However, descriptive statistics showed that there were some tendencies for participants to report variations between colors. For example, orange cats were less likely to be considered stubborn and tri-colored cats were more likely to be thought of as shy than other colors of cats. White cats were less likely to be considered friendly, calm, trainable, or tolerant in comparison with other colors of cats. Participants were more likely to agree that black cats are bold and disagree that they are shy. All colors of cats were considered to be trainable.

The pilot study had a small sample, with limited population demographics and a large percentage of animal professionals. Because there was some variation in how likely people were to agree with statements about differently colored cats in the pilot survey, we anticipated that a larger scale survey could show distinctions in how humans perceive the personality traits of differently colored cats.

Main Study Participants and Procedure

Participants were obtained through an online solicitation for a cat-related survey during January to March of 2010, primarily using the Craigslist community volunteer webpage (www.craigslist.org) for metropolitan areas of the United States (San Francisco, New York City, Chicago, Boston, Atlanta, GA, Washington DC, and Austin, TX) as it was anticipated that the Craigslist pages for larger cities would attract greater and more diverse participation in the survey. Participants were also solicited through postings on the website Facebook

(www.facebook.com) on the authors' personal Facebook pages. The solicitation was titled "Participate in a Survey about Domestic Cats."

The survey was conducted using the website Survey Monkey (www.surveymonkey.com). It included an informed consent page describing the possible risks, benefits, and duration of the task. It required participants to verify that they were over the age of 18 years and to give informed consent by checking a box online before continuing with the survey.

The survey used the same questions that were utilized in the pilot study. Forty-nine questions regarding the 10 personality terms (active, aloof, bold, calm, friendly, intolerant, shy, stubborn, tolerant, and trainable) and five colors of cats (orange, tri-colored, white, black, and bi-colored) were presented in a randomized order that changed for each participant. Thus, all participants answered questions about each term for each color of cat. Due to researcher error, one question was omitted from the entire survey and no data were collected for tri-colored cats for the personality trait "shy."

Participants were asked to provide background information: gender, ethnicity, age, education, and both work and living experience with cats. In this segment, participants were also asked how important color and personality were to them when adopting a new cat. Participants were not paid.

One hundred and eighty-nine people (165 women (87.3%), 18 men (9.5%) and six (3.2%) who did not report their sex) participated and produced valid questionnaire responses. The majority of participants identified as Caucasian (85.7%, $n = 162$), with six participants identifying as Latino or Hispanic (3.2%), one as Black (0.5%), three as Asian (1.6%), seven as multi-racial or multi-ethnic (3.7%), five as "other" (2.6%), and five participants who declined to state their race or ethnicity (2.6%). While nationality was not known, survey solicitations were primarily in the United States. All participants were over the age of 18 years, with 41.8% between 18 and 25, 9% between 26 and 30, 16.9% between the ages of 31 and 40, 12.7% between the ages of 41 and 50, and 19.6% of the participants above the age of 50. The majority of participants were at least high-school educated: 52.4% had a high school education or some college, and 47.6% had a Bachelor's degree or graduate education. Most participants had experience living with a cat: 75.1% of respondents currently lived with a cat, and 95.2% stated they had lived with a cat at some point in their life. Most respondents (66.7%) did not have any professional experience working with animals.

Analysis

All data were analyzed using SPSS 17.0 (Chicago, IL, USA) and JMP 8.0. Because the data did not meet the assumptions of normality, the responses to each personality trait question were analyzed using non-parametric statistical tests. The Friedman's Test was used to conduct 10 non-parametric omnibus one-way analyses of ranks, one for each personality trait term, to determine if there were differences in how people rated any of the cat colors on that term. If significant differences were found in the omnibus test, follow-up, non-parametric pairwise comparisons using the Wilcoxon Signed Rank Test were conducted to determine which colors of cats received significantly different ratings for each personality term.

Results

Four-hundred and forty-one people began the online survey and 199 completed it. Of these, five surveys were deemed unusable due to participants skipping more than five questions on the survey, and an additional five surveys were deemed unusable due to participants answering

all questions with either "strongly agree" or "strongly disagree." These 10 surveys were excluded from the final analysis. Forty-three people (22.8%) answered all cat personality questions "neutral." These participants were left in the data pool as it was presumed they felt there was no correlation between personality traits and coat color. This left 189 surveys that were included in the final data analysis.

The means and standard deviations of the ratings for each color cat for each personality trait are listed in Table 1. The Friedman's non-parametric omnibus analysis of variance tests indicated significant differences for nine of the personality terms in at least one pair of color categories: active ($\chi^2_{(4)} = 60.53$, $p < 0.001$); aloof ($\chi^2_{(4)} = 43.87$, $p < 0.001$); bold ($\chi^2_{(4)} = 46.11$, $p < 0.001$); calm ($\chi^2_{(4)} = 10.92$, $p = 0.027$); friendly ($\chi^2_{(4)} = 42.10$, $p < 0.001$); intolerant ($\chi^2_{(4)} = 24.76$, $p < 0.001$); shy ($\chi^2_{(3)} = 41.74$, $p < 0.001$); tolerant ($\chi^2_{(4)} = 23.73$, $p < 0.001$); and trainable ($\chi^2_{(4)} = 12.16$, $p = 0.016$). No significant differences were found for stubbornness.

Table 1. Means and standard deviations (*SD*) of the ratings for each color cat for each personality trait.

	Orange		Tri-Colored		White		Black		Bi-Colored	
Trait	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*
Active	3.20	1.45	3.18	1.19	3.69	1.03	3.06	1.26	3.05	1.13
Aloof	4.40	1.39	3.73	1.17	3.78	1.15	3.97	1.33	4.20	1.24
Bold	3.29	1.30	3.57	1.28	3.92	1.00	3.44	1.25	3.41	1.19
Calm	3.66	1.18	3.78	1.12	3.46	1.06	3.55	1.16	3.76	1.07
Friendly	2.92	1.23	3.39	1.23	3.40	1.12	3.13	1.21	3.03	1.14
Intolerant	4.37	1.18	4.03	1.19	4.16	0.98	4.33	1.09	4.39	1.21
Shy	4.42	1.16	–	–	3.82	1.05	4.01	1.10	4.30	1.21
Stubborn	3.91	1.25	3.79	1.19	3.93	0.91	3.99	1.16	3.95	1.23
Tolerant	3.42	1.08	3.84	1.14	3.69	0.95	3.47	1.03	3.63	1.01
Trainable	3.20	1.33	3.29	1.34	3.42	1.22	3.31	1.36	3.31	1.31

Based on a 7-point Likert scale (1 = strongly agree, 2 = agree, 3 = agree a little, 4 = neutral, 5 = disagree a little, 6 = disagree, and 7 = strongly disagree).

– Indicates data not collected due to researcher error.

Ten pairwise comparisons using Wilcoxon Signed Rank Tests for the five colors of cats were done for each of the nine personality terms where the Freidman's Test found a significant difference. Due to the number of multiple comparisons, we used a Bonferroni correction and adjusted alpha to 0.005 to reduce the chance of a family-wise error. Results for significant pairwise comparisons are shown in Table 2.

Comparing the colors of cats based on the given terms describing personality traits, results showed that participants were likely to say that all other listed colors of cats are more "active" than white cats. For "aloofness," participants were likely to agree that tri-colored, black, and white cats are more aloof than orange cats, and that tri-colored and white cats are more aloof than bi-colored cats. For "boldness," participants agreed that all listed colors of cats are more bold than white cats. White cats were considered more "calm" than tri-colored and bi-colored cats. For "friendliness," orange, black, and bi-colored cats were seen as more friendly than tri-colored cats, while orange and bi-colored cats were seen as friendlier than white cats. Tri-colored cats were rated as more "intolerant" than orange, black, and bi-colored cats. White

Table 2. Results for significant pairwise comparisons from the Wilcoxon Rank Sum Tests for all cat color pairs for each personality trait.

Trait	Color Pair	Means for Color Pair*	*Z*-score	*p*-value†
Active	Orange–White	3.20, 3.69	–4.029	< 0.001
	Tri-colored–White	3.18, 3.69	–5.016	< 0.001
	Black–White	3.06, 3.69	–5.593	< 0.001
	Bi-colored–White	3.05, 3.69	–6.230	< 0.001
Aloof	Tri-colored–Orange	3.73, 4.40	–5.349	< 0.001
	Black–Orange	3.97, 4.40	–4.338	< 0.001
	White–Orange	3.78, 4.40	–5.705	< 0.001
	Tri-colored–Bi-colored	3.73, 4.20	–4.063	< 0.001
	White–Bi-colored	3.78, 4.20	–3.985	< 0.001
Bold	Orange–White	3.29, 3.92	–5.075	< 0.001
	Tri-colored–White	3.57, 3.92	–3.342	0.001
	Black–White	3.44, 3.92	–4.032	< 0.001
	Bi-colored–White	3.41, 3.92	–5.123	< 0.001
Calm	White–Tri-colored	3.46, 3.78	–3.248	0.001
	White–Bi-colored	3.46, 3.76	–3.160	0.002
Friendly	Orange–Tri-colored	2.92, 3.39	–4.497	< 0.001
	Orange–White	2.92, 3.40	–4.824	< 0.001
	Black–Tri-colored	3.13, 3.39	–2.936	0.003
	Bi-colored–Tri-colored	3.03, 3.39	–3.448	0.001
	Bi-colored–White	3.03, 3.40	–4.108	< 0.001
Intolerant	Tri-colored–Orange	4.03, 4.37	–3.338	0.001
	Tri-colored–Black	4.03, 4.33	–3.010	0.003
	Tri-colored–Bi-colored	4.03, 4.39	–3.147	0.002
Shy	White–Orange	3.82, 4.42	–5.293	< 0.001
	White–Bi-colored	3.82, 4.30	–4.387	< 0.001
	Black–Orange	4.01, 4.42	–3.740	< 0.001
Tolerant	Orange–Tri-colored	3.42, 3.84	–4.351	< 0.001
	Black–Tri-colored	3.47, 3.84	–3.692	< 0.001
Trainable	Orange–White	3.20, 3.42	–3.205	0.001

*Based on a 7-point Likert scale (1 = strongly agree, 2 = agree, 3 = agree a little, 4 = neutral, 5 = disagree a little, 6 = disagree and 7 = strongly agree). The first mean in each pair is associated with the first color in the Color Pair column to the left. Second mean is associated with the second pair in the Color Pair column to the left. The first mean in each pair is associated with the color category that participants were most likely to agree with for the given term.

†Alpha adjusted to 0.005 to reduce probability of family-wise error.

cats were rated as more "shy" than orange and bi-colored cats, and black cats as more shy than orange cats. For "tolerance," orange and black cats were perceived as more tolerant than tri-colored cats. Finally, for "trainability," orange cats were rated as more trainable than white cats.

To further describe our findings, we concluded that a color group of cats has been rated differently on a personality term when they were significantly different from at least two other colors of cats. These differences are outlined in Table 3. Based on this, orange cats were rated as relatively high in friendliness and low in aloofness and shyness. Tri-colored cats were rated as relatively high in aloofness and intolerance and low in friendliness and tolerance. White cats were rated as relatively high in aloofness, calmness, and shyness, and low in activity, boldness,

Table 3. Differences in terms assigned to cats based on coat color.

Color	Terms More Likely to Be Assigned	Terms Less Likely to Be Assigned
Orange	Friendly	Aloof, shy
Tri-colored	Aloof, intolerant	Friendly, tolerant
White	Aloof, calm, shy	Active, bold, friendly
Black	No differences	No differences
Bi-colored	Friendly	Aloof

Based on significant differences from at least two other color categories of cats.

and friendliness. Bi-colored cats were rated as relatively high in friendliness and low in aloofness. Black cats were not rated differently from more than one other color category on any trait terms. This was reflected in the data: the means and standard deviations for black cats on each personality term tended to be less extreme than the means and standard deviations of the other color groups of cats (see Table 1).

In response to questions about the importance of color and personality when adopting a new cat, 26.1% identified color as important or very important, 23.9% felt neutral, and 50% felt that color was not important when adopting a new cat. The Friedman's Test was used to determine if there were differences in how participants assigned personality terms to all colors of cats by grouping participants into three categories: Color Important, Color Neutral, and Color Not Important. No differences between participant groups were found (all $p > 0.10$). Personality was considered important or very important when adopting a new cat to 94.7% of respondents, while 3.2% felt neutral, and 2.2% felt that personality was not important at all. No group comparisons were done due to small group sizes in both Personality Neutral and Personality Not Important.

Discussion

The results of our survey suggest that people might perceive coat color as a factor that contributes to the personalities of differently colored cats. This is supported by the fact that when given 10 terms to describe five colors of cats, participants were often likely to show distinct patterns of agreement as to how they would assign these terms to the different color groups of cats.

The results of this survey also support previous research showing that people are willing to attribute personality traits to domestic cats. Lee, Ryan and Kreiner (2007) conducted a study in which cat owners were asked to what extent their own cats possessed several personality traits. Their results supported generalizing the Five-Factor Model (extraversion, neuroticism, agreeableness, conscientiousness, and openness) to cats as a way to assess behavior and personality.

Although differences were found in how people perceive differently colored cats, it is not known where those perceptions come from. Almost all participants in this survey either currently lived with a cat or had lived with a cat at some point in their life. Most people have come into contact with a cat at some point, even if they have not owned their own cat; at the very least, they have seen cats on television or in other forms of popular media. Advertising and the presence of cats in popular culture may suggest or reinforce ideas about cat personality. A study of the use of animals in advertising found that cats were frequently depicted with anthropomorphic qualities (Spears, Mowen and Chakraborty 1996).

In our survey, orange cats were considered relatively high in friendliness and low in aloofness and shyness in comparison to the other colors of cats. Interestingly, depictions of some of the most well-known orange cats in American culture, such as Morris, "The world's most finicky cat" (Choron, Choron and Moore 2007) and Garfield, who is described as lazy and cynical (Garfield Pressroom 2006), are not positive. However, based on sales and advertising, these two cat characters are hugely popular within the United States (Internet Movie Database 2011; 9Lives.com n.d.), and compared with other colors of cats, orange cats tend to be adopted quickly from shelters (Lepper, Kass and Hart 2002). One possibility is that the tendency for orange cats to be highly anthropomorphized in advertising and other popular media influences their popularity. For example, both Morris and Garfield are depicted as being able to talk.

Tri-colored cats (calicos and tortoiseshells) were ranked relatively high in aloofness and intolerance, and low in friendliness by the participants in this survey. The International Cat Association website describes them as follows: "They tend to have what the cat fancy calls 'Tortie-tude.' More than any other color, these girls have an 'opinion' on everything" (The International Cat Association Southeast Region n.d.). A Google search for the term "Tortitude" (tortoiseshell attitude) brings up over 15,000 websites, many of which imply that tortoiseshell cats have unique personality traits including stubbornness, independence, and unpredictability.

As orange cats are likely to be male and tri-colored cats female (Wright and Walters 1980), the differences in traits assigned to these colors of cats may be influenced by perception of personality of male and female cats. There is little or no published research on how people perceive different personality traits of animals based on their sex. The current study did not assess attitudes about the biological sex of cats, but our results could reflect attitudes about the sex and personality of cats rather than, or along with, perceptions of coat color and personality.

Temple Grandin has asserted that pure white animals have more neurological problems than other colors of animals due to the levels of melanin in the midbrain (Grandin and Johnson 2006). While biologically these neurological traits are likely associated with albinism, attitudes to albino animals may influence perceptions of non-albino white animals. In the United States media, cat food advertisements for Fancy Feast depict a white Persian cat being fed from a crystal goblet, which may conjure the image of being spoiled or aloof. There is even an online group "The Anti-Fancy Feast Cat Association" on the website Facebook, "for people who are not fans of the Fancy Feast Cat," which claims the cat is "clearly snobby" (Facebook n.d.). Results of the current study mirror this concept, as evidenced by participants' agreement that white cats are more aloof and less friendly than orange and bi-colored cats, and less trainable than orange cats.

Bi-colored cats were considered relatively high in friendliness and low in aloofness, but few other differences were found. One possible reason for this is that, because we did not specify the primary color of the cat, only that the cat had white patches, people may have not been visualizing the same fur color combinations when assessing the given statements with personality terms. For instance, some people may have been visualizing black and white whereas others were visualizing orange and white. A recent study (Munera 2010) did not find any differences on a standardized temperament test between cats of different solid coat colors and cats of the same coat colors with white patches.

There is a documented tendency for adoptable, dark-colored cats to remain in rescue longer and be more likely to be euthanized than those that are lighter colored or patterned (Lepper, Kass and Hart 2002). Black cats have also long been associated with bad luck (Tobacyk and Milford 1983; Wiseman and Watt 2004). Based on this, we anticipated that black

cats would be assigned more negative traits and fewer positive traits. Contrary to our expectations, there were no significant differences between ratings assigned to black-colored cats and to the other color cat groups. The lower adoption rate of black cats has often been attributed to their "plain" appearance (Mulhausen 2008). In the current survey, results support the suggestion that factors other than personality, such as appearance or being harbingers of superstitious bad luck, may primarily contribute to the decreased adoption rate of black cats.

While survey respondents indicated that they placed more importance on personality than color when considering selection of a companion cat, our results indicate that they may believe the two qualities are linked, especially in some colors of cats. Participants showed some consistent responses that demonstrate a greater willingness to assign certain terms representing personality traits, such as friendliness and shyness, to certain colors of cats over others. The failure to assign negative personality traits to black cats when black cats are least likely to be adopted in animal shelters located in the United States may also indicate that to a potential adopter, looks do matter. While breeding has recently introduced some changes in the physical structure of the domestic cat, cats are morphologically similar, with coat color being the most readily apparent and easily identifiable difference among cats.

Coat color may be a predictive factor in the adoption and euthanasia rates of domestic cats in shelters (Lepper, Kass and Hart 2002). Potential adopters consider superficial traits, such as coat color, as well as personality and behavioral tendencies when deciding which cat to add to their family. However, when cat owners are surveyed after adoption, personality has been cited as a primary reason for satisfaction with their cats (Neidhart and Boyd 2002). The discrepancy between factors predicting that a cat will be adopted and the main reason adopters are satisfied with their cats after they adopt indicates a possible disconnect between the way people choose a new cat and how appropriate that cat may be for them.

Participants in the Neidhart and Boyd (2002) survey also reported that their main areas of dissatisfaction during the adoption process involved a lack of information on the behavioral tendencies of adoptable cats and which animal was best suited for them. Their results may suggest that when people are faced with a lack of accurate behavioral information on a specific cat, they will make decisions based on their previous experiences and personal perceptions about cats. These perceptions could include the belief that coat color is an indicator of personality. Our study on human perceptions of cat coat color suggests that a subtle but significant bias about personality in relation to coat color exists.

Shelters would benefit from having more empirically reviewed tools and training on how to evaluate the personalities of cats and match them with adopters (Casey et al. 2009). Additionally, recognizing that potential adopters may have a bias about cat coat colors allows educational material to be developed to address the issue. For example, animal rescue personnel may want to promote white and tortoiseshell cats by emphasizing positive personality traits, recognizing that people may hold negative biases about these colors of cats.

A limitation of this survey is the use of on-line recruitment for participants. This has limited our study to those with internet access, who are willing to participate in a cat-related survey, and who frequent the volunteer community pages of craigslist.org. The respondents to our survey were predominantly Caucasian and female but we were able to get a wide range of ages represented within our participants.

As a result of this study, we feel that there are many potential questions about domestic cats, temperament, and coat color that merit further consideration. Repeating this survey with a larger sample size and a more diverse population could reveal how these tendencies to

assign particular personality terms to differently colored cats may be found across different demographic groups, cultures, and locations. Certainly there is a great need to further explore whether or not these perceptions have any basis in behavioral and genetic differences between cats of different coat colors. Finally, looking at the decisions of pet adopters at animal shelters to see if they are influenced by the colors of the cats they are considering adopting, as well as how coat color is related to the length of stay and euthanasia rates of shelter cats, will further illuminate the real-world impact of human perceptions of cat personality based on coat color.

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