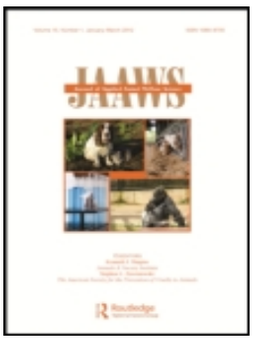

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Speed of Dog Adoption: Impact of Online Photo Traits

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The Internet has radically changed how dogs are advertised for adoption in the United States. This study was used to investigate how different characteristics in dogs' photos presented online affected the speed of their adoptions, as a proof of concept to encourage more research in this field. The study analyzed the 1st images of 468 adopted young and adult black dogs identified as Labrador Retriever mixed breeds across the United States. A subjective global measure of photo quality had the largest impact on time to adoption. Other photo traits that positively impacted adoption speed included direct canine eye contact with the camera, the dog standing up, the photo being appropriately sized, an outdoor photo location, and a nonblurry image. Photos taken in a cage, dogs wearing a bandana, dogs having a visible tongue, and some other traits had no effect on how fast the dogs were adopted. Improving the quality of online photos of dogs presented for adoption may speed up and possibly increase the number of adoptions, thereby providing a cheap and easy way to help fight the homeless companion animal population problem.

Keywords: *dog, adoption, Internet, photos, rehoming*

Overcrowding of nonhuman animal shelters in the United States has been an ongoing problem for decades. Research estimates show that 2 million to 6 million dogs and cats are euthanized annually in the United States, and this number accounts for 5% of the companion animal population (Rowan, 1992). Previous research has demonstrated that certain inherent traits of dogs affect adoptability or speed of adoption including breed, color, age, and behavior (Diesel, Pfeiffer, & Brodbelt, 2008; Lepper, Kass, & Hart, 2002; Weng & Hart, 2012).

The prevalence of the Internet in people's lives has grown dramatically; it was estimated in 2011 that 78% of American adults used the Internet, compared with only 10% in 1995 (Zickuhr & Smith, 2012). This increase in Internet usage has changed how adoptable dogs are presented to the public, with websites like www.petfinder.com offering more than 300,000 adoptable companion animals for online viewing from across the United States. Petfinder has claimed to help with the adoption of more than 20 million dogs since its launch in 1995 (Kdelmonico, 2012), and shelters report that more than 60% of their adoptions come through the site (Petfinder, 2012).

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However, little is known about how the quality of the advertisements for dogs online has affected adoptions. Anecdotal evidence suggests that improving the quality of photos online will lead to more Internet traffic and higher and faster adoption rates (Persch, 2011; Thomas, 2011). Some photographers even suggest specific tips to improve the photographs of adoptable animals, with little evidence as to how each suggestion may improve adoption times (Berg, 2011; Casteel, 2012; Fromm, 2008; Pous, 2011).

This study was used to assess the quality of online photos of adopted dogs to determine if any traits in their photos had an impact on the speed of adoption. The overall hypothesis was that the features of a dog's online photo can impact how fast the dog is adopted.

MATERIALS AND METHODS

Data were retrieved for all dogs adopted through Rescuegroups.org during the period from January 1, 2011, to June 15, 2012. (www.rescuegroups.org). Rescuegroups.org is a nonprofit organization that provides technology and website services to animal rescue groups and shelters across the United States to help them promote dogs for adoption. Each individual record was associated with a unique ID, picture URLs (ranging = 0–15), and a number of fields describing the dog. All records describing the dogs were inputted by the individual shelters presenting the dogs for adoption as they saw fit, including some subjective fields such as primary breed in mixed-breed dogs, color, and age.

Many of the flag fields (OK with dogs, OK with cats, OK with kids, and altered) contained missing values. When a user searches one of the large websites advertising dogs online (e.g., www.petfinder.com), these traits are only displayed on a dog's profile when they are flagged as "No," and these traits are left off if they are answered as "Yes" or if they are missing. Because this study was used to evaluate how a dog's online presentation affected his or her adoption, the missing values were set to "Yes," like in their online profiles. Primary breed and color fields were consolidated to account for shelters entering synonyms, therefore reducing the number of variables in each category (e.g., "Yellow Labrador Retriever," "Black Labrador Retriever," and "Labrador Retriever" were all changed to read "Labrador Retriever").

Days to adoption was calculated based on the difference between "created date" and "last updated date." Dogs adopted in less than a day were removed from the data, as it was assumed they were inputted for digital recordkeeping and thus represented inaccurate data. Only dogs who were adopted within 5 months (150 days) were included in the study. This cutoff was set based on anecdotal information from shelters and aimed to exclude dogs with traits that were not classified in the online database that may significantly lengthen their times to adoption—for example, behavior issues, medical conditions, and aggression.

The black Labrador Retriever mix was the most common and homogenous breed and color in the original data and within two age groups (young and adult, chosen out of four possible age groups). The first image URLs and the unique IDs of the dogs selected for analysis were then loaded into Microsoft Excel (Microsoft, 2010). The spreadsheet contained a program to display each picture when a URL was highlighted. A veterinary medicine student, who was familiar with dogs, analyzed each photo. Traits identified included a global subjective assessment of quality (examples in Figure 1) and other objective traits (Table 1). The observer was blind to other data including days to adoption.

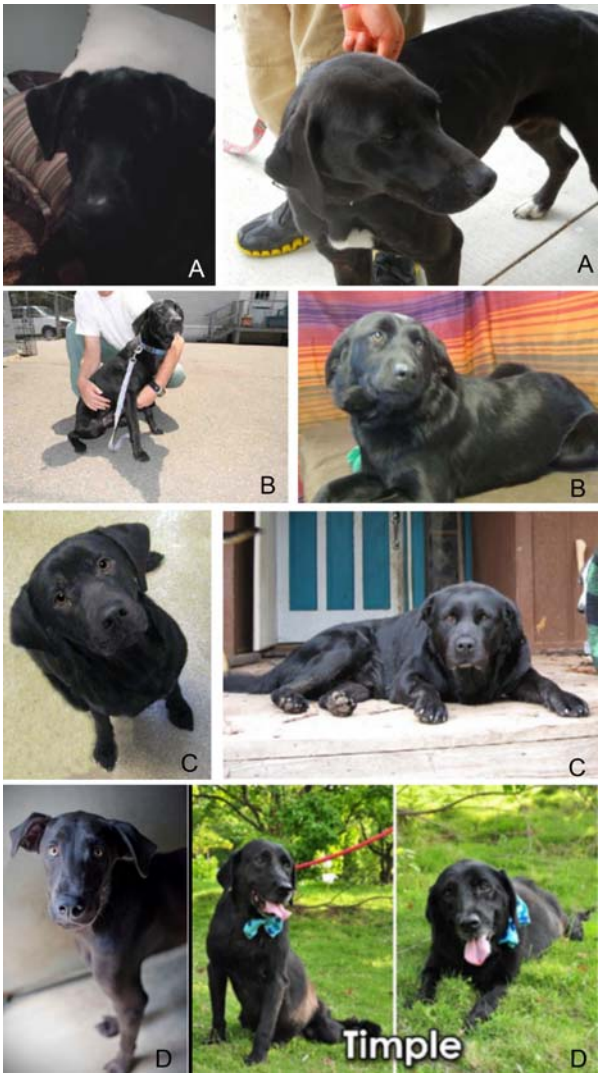

FIGURE 1 Representative examples of (A) poor, (B) average, (C) good, and (D) great photos of black Labrador Retriever mixes. The global trait "quality" was assessed subjectively taking into account the image as a whole.

Statistical Analysis

All cleaning of data and statistical analysis were carried out in *R* (*R* Development Core Team, 2010). A histogram of days to adoption appeared Poisson-like, so only nonparametric tests were used (Figure 2). A Pearson correlation coefficient was calculated to assess the relationship between the number of photos each dog had and the days to adoption. Kruskal-Wallis tests were performed to study the differences in median days to adoption (MDA) for each image trait analyzed. If the trait was statistically significant ($p < .05$) and had more than two levels,

TABLE 1
Traits Used to Analyze Photos

Trait	*Categories*	*Description*
Angle	above, at	At: the picture is taken at the dog's eye level Above: the picture is taken looking down on the dog
Blurry	yes, no	Whether the photo is blurry
Camera	at, toward, away	At: the dog is looking directly at the camera, making eye contact toward: the dog's face is angled toward the camera, but there is no eye contact Away: the dog is looking away, both eyes are not visible
In cage	yes, no	Whether the dog is in a cage (with or without door open)
Outdoors	yes, no	Whether the photo was taken outdoors
Person	yes, no	Whether there is a person visible in close contact with the dog
Position	sit, stand, lie, held, N/A	Position the dog is photographed in (N/A if cannot tell from the photo)
Quality	great, good, average, poor	This global trait was assessed by a single observer. Examples of photos in each category can be seen in Figure 1. Photos were assessed to be great, good, average, or poor quality. The observer took into account the ability to see dogs' features and personalities, the photo setting, lighting, and an overall evaluation of how flattering the photo was. Poor photos had commonly hard-to-distinguish features of the dog due to lighting, setting, and/or composition, while great photos presented the dog in a very flattering way and often looked professionally taken.
Small	yes, no	Whether the photo's largest dimension is smaller than 300 pixels (1 inch), so the photo is too small to make out details of the dog
Tongue	yes, no	Whether the tongue is visible
Toy	yes, no	Whether a toy is visible (e.g., stuffed animal, tennis ball, etc.)
Wearing bandana	yes, no	Whether the dog is wearing a bandana or clothing around his or her neck

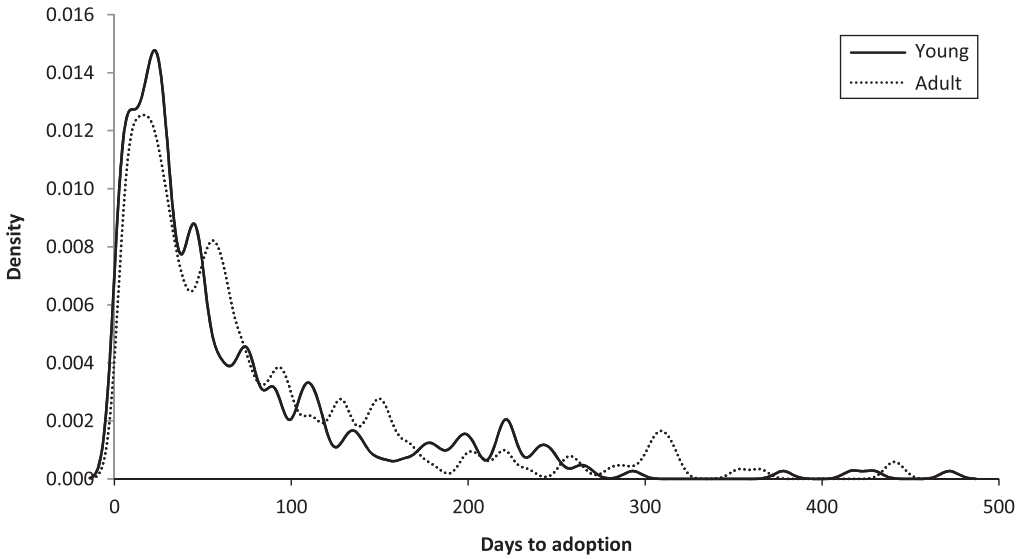

FIGURE 2 Histogram of days to adoption for young ($n = 255$) and adult ($n = 213$) black Labrador Retriever mixes.

a post-hoc pairwise Wilcoxon Rank Sum test was performed to determine significance of specific pairs. A chi-square correlation was calculated to assess the relationship between each of the traits analyzed in the photos and the subjective global quality trait.

RESULTS

Sixty-five thousand adopted dogs were identified. Those who were adopted in less than a day were removed, leaving a total of 50,000 records. The data contained a total of 992 black Labrador Retriever mixes that was whittled down to a database of 468 (255 young and 213 adult) who were classified as OK with dogs, OK with cats, OK with kids, neutered, of mixed breed, and similar-size dogs. The MDA for young dogs was 31 days, and for adult dogs, it was 41 days. A weak positive correlation was found between the number of photos each dog had and the days to adoption (young, $r = .316$; adult, $r = .352$).

The results of image analysis for young dogs are shown in Table 2, and the results for adult dogs are shown in Table 3. The global trait quality had the biggest effect on MDA for young dogs (Figure 3), with a difference of 29 days between poor and great photos and a difference of 21 days between average and great photos (MDA, poor = 43 days, average = 35 days, good = 28 days, great = 14 days; $p = .04$). Quality was not statistically significant in the adult dog population, though the data showed a similar trend (MDA, poor = 52 days, average = 48-days, good = 35 days, great = 38 days; $p = .16$).

A strong association between high-quality images and the following photo traits was demonstrated (chi-squared test): a nonblurry photo ($p < .0001$), canine eye contact with the camera ($p < .0001$), the canine not being in a cage ($p < .0001$), photo taken outdoors ($p < .0001$), the canine's tongue being visible ($p < .0001$), the canine wearing a bandana ($p < .0001$), the canine not being small ($p < .0001$), and the angle at which the photo was taken ($p = .0008$). There was no association between high-quality photos and a toy being present or the position of the dog.

In the young dog population, both canine eye contact with the camera and the position of the dog had an effect on MDA. Photos containing canine eye contact with the camera (Figure 4) had an MDA of 27 days compared with 45 days when looking toward the camera ($p = .01$). The MDA was not statistically significantly different when dogs were looking away from the camera compared with either looking at the camera or toward the camera (MDA = 29 days, $p > .05$). Young dogs standing in their photos (MDA = 26 days) were adopted 14 days faster than sitting dogs (MDA = 41 days, $p = .03$), while there was no significant effect of dogs lying or being held (MDA lying = 30 days, held = 6 days, $p > .05$; Figure 5). In the adult dog population, position and canine eye contact with the camera did not have a statistically significant effect on MDA ($p > .05$).

The MDA was significantly higher for blurry photos (MDA = 65 days) compared with nonblurry photos (MDA = 43 days, $p = .02$; Figure 6) and for small photos (MDA = 53 days) compared with adequately sized photos (MDA = 40 days, $p = .05$). Photos taken outdoors resulted in fewer MDA for adult dogs (MDA = 37 days; Figure 7) compared with photos taken inside (MDA = 51, $p = .04$). Blurriness, photo size, and photo location did not have statistically significant effects on MDA in the young dog population.

TABLE 2
Results of Photo Analysis for Young Black Labrador Retriever Mixes

		Days to Adoption				
	Category	*N*	*1st Q*	*median*	*3rd Q*	*p value*
Angle	above	83	21	31	76	.07
	at	172	16	29	58	
Blurry	no	234	16	29	62	.34
	yes	21	28	41	60	
Camera	**at**	**157**	**14**	**27**	**54**	**.02**
	toward	**57**	**26**	**45**	**87**	
	away	41	19	29	66	
In cage	no	232	16	31	62	.86
	yes	23	15	37	63	
Outdoors	no	98	18	37	71	.16
	yes	156	16	29	54	
Person	no	236	17	31	62	.88
	yes	19	15	27	73	
Position	held	1	89	89	89	**.03**
	lie	34	16	30	71	
	sit	**98**	**22**	**41**	**63**	
	stand	**89**	**15**	**26**	**47**	
	NA	33	10	30	76	
Quality	**poor**	**48**	**22**	**43**	**65**	**.04**
	average	**98**	**18**	**35**	**70**	
	good	94	13	28	51	
	great	**14**	**5**	**14**	**33**	
Small	no	236	18	31	64	.24
	yes	21	12	17	53	
Tongue	no	172	16	29	61	.22
	yes	83	21	40	69	
Toy	no	245	16	30	62	.82
	yes	10	17	38	52	
Wearing bandana	no	239	17	32	63	.15
	yes	16	6	22	45	

Note. Statistically significant findings are in bold. 1st Q = first quartile; 3rd Q = third quartile.

All other qualities analyzed were shown to have no statistically significant effect on MDA in either age group including camera angle, toy present, tongue visible, wearing of a bandana, and being in a cage.

DISCUSSION

This study was used to measure the influence of traits of online photos on the MDA of dogs in shelters. It had previously been suggested that global photo quality (higher quality decreased MDA), a photo outdoors (outdoors decreased MDA), and the dog looking at the camera (eye contact decreased MDA) improve a dog's adoption times, and our data support these hypotheses (Berg, 2011; Casteel, 2012; Fromm, 2008; Pous, 2011). A photo taken in a cage, the angle of the

TABLE 3
Results of Adult Black Labrador Retriever Mixes' Photo Analyses

		Days To Adoption				
	Category	*Count*	*1st Q*	*Median*	*3rd Q*	*p value*
Angle	above	63	20	30	64	.31
	at	162	19	48	72	
Blurry	**no**	**212**	**19**	**40**	**71**	**.05**
	yes	**13**	**41**	**64**	**97**	
Camera	at	128	20	41	72	.89
	toward	62	18	34	74	
	away	35	21	46	63	
In cage	no	214	19	40	71	.36
	yes	11	19	62	96.5	
Outside	**no**	**81**	**23**	**51**	**89**	**.04**
	yes	**143**	**27**	**37**	**65**	
Person	no	209	20	42	72	.46
	yes	16	13	28	89	
Position	held	1	110	110	110	.51
	lie	23	28	51	65	
	sit	81	15	40	71	
	stand	90	20	37	74	
	NA	30	21	48	71	
Quality	poor	25	27	52	63	.166
	average	94	19	48	81	
	good	87	19	35	72	
	great	19	10	38	61	
Small	**no**	**201**	**17**	**40**	**71**	**.05**
	yes	**24**	**32**	**53**	**92**	
Tongue	no	124	17	48	71	.98
	yes	101	21	39	73	
Toy	no	221	19	40	72	.41
	yes	4	46	51	64	
Wearing bandana	no	204	20	41	73	.25
	yes	21	9	33	66	

Note. Statistically significant findings are in bold. 1st Q = first quartile; 3rd Q = third quartile.

photo, and the wearing of a bandana did not have statistically significant effects on MDA. A dog standing, which had not been identified previously as having an effect, decreased MDA.

We identified a weak positive correlation between the number of photos each dog had available online and MDA. It is possible that as the dogs remained in a shelter longer, more photos were added. However, in the absence of data regarding the dates when the photos were added to the database, this cannot be confirmed.

The results showed that among young dogs, those with a higher global-quality photo (Figure 1) had a shortened MDA than did those with a poor-quality photo. This supports existing anecdotal evidence (Persch, 2011; Thomas, 2011), and it is not surprising, as better photos may catch the eye of potential adopters and make the dog's features and personality more visible. Among adult dogs, a similar trend toward faster adoptions when the dogs had better photos was

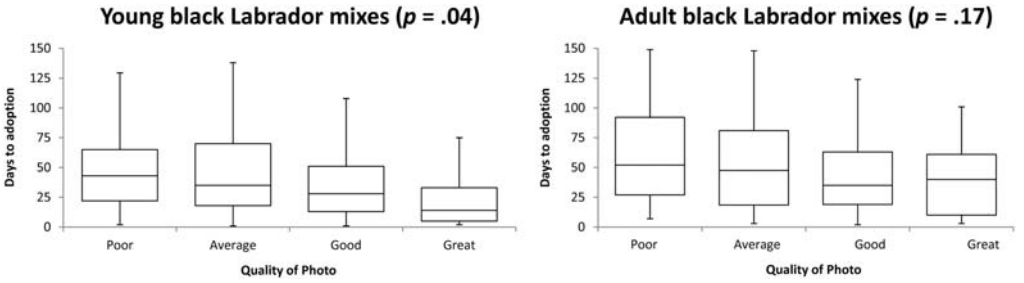

FIGURE 3 Days to adoption as a function of global photo quality for young ($n = 255$) and adult ($n = 213$) black Labrador mixes.

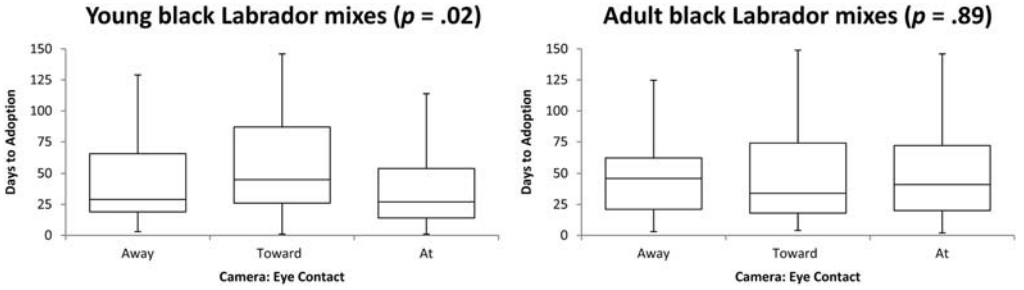

FIGURE 4 Days to adoption as a function of eye contact with the camera for young ($n = 255$) and adult ($n = 213$) black Labrador mixes.

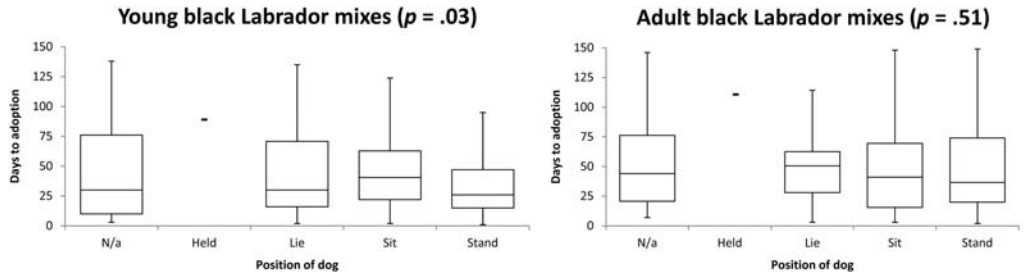

FIGURE 5 Days to adoption as a function of the position of the dog for young ($n = 255$) and adult ($n = 213$) black Labrador mixes.

not statistically significant; however, it may be demonstrable in a larger study. In the group of adult dogs analyzed, a blurry or small picture increased time to adoption, in accordance with our predictions. The effects of blurry and small photos were not statistically significant in the younger dog population, which may be due to a small sample size ($< 10\%$).

In the young age group, canine eye contact decreased MDA compared with merely looking toward the camera. This also confirms the many anecdotal suggestions to get a dog's eye contact

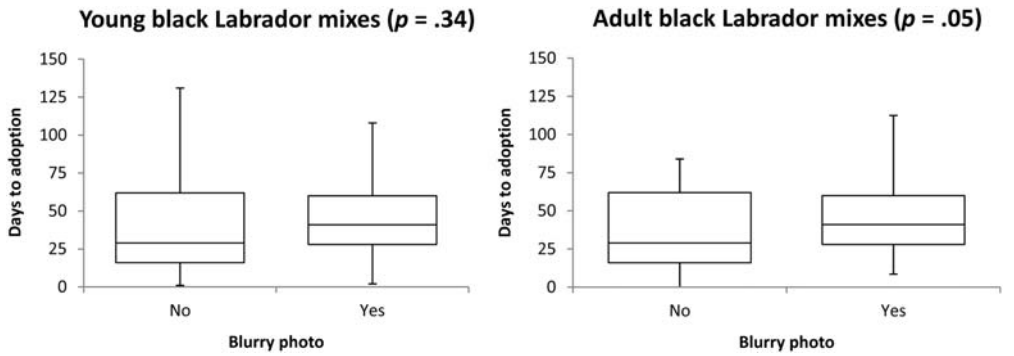

FIGURE 6 Days to adoption as a function of whether photos were blurry for young ($n = 255$) and adult ($n = 213$) black Labrador mixes.

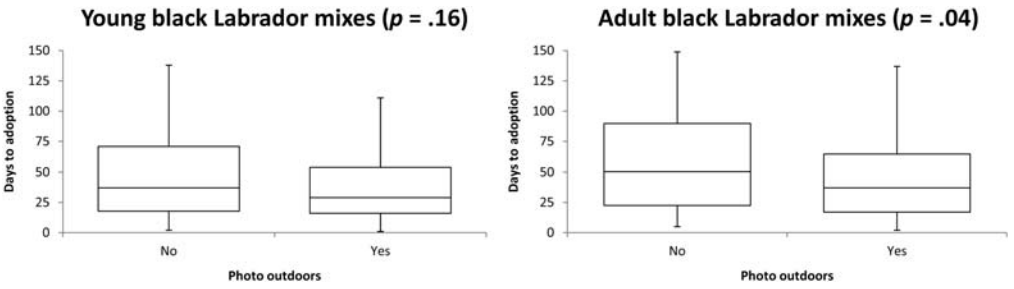

FIGURE 7 Days to adoption as a function of whether photos were taken outdoors for young ($n = 255$) and adult ($n = 213$) black Labrador mixes.

when photographing him or her for adoption (Berg, 2011; Casteel, 2012; Fromm, 2008). Young dogs also showed that standing up instead of sitting down decreased MDA. The position of the dog has not been discussed much in literature on improving days until adoption, so this provides a new variable to consider. It is possible that standing up allows more of the dog's features to be visible compared with sitting, leading to the positive effect. Photos taken up close that did not allow evaluation of the dogs' posture did not have a statistically significant effect on adoption times.

Surprisingly, the adult dog analysis was not statistically significant for either eye contact or position. This could be due to a number of different factors: Potential adopters of younger dogs may make more spur-of-the-moment decisions to adopt and may be drawn in by the first picture they see, while older dogs attract more thoughtful adopters. Further analysis of these traits with a larger image pool and a wider range of ages may give more clues as to how eye contact and position affect adoption.

Photos taken outdoors instead of inside had a positive impact on days to adoption in the adult population. Although only a few authors have suggested taking dogs' photos outdoors to improve adoption times (Casteel, 2012; Fromm, 2008), many have suggested that improved lighting has a big effect on photo quality, and outdoor photography often improves the amount of

light (Berg, 2011; Pous, 2011). It was surprising that being outdoors did not have an impact on younger dogs; it is possible that younger dogs are more photogenic, or require less effort to attract adopters. Further analysis with a wider range of ages and dogs may shed light on how lighting and being outdoors in the photos impact adoptions.

In both age groups, none of the following traits were shown to be statistically significant: visibility of the tongue, angle of the photo, location in/out of a cage, wearing a bandana, having a toy present, and having a person present. All of these traits have been anecdotally suggested to improve dogs' photos and to speed up the days to adoption on multiple websites (Berg, 2011; Casteel, 2012; Fromm, 2008; Pous, 2011). Some of these—being in a cage, wearing a bandana, having a toy present, and having a person present—may be inconclusive due to small sample size, as they each made up less than 10% of the photos analyzed. The angle of photography (eye level compared to from above) may not actually make a photograph more flattering, as suggested by some photographers (Berg, 2011; Fromm, 2008). It is possible that this is their personal preference, while the general public has no preference.

Many photographers suggested that making a dog look happy and smiling (often the same as having the tongue out for a Labrador Retriever) should improve the dog's speed to adoption. However, this again may be personal preference of the photographer, while potential adopters may all have different preferences in what is appealing in a dog's photo. Some potential adopters may adopt because they feel sympathy for a sad-looking dog, while others may be drawn by visible happiness. There is minimal research on which facial expressions may attract potential adopters.

The overcrowding of companion animal shelters across the United States has led to the euthanasia of high numbers of potentially adoptable dogs. Although there is much ongoing research and effort into reducing the number of homeless companion animals, anything that can speed up adoption times for current dogs may make room for more dogs to get adopted. This study is a proof of concept to show that a dog's online advertising may have an effect on how fast they are adopted. Further research will continue to provide shelters with simple and cheap ways to increase the speed of adoption for their dogs. Our data provide further evidence for some anecdotal suggestions about improving online photos of dogs presented for adoption, while not supporting others.

Using this study, shelters can start to focus their efforts on improving qualities of photos that may actually impact dog adoption times. Research has shown that keeping animals in shelters can increase their stress levels and cause abnormal behaviors, thus negatively affecting their chances of adoption (Beerda, Schilder, van Hooff, & De Vries, 1997; Coppola, Grandin, & Enns, 2006). Shortened adoption times resulting from improved photos may also help increase the number of adopted dogs.

Only young and adult adopted black Labrador Retriever mixes were used in the study to minimize confounding variables; however, many variables affect dog adoption that could not be accounted for, including location, shelter policies, and dog behavior. The study included dogs from across the United States and from shelters of various sizes to achieve a large enough data pool. Location, shelter size, and shelter policies could definitely impact the speed of adoption. Additionally, although the online profile may bring potential adopters in to meet a dog, the interactions and personality of the dog will affect their adoption, and this is very difficult to control for. Future research should include more breeds and ages of dogs and try to factor in shelter-level variability to test if these findings hold true across a wider population.

Analyzing the images, especially assessing the quality of the photos, is subjective by nature, and in this study, all dog photos were analyzed by only one person. A future repeatability study for photo analysis of traits may be useful to validate this approach.

This research is based on the assumption that potential adopters view dogs' photos online before adopting and that this has an impact on their decision to take home animals. Although sites like www.petfinder.com claim to have aided in the adoption of millions of companion animals, so far, this assumption is purely anecdotal. More statistical analysis should be done on how the prevalence of the Internet in the last decade has affected dog adoptions. Initially, we hoped to include in the analysis statistics about a dog's online profile such as page views and if adopters had looked online before choosing their new dogs; however, it was not possible to obtain data sets with this information.

The results of the study show that the dogs' online presentations have potential to affect their time to adoption. Hopefully, this will encourage shelters and adoption websites to record and analyze more data. This future research should include what percentage of adopters look online before adopting, how page views of dogs correlate to adoption time, what prompts adopters to adopt, and how descriptions of dogs online affect adoption. Ongoing web analytics will help shelters make better use of their online presence and advertising and will help them to continue improving their presentation of companion animals to potential adopters.

CONCLUSION

This study demonstrated that the traits of online photos may affect the speed in which a young or adult black Labrador Retriever mix is adopted. The young dogs' MDA were decreased by having a higher-quality photo, the dog standing up, and canine eye contact with the camera. The adult dogs' MDA were decreased when the photo was taken in an outdoor location, was not too small, and was not blurry.

Although this study focused on only black Labrador Retriever mixes of the young and adult age categories, the authors believe that these positive photo traits would apply to dog photos at large. This information can begin to be used to easily and cheaply help shelters increase the impact of their online advertising of dogs and to decrease how long the dogs stay in shelters. This study should spark future research and discussions into further aspects of online advertising for dogs that will likely provide more simple improvements to help increase the speed of adoption of homeless companion animals.

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