Seeing Dogs: Human Preferences for Dog Physical Attributes

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ABSTRACT This study systematically investigated peoples’ preferences for dog physical attributes in images of real-life dogs. Participants (n = 124) completed an aesthetic-preference test wherein they viewed 80 image pairs of mixed-breed adult dogs and were asked which image they “liked best.” In each image pair, the two dog images appeared to be nearly identical, but unbeknownst to participants, the images differed slightly in that one physical characteristic had been manipulated. By altering a single physical characteristic in each image pair, participant preference for each of 14 different physical attributes could be investigated over the course of the study. The feature manipulations examined theories relating to Kindchenschema (an infantile appearance, per Konrad Lorenz), ostensive human similarity, the process of domestication, as well as differences in attribute size and symmetry. The results showed that participants preferred some features associated with the infant schema—large eyes and wider-set eyes. They also preferred certain human-like attributes: colored irises and a distinct upturn of the commissure, seeming to capture a smile. By contrast, participants did not reveal a preference for physical characteristics relating to feature size, symmetry or the process of domestication. The findings suggest that identifiable physical attributes of domestic dogs have aesthetic value and, additionally, that human preferences for aesthetic differences can be systematically investigated. Given that people attend to and care about the way dogs look, the effects of particular physical attributes on peoples’ preferences merit investigation.

Keywords: aesthetic preference, anthropomorphism, dogs, Kindchenschema, physical characteristics

Beauty may not always be in the eye of the beholder. In human faces, certain physical attributes, such as symmetry and averageness, have been demonstrated to influence judgments of attractiveness; such characteristics may hold valuable information about the health and well-being of preferable mates (Thornhill and Gangestad...
Recent work has suggested, "animals—apes and monkeys—are the likeliest candidates" to be anthropomorphized. Endangered species afforded the most protection and perceived as most popular have a decidedly human-like physical appearance and a phylogenetic similarity to humans (DeKay and McClelland 1996; Kellert 1996). Taken together, aesthetic preferences extend beyond humans to objects and nonhuman animals.

People attend to dog physical appearance, particularly when making decisions involving dogs. In animal shelters, "appearance" is noted as more important to people who adopt dogs than cats (Weiss et al. 2012). In another study, people ignorant of shelter dogs’ outcomes rated dogs who had been adopted as more attractive than dogs who ultimately had been euthanized (Protopopova et al. 2012). Dogs showing more facial flexibility—specifically determined by raising of the brow—were preferred over dogs showing less facial flexibility (Waller et al. 2013). Additionally, when classifying dogs by breed, dog breeding organizations such as the American Kennel Club employ specific language to describe the requirements of each breed’s physical appearance and often link physical appearance to temperament characteristics.

The current study investigated which components of dog physical features are attractive. We followed the methods of Sternglanz, Gray and Murakami (1977) by systematically varying each physical feature under investigation while holding all others constant. This method explored the role of specific physical features in peoples’ preferences. We employed a two-way, forced-choice task—as recommended by Palmer, Schloss and Sammartino (2013)—as the optimal way to investigate aesthetic preference. In the current study, participants saw image pairs of mixed-breed adult dogs on a computer screen and provided their preference for one image over the other. A single aspect of a dog’s physical appearance was altered in each image pair to investigate peoples’ preference for that instantiation of the attribute.
Over the course of the study, 14 different physical features were systematically investigated. Attributes tested included elements of the infantile configuration described by Lorenz, specifically a large forehead, large eyes, thick extremities, and a bulging cheek region. Also tested were the notably human-like features of colored irises and the appearance of a “smile,” both suggested by Horowitz and Bekoff (2007) as possible attractors of preference. Other features tested fell in the categories of feature symmetry and size, as well as whether people are attracted to mixed facial coloration in dogs, a byproduct of the domestication process (Trut 1999). A questionnaire captured personal background details and assessed participant affinity for animals. People are known to prefer different species, for example, self-reporting as a “dog person” or “cat person” (Perrine and Osbourne 1998; Gosling, Sandy and Potter 2010). This study explored whether affinities for animals could affect peoples’ aesthetic preferences. Ultimately, this study investigated the specific elements of dog physical appearance to which people are attracted.

Methods
Participants
Participants were 124 college students from Barnard College and Columbia University, 91% female (n = 113) and 9% male (n = 11); age: 19 +/- 2.5 yr. Participants received credit toward a Human Participation in Research requirement for Introductory Psychology classes. The study was conducted at the Barnard Psychology Computer Lab, and participants were alone in a room when completing the computer-based aesthetic-preference test and questionnaire.

Procedure
Participants sat in a darkened room and were presented with a series of dog image pairs on SuperLab 4.5 stimulus presentation software (www.superlab.com). The computer monitor measured 19 inches diagonally and had a resolution of 1440 x 900 pixels. The images in each pair were presented side-by-side, with the center of the images presented at –200 and + 200 pixels from the center of the screen.

In each trial, participants saw two nearly identical images of the same dog presented against a white screen. The images presented in each pair differed from one another only in that one feature had been manipulated (see “Image manipulations” section for details). Participants were instructed to look at both images and report which image they “liked best” by keying in “z” or “m” for the left or right image, respectively. The “liked best” description served to capture participant aesthetic judgment (Linsen et al. 2011), and prior studies of feature preference also used this terminology (Fullard and Reiling 1976; Wehr et al. 2001).

Participants had up to 15 s to key in their preference, and they had been informed there was no need to rush. If they did not answer within 15 s, both images disappeared, and a new screen prompted participants to make a selection before continuing to the next image pair. Participants began by viewing five practice image pairs, after which they viewed 80 experimental image pairs. Image-pair order, as well as left/right screen position within each image pair, was randomized.

Image Manipulations
Twenty-eight high-resolution images of mixed-breed adult dogs, obtained from general photo-sharing Internet websites, served as stock images. In the stock images, dogs directed their gaze toward the camera and were facing forward. We specifically selected images of mixed-breed dogs to avoid potential breed-specific biases or preferences. For example,
Poodles with small, dark eyes might be preferred because “eyes round, protruding, large or very light” constitutes a breed fault (AKC 2013). We used images of adult dogs over images of puppies to avoid an existing preference for puppies (Mariti et al. 2011) and to investigate preferences relevant to adult dog aesthetics. We cropped all images when possible so that a one-inch border framed each dog image.

The feature manipulations investigated 14 different physical attributes. Each feature manipulation fell into one of five categories. Five of the 14 features related to a juvenile appearance (size of eyes, paws, jowls, top-of-the-head, and space between the eyes); two features were modified to look more human-like (presence of smile and presence of colored irises) (Horowitz and Bekoff 2007); five related to feature size (size of ears, tongue, eyebrows, nose, and nostrils); one feature was manipulated to capture symmetry (presence of ear symmetry); and another feature was manipulated to capture a byproduct of domestication (presence of piebald facial coloration).

Feature alterations were developed thusly: when there was a size component, a 15% difference was created in the feature of interest between the two images. In line with Sternglanz, Gray and Murakami (1977), manipulations allowed participants to react to subtle aesthetic differences, and this manipulation was sufficient to create a difference yet not large enough to introduce a grotesque or caricatured alteration. During pilot testing, participants were unable to identify the manipulation itself when a 15% difference was introduced. To avoid the alteration itself as the defining feature between the two images, each image in each pair received some sort of alteration. For example, when the alteration related to size, the smaller feature increased to 103% of its original size, and the larger feature increased to 118% of its original size. We made other alterations by removing an element from one image, such as removing color from the iris by coloring the iris black, removing piebald coloration from the head by covering it with the surrounding hair color, and removing the slight upturn of a dog's commissure. We captured a more symmetrical aesthetic by adjusting the ear position so that ears mirrored each other. We used Microsoft Paint for feature manipulations, and we used Picasa on all images to smooth any edges or open spaces created during feature modifications. To the eyes of the experimenters who did not manipulate the images and therefore did not know which feature had been changed or how, differences were imperceptible for most image pairs. Figure 1 offers examples of five image pairs from the study, as well as the direction of participant preference.

Importantly, each image-pair presentation explored only one modified attribute. Images in a pair were identical except that, for instance, the dog had colored irises in one image in the pair and darkened (black) irises in the other image in the pair—all other features remained constant across the two images. Over the course of the 80 trials, different image pairs investigated preference for the same type of attribute. By modifying attributes on a number of different mixed-breed dog images, we assessed whether preferences for particular attributes are generalizable. The modifications were presented six times for each feature, except for three features which were modified four times (piebald coloration) or five times (ear symmetry and paw size), due to difficulty in image manipulation.

Furthermore, over the course of the study, each stock image was used for a number of separate feature manipulations. Manipulations did not accumulate on each image, and only one component of the dog image was manipulated in each image-pair presentation. For instance, participants might have seen (from the same stock image) one image pair with manipulated eye size but all other features the same, another image pair with manipulated ear size but all
Figure 1. Feature modifications preferred by participants: 1–2 eyes (bigger*/smaller); 3–4 jowls (bigger/smaller*); 5–6 space between the eyes (bigger*/smaller); 7–8 iris color (present*/absent); 9–10 smile (distinct*/not distinct). *denotes participant preference.
other features unchanged including eye size, and another image with manipulated iris coloration but all other features unchanged. This controlled variation was important in allowing each image pair to explore the contribution of a particular physical attribute to peoples’ avowed preference for one image over the other. Because participants saw the same dogs (albeit differently modified) over the course of the experimental trials, participants were told that although some images might appear similar to what they had seen before, each image pair was to be evaluated independently.

**Questionnaire**

After completing the preference task, each participant completed a questionnaire that collected general demographic information and participants’ feelings toward animals. To determine whether each participant was a self-described “animal person” or a self-described “non-animal person,” participants responded “yes” or “no” to the question, “Would you describe yourself as an animal person?”

**Results**

We used SPSS Version 19 (Chicago, IL, USA) for data analysis. Image preference within each image-pair presentation served as the unit of analysis, and we tested associations using a chi-square test (Siegel 1956). When comparing each participant’s image preferences with their questionnaire response, we analyzed data with normal approximation to the binomial test due to binary outcomes. We tested normality using the Kruskal-Wallis test.

Participants displayed a preference for the two “human-like” attributes investigated—colored irises ($z = 12.76, p < 0.001$) and a distinct smile ($z = 5.50, p < 0.001$). Participants evinced a preference for some, but not all, of the infantile cues. They preferred dogs with larger

<table>
<thead>
<tr>
<th>Feature Modification</th>
<th>Preference Direction</th>
<th>Percentage in Preferred Category</th>
<th>Raw Preference Numbers</th>
<th>$z$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye size (bigger, smaller)</td>
<td>Bigger eyes</td>
<td>57%</td>
<td>421, 323</td>
<td>3.59</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Jowl size (bigger, smaller)</td>
<td>Smaller jowls</td>
<td>57%</td>
<td>422, 322</td>
<td>-3.67</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Space-between-the-eyes size (bigger, smaller)</td>
<td>Bigger space between the eyes</td>
<td>59%</td>
<td>440, 304</td>
<td>4.99</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Iris color (present, absent)</td>
<td>Colored irises</td>
<td>73%</td>
<td>546, 198</td>
<td>12.76</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Smile (present, absent)</td>
<td>Distinct smile</td>
<td>60%</td>
<td>447, 297</td>
<td>5.50</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Ear size (bigger, smaller)</td>
<td>No preference</td>
<td>–</td>
<td>387, 357</td>
<td>1.10</td>
<td>0.288</td>
</tr>
<tr>
<td>Nose size (bigger, smaller)</td>
<td>No preference</td>
<td>–</td>
<td>360, 384</td>
<td>-0.88</td>
<td>0.399</td>
</tr>
<tr>
<td>Nostril size (bigger, smaller)</td>
<td>No preference</td>
<td>–</td>
<td>376, 368</td>
<td>0.29</td>
<td>0.797</td>
</tr>
<tr>
<td>Paw size (bigger, smaller)</td>
<td>No preference</td>
<td>–</td>
<td>321, 299</td>
<td>0.88</td>
<td>0.399</td>
</tr>
<tr>
<td>Tongue size (bigger, smaller)</td>
<td>No preference</td>
<td>–</td>
<td>368, 375</td>
<td>-0.26</td>
<td>0.826</td>
</tr>
<tr>
<td>Eyebrow size (bigger, smaller)</td>
<td>No preference</td>
<td>–</td>
<td>369, 375</td>
<td>-0.22</td>
<td>0.855</td>
</tr>
<tr>
<td>Top-of-the-head size (bigger, smaller)</td>
<td>No preference</td>
<td>–</td>
<td>366, 376</td>
<td>-0.37</td>
<td>0.741</td>
</tr>
<tr>
<td>Facial coloration (present, absent)</td>
<td>No preference</td>
<td>–</td>
<td>251, 245</td>
<td>0.27</td>
<td>0.822</td>
</tr>
<tr>
<td>Ear symmetry (present, absent)</td>
<td>No preference</td>
<td>–</td>
<td>328, 292</td>
<td>1.45</td>
<td>0.160</td>
</tr>
</tbody>
</table>

Table 1. Feature modifications and participant preferences.
eyes, a commonly noted juvenile feature ($z = 3.59, p < 0.001$); smaller jowls, as opposed to bulging cheeks ($z = -3.67, p < 0.001$); and larger space between the eyes, associated with larger cranial vault size ($z = 4.99, p < 0.001$), but no preference for larger paws (which could be associated with thick extremities), or a larger cranial vault. There were no size-related preferences when modifications were unrelated to a juvenile appearance—larger ears, tongue, eyebrows, nose, or nostrils. Nor were there preferences for images with piebald facial coloration, a common product of domestication, or the presence of a more symmetrical appearance—dogs whose ears mirrored one another. Preference results are presented in Table 1.

Preferences varied between participants with different perceptions of animals. Self-reported “animal people” ($n = 101$) showed the same feature preferences found in the general survey, preferring bigger eyes ($z = 3.45, p < 0.001$), colored irises ($z = 11.32, p < 0.001$), smaller jowls ($z = -2.95, p = 0.002$), a larger space between the eyes ($z = 5.42, p < 0.001$) and a distinct, discernible “smile” ($z = 5.91, p < 0.001$). In contrast, “non-animal people” ($n = 23$) showed a clear preference for only colored irises ($z = 5.40, p < 0.001$) and smaller jowls ($z = -2.11, p = 0.05$).

**Discussion**

Our results indicate that the physical attributes implicated in human preference ratings can be systematically investigated in pictures of dogs. Additionally, particular attributes were preferred over others, including some aspects commonly associated with the infant schema as well as a human-like aesthetic. On the other hand, not all manipulations made to dog physical appearance elicited a preference—such as ear symmetry, increased size of particular features, or piebald facial coloration (whether present or absent).

The current findings suggest that not all elements of the infant schema, as tested here, hold the same aesthetic value. Participants may express an affinity for the overall infantile aesthetic and even extend that preference to nonhumans (Stern glanz, Gray and Murakami 1977; Archer and Monton 2011), but the current study found that participants only preferred some of the features historically associated with an infantile aesthetic, such as bigger eyes and a larger space between the eyes (in accordance with a larger cranial vault). By including additional test stimuli—such as enlarged ears, tongue, eyebrows, nose, and nostrils—we were able to investigate whether participants were simply attracted to an enlarged version of a physical attribute or were attracted to attributes of the infant schema itself. Our findings suggest that a bigger feature unto itself is not necessarily more attractive. Instead, it could be the aesthetic value of enlarged, key infantile features that mediates preference.

Additionally, participants’ lack of preference for enlarged paws (evoking “short and thick extremities”), larger jowls (evoking a “bulging cheek region”), and a larger top of the head (evoking an enlarged brain capsule)—attributes specifically identified by Lorenz (1950/1971)—suggest that not all commonly described infantile features elicit attraction when viewed in isolation. This is consistent with previous findings that certain combinations are instrumental in promoting a preferred response. For example, Archer and Monton (2011) found that participants preferred images containing the infantile features of “a high forehead and a small chin, with a relatively high measurement of the center of the eye to the crown of the head divided by the center of the eye to the base of the chin.” stern glanz, Gray and Murakami (1977) found an anatomical relationship between large eyes and a large forehead. Our participants’ lack of preference for certain aspects commonly associated with the infant schema could suggest that these aesthetics work in unison to elicit an overall preferred aesthetic. To that end, it is possible...
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that in mixed-breed adult dogs, larger eyes and a larger space between the eyes, unto themselves, capture the essence of an overall aesthetic better than other typically infantile features.

The current study also suggests that an anthropocentric framework can be applied to the physical appearance of nonhuman animals. Physical attributes rated preferentially were those explicitly selected to capture a human-like similarity, namely colored irises and an approximation of a smile. Similarly, Waller et al. (2013) found that dogs with “flexuous facial features”—akin to what we would see in humans—were treated preferentially. A preference for flexuous facial features was specifically proposed by Horowitz and Bekoff (2007) and is consistent with the notion of peoples’ attraction for one’s own likeness (Eddy, Gallup and Povinelli 1993; Roy and Christenfeld 2004).

Importantly, the current study draws its conclusions from data collected on subtle manipulations of a discrete number of attributes, with the focus on whether a nearly imperceptible shift in appearance elicited a preference; we did not explore the extent of preference or the optimal boundaries where an aesthetic shifts from preferred to not-preferred (Sprengelmeier et al. 2009; Lobmaier et al. 2010). Studies incorporating additional scaled manipulations of physical attributes could produce a more comprehensive understanding of the value of each attribute to people’s preferences. Similarly, people may attend to facial symmetry (see Thornhill and Gangestad 1999), but not as specifically presented in this study. Additionally, while we refer to specific manipulations as “elements of the infant schema” or manipulations to look more “human-like,” this study, like others, did not explicitly test whether these manipulations did in fact make the dogs appear more infant- or human-like (Archer and Monton 2010). The current study relied on physical attributes that historically have been associated with an infant schema or suggested to be more “human-like.”

Aesthetic preferences can be moderated by variables such as sex, personality, pet-ownership status, and even attachment to a companion animal (Lobmaier et al. 2010; Archer and Monton 2011; Lehmann, Huis in’t Veld and Vingerhoets 2013). Men and women maintain different aesthetic preferences, particularly relating to the infant schema (Fullard and Reiling 1976; Lobmaier et al. 2010) and general features of attractiveness (Thornhill and Gangestad 1999; Rhodes 2006; Little, Jones and DeBruine 2011). In the current study, preference differences arose between participants based on their affinity for animals. “Non-animal people” were less discerning in their preferences—exhibiting a clear preference for images with colored irises, a more salient attribute, and smaller jowls, which suggests that larger jowls did not fit with the overall aesthetic of the dogs. On the other hand, “animal people” preferences accorded with those of the overall group, suggesting that “animal people” were more likely to observe and prefer subtle differences in dog physical appearance.

Limitations stemming from a mostly female subject pool and a small number of “non-animal people” make it difficult to generalize the results. Also, as with many studies investigating aesthetic preferences relating to dog appearance (i.e., Fratkin and Baker 2013; Golle et al. 2013), the current study lacks a cross-cultural perspective. Given cross-cultural differences in dog-keeping practices and behavior ratings (Fielding 2008; Wan et al. 2009), as well as societal differences in aesthetic preferences (Thornhill and Gangestad 1999), it is possible that culturally mediated preferences exist as well.

Applications for the current study are twofold and relate to attributions made to dogs as well as the presentation of adoptable dogs in photographs. Domestic dogs reside in the anthropogenic environment and often maintain intimate relations with people. Dogs can move in sync with humans, anticipate human behavioral patterns (Kubinyi et al. 2003; Kerepesi et al. 2010).
2005), and their behavior is frequently anthropomorphized and described using human characteristics (Sanders 1993). The companion dog’s very phenotype has been described in terms of anthropomorphic selection—“selection in favor of physical and behavioral traits that facilitate the attribution of human mental states to nonhumans” (Serpell 2003). For example, owners often interpret highly ritualized submissive displays as evidence of dogs being guilty, even though empirical findings suggest that such displays are not consistently associated with a dog’s misdeed (Horowitz 2009; Hecht, Miklósí and Gácsi 2012).

Dog physical appearance is also susceptible to anthropocentric attributions, and there is a known relationship between feature attractiveness and personality and character attributions (Little, Jones and DeBruine 2011). For example, according to the American Kennel Club, the expression of the Great Pyrenees is “elegant, intelligent and contemplative,” while the Chihuahua’s expression is “saucy” (AKC 2013). Fratkin and Baker (2013) found that dogs’ coat color and ear shape affect personality attributions: a picture of a floppy-eared dog led the dog to be rated higher on “Agreeableness” and “Emotional Stability” than the exact same picture of the dog with pointy-ears (which led to a higher rating on “Extroversion”). Regarding coat color, a yellow-dog picture received a higher rating on “Agreeableness,” “Conscientiousness,” and “Emotional Stability” than an identical picture of the dog with a black coat. This new vein of research is a reminder that physical appearance alone can be associated with substantive attributions.

Our study’s methods and line of inquiry could help investigate how attributions are made to dogs based on their physical appearance. For example, why is the expression of the Cocker Spaniel described as “intelligent, alert, soft and appealing,” while the expression of the Dogue de Bordeaux is “serious” (AKC 2013)? What is it about particular physical features, preferred or otherwise, that produce these attributions? The techniques of the current experiment could be applied to a study of the physical prompts to anthropomorphisms, that is, the relationship between dogs’ physical appearances and the attributions made to them. Building from the current study, an experiment in which participants view dogs with slightly altered physical features accompanied by different descriptive adjectives could offer insight into how people make character attributions to dogs.

Additionally, people’s interest in adopting dogs is affected by dog appearance (Weiss et al. 2012), and animal rescue organizations can be cognizant of this phenomenon when presenting images of adoptable dogs. Fratkin and Baker (2013) encouraged animal rescue organizations to consider dog physical appearance when “marketing” dogs. In line with the current study, animal rescue groups might consider incorporating preferred, salient features into their adoptable dog pictures; for example, a picture of a dog with colored irises and a distinct “smile” could be viewed preferentially by potential adopters. An image of a dog that captures enlarged eyes could also be viewed preferentially. Animal rescue groups might find that emphasizing preferred physical characteristics entices people to meet the dog in question. Importantly, whether presenting dogs in this light would result in adoptions, or even adoptions of different dogs, is unknown. Future research could determine not only preference for isolated features, but also whether particular attributions are associated with particular physical features and whether aesthetic preferences motivate potential adopters to meet a dog.

This study investigated human preference for a variety of physical attributes in dogs, including human-like attributes and attributes historically related to Lorenz’s theory of neoteny. Our work demonstrates the success of testing feature preferences by systematically varying one feature while holding others constant. This method is particularly useful when ascertaining how various morphological aesthetics might contribute to qualitative or anthropomorphic attributions made to dogs.
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