THE EFFECTS OF SOCIAL TRAINING AND OTHER FACTORS ON ADOPTION RATES OF SHELTER DOGS

By

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To my loving husband
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Abstract of Thesis Presented to the Graduate School of the University of Florida in Partial Fulfillment of the Requirements for the Degree of Master of Science

THE EFFECTS OF SOCIAL TRAINING AND OTHER FACTORS ON ADOPTION RATES OF SHELTER DOGS

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The issue of canine overpopulation in the United States has become increasingly evident as animal shelters euthanize close to 250,000 adoptable dogs each year. The aim of the present study was to identify factors that influence and predict adoption rates. Previous research suggests that the public perceives friendly and sociable dogs as more adoptable. The present study hypothesized that dogs trained to gaze into potential adopters' eyes will be perceived as more attractive and will thus have a greater likelihood of being adopted. In addition, we investigated other individual factors that may predict adoption rates. Outcomes (adoption, euthanasia, or induction into a rescue facility), scores on a sociability test, morphological traits, and mode of intake were tracked for each dog in the study. The dogs in the group trained to gaze at people were not more likely to be adopted. Higher sociability test scores did not predict adoption but did predict length of stay. Furthermore, breed and mode of intake were predictive of adoption, and size and color were predictive of length of stay. A second experiment found that adopted dogs were perceived as more physically attractive. These findings suggest that other factors besides behavior may be more important to adopters when considering adopting a dog.
CHAPTER 1
INTRODUCTION

The leading preventable cause of pet death in the United States is the euthanasia of healthy animals in shelters (Griffin, 2007). Up to 10 million pet dogs are admitted to shelters and approximately a quarter of a million of adoptable dogs are euthanized each year (AVMA, 2007; ASPCA, 2011). Furthermore, more than 10% of all dogs in the US are housed in shelters (inferred from statistics from AVMA, 2007, and NCCPC, 1994-97). Because of the extraordinarily large volume of homeless animals, shelters are often stretched for resources and are only able to provide basic necessities for each animal. Therefore, these animals typically live in barren, noisy environments with little to no opportunities for engaging in species-specific behaviors (for a review see Wells, 2003).

The problem of pet-overpopulation can be addressed from several angles. Although the sterilization of pets and the prevention of relinquishment are essential to decrease the input of homeless pets into shelters, improving adoption rates is crucial to increasing the output of pets from shelters to homes. Research has suggested that sterilization programs are not effective in certain situations at decreasing shelter dog populations (Patroneck & Glickman, 1994). The aim of the present study was to identify manipulations of the shelter environment that will have the largest impact on adoptability with minimum levels of effort from the shelter staff.

Several studies suggest a positive influence of human interaction on the physiology and behavior of dogs housed in animal shelters. This interaction was shown to decrease cortisol levels in shelter dogs (Coppola et al., 2006; Bergamasco et al., 2010). In addition, human interaction also improved the behavior of the dogs. Bergamasco et al. found that dogs scored higher on a sociability test after a brief human
interaction and Normando et al. (2009) found that dogs spent more time wagging their tails and standing in the front of their cages. Although human interaction has been shown in these studies to be enriching for shelter dogs, it is unclear whether this intervention can function to increase adoption rates, which is ultimately the only true positive outcome for the dogs. Several studies have focused on exploring which factors potential adopters look for when adopting a dog, and other studies have looked at whether human interaction can directly influence adoption rates.

Although each potential adopter looks for unique characteristics in a dog, certain factors in the shelter seem to influence many people. Adopters have been reported to prefer light-colored over dark-colored dogs (Wells & Hepper, 1992; Lepper et al., 2002), dogs surrendered by their owners over dogs that were found as strays (Wells & Hepper, 1992), long-haired over short-haired dogs (Wells & Hepper, 1992), young over old dogs (Lepper et al., 2002; Clevenger & Kass, 2003), neutered over intact dogs (Lepper et al., 2002; Clevenger & Kass, 2003), and toy breeds over other breeds (Clevenger & Kass, 2003). Whereas many factors, such as breed, color, age, coat length, neuter status, and mode of intake, seem to influence adoption rate, no single factor consistently predicted higher adoption rates across all the different studies.

Several authors have attempted to directly alter adoption rates through human interaction with the dogs. Braun (2011) reported anecdotal evidence that an unsystematic volunteer training program decreased length of stay of dogs at a shelter. Luescher and Medlock (2009) reported that obedience training had positive effects on adoption rates. The authors evaluated 180 dogs living in a shelter, with half of the dogs assigned to the training condition and half to the control condition. The experimental
A group of dogs was trained for 20 min, by a single experimenter, to wear a head halter, to walk on a leash without pulling, to sit on command, and to not jump on people when approached. In addition, the trainer gave treats to the dogs belonging to the experimental group whenever she walked by their pens and they did not bark. Luescher and Medlock found that the training had a positive influence on adoption rates. These findings suggest that obedience might be an important factor influencing adoption rates. However, this study had several notable limitations. First, the staff were aware of the assignment of the individual dogs into experimental groups, thus making it possible that the staff influenced the choices of the adopters. Second, the intervention consisted of one professional trainer training a multitude of different behaviors, which makes this intervention difficult to replicate. Third, the study lacked a mechanism for verifying that the trained dogs actually acquired the behaviors, thus allowing for the possibility that other factors may have contributed to the higher adoption rates.

Whereas obedience seems to be important to potential adopters, sociability may play an even bigger role (Sternberg, 2003). A widespread belief in the shelter community is that the sociability of a dog surpasses all other characteristics in predicting success of the dog in the new home. Therefore, many shelters employ behaviorists to evaluate dogs on a measure of sociability and some even determine the dogs’ adoptability based on these measures (e.g. Sternberg, 2003). This widespread belief has some support in the literature. People perceive sociable dogs as low on aggression and high in friendliness, intelligence, and adoptability (Wright, Smith, Daniel, & Adkins, 2007). For that reason, it may be beneficial to train shelter dogs to emit behaviors that are perceived as social by the potential adopters in addition to, or as a substitute for, the
training of obedience behaviors. Therefore, in Experiment 1, we investigated whether human-directed social training can influence adoption rates. Our study improved on previous methodology by keeping the shelter staff unaware of the assignment of dogs into experimental groups, teaching only one behavior, and validating that the dogs in the training group actually acquired the behavior.
CHAPTER 2
EXPERIMENT 1

The main objective of the first experiment was to evaluate whether human-directed social training can increase adoption rates in shelter dogs. Specifically, we hypothesized that dogs trained to gaze into potential adopters’ eyes will be more attractive and thus more likely to be adopted. A dog gaze into the eyes of a human is typically perceived as a communicative and social gesture by people (e.g. Miklosi et al., 2000; Gacsi et al., 2005).

A second objective of the study was to identify those manipulations of the shelter environment that would have the largest impact on adoption rates with minimum levels of effort from the shelter staff. We compared a low-cost and low-effort intervention to a higher-cost and higher-effort intervention by including a group of dogs that were fed regardless of behavior in order to evaluate whether simply feeding the dog would have a similar outcome as training.

The final objective of the study was to investigate which individual factors, such as breed, color, sociability, etc. were best at predicting adoption.

Materials and Methods

Animals and Housing

A total of 180 dogs over five months of age that were available for adoption at the Alachua County Animal Services (Gainesville, FL, USA) from the beginning of May to the end of October 2011 were used for this study. This shelter is the only open-admission animal shelter in the county and accepts relinquished as well as stray and seized pets. All animals were held for a mandatory period of three days, after which the shelter staff deemed certain animals adoptable based on health and temperament. No
formal temperament testing was implemented at the shelter at the time of the study. All adoptable dogs were scheduled for castration within their first week.

The housing for adoptable dogs included one row of adjacent pens with cement walkways in front and in back of the pens. The dogs were individually housed, with some exceptions, in 1.02 m x 4.57 m x 2.08 m pens with 2/3 of the pen outdoors, facing a grassy area and the other 1/3 indoors, facing other pens with dogs not yet deemed adoptable across a central corridor. The public was only allowed to view the dogs from the front outdoor walkway. All pens had cement floors and 1.22 m tall cement walls that were connected to the ceiling of the pen with a chain-link fence. Each pen contained a water dish, a food dish, and a Kuranda bed (Kuranda USA, Annapolis, MD, USA) in the inside portion of the pen. The dogs were fed and had their pens cleaned daily before 11:00 h. Shelter volunteers, when available, took the dogs out for exercise, play time, and unsystematic training to the grassy or concrete areas in front of the pens.

Each pen had a card attached to the front, which listed the dog’s identification number, name, age, breed, mode of type (surrendered by the owner, found as a stray, or confiscated by animal control), and sometimes a very brief description or history of the dog.

A potential adopter could request to interact with the dog, after which a volunteer or staff member led the adopter and dog into either the grassy or the concrete area, depending on the age of the dog. The dog was then let off leash, and the volunteers allowed the adopter to play and give treats to the dog.

Each week, independent rescue organizations toured the shelter and selected dogs to be placed into foster homes. Every six weeks, a training program selected dog-
friendly and non-intimidating dogs to be fostered at the prison. Adoptable dogs were marketed by the shelter on its website, several national online databases, local news channels, and through a popular online social networking site. Dogs that were labeled as hard-to-adopt, based on breed and size, were placed into an additional marketing program that used the same social networking site, local news channels, and printed flyers displayed in various locations in the city of Gainesville. In addition, these dogs had a lower adoption fee and came with a bag of dog food when adopted.

**Treatments**

As the dogs became available for adoption, they were randomly assigned to one of the three treatment conditions: the control group, the feeding group, or the training group. The shelter staff and volunteers were not informed about the specifics of the treatment groups and were not told which dogs were placed into which groups. The dogs in the control group did not receive any additional interaction besides the usual interactions with the shelter staff and volunteers. The dogs in the feeding and the training groups received additional 15 min interactions between the hours of 8:00 h and 14:00 h for six days of the week throughout their stay at the shelter. The dogs in both of the groups were led out of their pens into a 25.6 m x 11 m grassy area that contained a small pool, benches, agility equipment (a ramp, a tire jump, and a long narrow bench), toys, trees, and bushes. The dogs were let off lead and allowed to explore the area for 5 min. During this time, the experimenter and assistants briefly greeted the dog if it initiated contact. At the end of the 5 min, the experimenter gave the dog a choice of treats: Beggin® Strips (Société des Produits Nestlé S.A., Vevey, Switzerland), hot dogs, or Easy Cheese® (Kraft Foods Global, Glenview, IL, USA), and determined which
seemed to be preferred by the dog. If the dogs did not show interest in the food, the experimenter used brief access to a squeaky toy or petting instead of the food.

The dogs in the feeding group were then given a treat every 15 s for 10 min (for a total of 40 treats), regardless of behavior. Before offering the treat, the experimenter said, “Come here!” and then offered the treat to the dog. If the dog did not collect the treat within 5 s, the experimenter removed the treat and re-presented it 10 s later. The dogs in the training group were shaped by successive approximations to gaze into the eyes of the experimenter for 15 s. The experimenter waited until the dog offered a certain behavior, such as coming into proximity of the experimenter, said, “Come here!”, and offered a treat to the dog. If the dog was already in proximity, the experimenter waited until the dog oriented towards the experimenter. After the dog was reliably orienting, the experimenter waited until the dog looked up into the eyes of the experimenter. The last step of the training involved the experimenter reinforcing longer and longer durations of gazing into the eyes. The experimenter ignored any undesirable behaviors from the dog, such as barking, jumping, nipping, etc. If the dogs in the training group received 40 treats, the experimenter went out of sight until the 10 min ran out, after which the dog was taken back to its pen. If 10 min elapsed without the dog earning 40 treats, the experimenter gave the dog the remaining treats all at once and led the dog back into the pen.

The experimenters varied daily for each dog in order to expose the dogs to as many different people as possible and thus facilitate generalization of the training to an actual adopter. The experimenters consisted of the author, a local dog trainer, a veterinary student, and eight undergraduate students (of whom two were male).
The methods were systematically altered to fit the needs of certain dogs. Dogs that had undergone surgery in the past three days were not allowed to be in the grassy area for health reasons. Instead, these dogs were left on leash and the treatments were conducted in an adjacent 7.6 m x 4.3 m concrete area. If the dogs were under one year of age, the treatment was conducted in the same concrete area, but off leash. These alterations reflected the actual interaction the specific dogs would receive from a potential adopter.

All interactions with the dogs in the feeding and training conditions were videotaped with a Kodak™ PlaySport Zx3 (Kodak Company, Rochester, NY, USA) video camera. As a validation procedure, a random sample of the dogs from the training and feeding conditions were selected for analysis (n = 10 in the training group and n = 9 in the feeding group). A coder, blind to the hypothesis and previously trained (to the criterion of interobserver agreement of 90% or above on four pilot videos that differed in difficulty), recorded the frequency and duration of looks at the experimenter. Looking was coded when the dog oriented its head at the waist or above or at the hand of the experimenter. A third of the videos were scored independently by an additional coder. Interobserver agreement was calculated by dividing the number of agreements by the sum of agreements and disagreements and multiplying by 100 for each 10 s time bin. The final interobserver agreement score for each video was calculated by taking the mean of all the scores for each time bin. An agreement was scored when both of the coders scored the same behavior as occurring within 1 ms.

The outcome data for the dogs was obtained on a weekly basis from the shelter records. Possible outcomes were adoption, placement into an independent rescue
organization, euthanasia due to health, euthanasia due to aggression, and euthanasia due to lack of space. Additionally, the information about the dog, as listed on the kennel card, was recorded (breed, age, mode of intake, and color). Size and the distance of the kennel by number from the central aisle were also recorded.

**Sociability Testing**

All dogs were given an Assess-A-Pet™ (Rondout Valley Animals for Adoption, Accord, NY, USA) sociability test on a weekly basis. This 2 min test was conducted during the hours of 8:00 h and 14:00 h on the day that no experimental treatments occurred (Saturday). Each dog was led out of its pen on a 1.2 m leash into the concrete area previously described. The sociability test was conducted as follows: the experimenter stood still in a neutral posture for 1 min, then the experimenter stroked the dog twice with a 2 s break between each stroke, then the experimenter sat neutrally in a chair for 5 s, and then finally, while seated, actively interacted with the dog in a positive manner for 20 s. Two observers independently assigned a sociability score. The score for the dog was obtained by averaging the two scores. One point was assigned to the dog for each continuous 2 s of gentle physical contact with the experimenter, sniffing excluded. One point was subtracted for every antisocial behavior. Antisocial behaviors included forceful, abrupt jumps onto the experimenter, forceful lunges against the leash, forceful abrupt muzzle contact with the experimenter, freezing of the body while being stroked, abrupt head orientations towards the experimenter while being stroked, and shaking off immediately after being stroked.

In addition to the live dual coding of the sociability test, a random sample (16%) of video recordings of the tests was analyzed by an observer blind to the dog's experimental condition to establish interobserver agreement.
An additional random sample (40%) of video recordings from the sociability testing was analyzed for baseline durations of looking at the experimenter in order to evaluate whether higher looking rates resulted in higher adoption rates, regardless of experimental condition. This was used as another validation procedure in order to evaluate whether adopters preferred dogs that looked into their eyes. A third of the videos were analyzed by a second observer to establish interobserver agreement.

All procedures were approved by the University of Florida Institutional Animal Care and Use Committee.

**Statistical Analyses**

All statistical analyses were performed using the statistical package SPSS® (International Business Machines Corp., Armonk, NY, USA) and GraphPad Prism (GraphPad Software, Inc., La Jolla, CA, USA). All factors that might have influenced adoption and length of stay were tested with a Multivariate General Linear Model. The two dependent variables were outcome (adoption, euthanasia, or rescue) and length of stay. Experimental condition (training, feeding, or control) was treated as the independent variable. All other factors (sociability, age, sex, color, breed, size, mode of intake, and kennel position) were treated as covariates. To initially test the full model, Type IV was used to account for missing data due to a portion of the dogs not receiving sociability tests. The final model was created through backward elimination of non-statistically significant variables and finally tested with a Type III Multivariate GLM, which did not exclude any data. Four dogs were excluded from the analyses due to experimental error, resulting in the total n = 176 (58 trained, 59 fed, and 59 control dogs).
A Shapiro-Wilk test of normality revealed that the baseline looking rates were not normally distributed (statistic = 0.92, df = 62, P = 0.001). Therefore, a Kruskal-Wallis test was used to test for differences in baseline looking rates between dogs with different outcomes (n = 70: 32 adopted, 17 rescued, and 21 euthanized dogs). This factor was tested separately from the other factors due to the smaller sample size.

A Shapiro-Wilk test of normality revealed that sociability scores were not normally distributed (statistic = 0.98, df = 148, P = 0.023). Therefore, a Kruskal-Wallis test was used to test whether morphological and background factors differed with regard to sociability test scores.

To validate the effectiveness of the training procedure, we compared durations of looking at the trainer for dogs in the training and the feeding groups. The percentage of looks over 2.5 s in duration was calculated for the 1st and the 7th day for a random sample of dogs (n = 19; 10 dogs in the training group and 9 dogs in the feeding group). A dog was scored as having acquired the trained behavior if it showed an increase in the percentage of looks over 2.5 s. Dogs showing a decrease or no change were coded as having failed to acquire the behavior. The number of dogs acquiring the behavior was analyzed using a Fisher's exact test.

Results

One hundred and seventy six dogs were studied at the Alachua County Animal Services. Of these dogs, 40.3% were male, age ranged approximately from 5 months to 7 years, and 38.6% were 1 year old or younger. The average length of stay was 18.0 days. Of all the dogs, 41.2% were adopted into a home, 26.6% taken into an independent rescue organization, and 32.2% euthanized for various reasons. Reasons
for euthanasia included poor health (47.4%), aggression towards humans or other animals (14.0%), and space limitations (38.6%).

To test for acquisition of the gazing response during training, a Fisher’s exact test was used to test whether the number of dogs that showed acquisition differed across the three experimental groups. In the feeding group, 1 out of 9 dogs showed acquisition, whereas in the training group, 9 out of 10 showed acquisition. This difference was statistically significant ($P = 0.001$). The interobserver agreement was 86%.

All potential factors (experimental condition, sociability, sex, age, breed, color, size, mode of intake, and kennel location) that may influence adoption or length of stay were initially tested in the full Multivariate GLM. Baseline looking rates were analyzed independently due to the smaller subject size used.

The Multivariate GLM revealed that sex ($F_{\text{outcome}}(1) = 1.3, P = 0.25; F_{\text{length of stay}}(1) = 0.45, P = 0.49$), age ($F_{\text{outcome}}(1) = 3.5, P = 0.55, F_{\text{length of stay}}(1) = 0.03, P = 0.85$), and kennel position ($F_{\text{outcome}}(1) = 1.2, P = 0.28, F_{\text{length of stay}}(1) = 0.24, P = 0.62$) were not significant variables that contributed to the model. Through backward elimination, these factors were removed from the model.

The final model consisted of the experimental condition as the independent variable and breed, mode of intake, color, size, and sociability as the covariates.

Experimental condition did not predict adoption rates or length of stay, $F_{\text{adoption rate}}(2) = 0.35, P = 0.71$ (Fig. 2-1), $F_{\text{length of stay}}(2) = 0.65, P = 0.52$. In the training group, 48.8% of dogs were adopted, whereas 40.7% in the feeding group and 37.3% in the control group were adopted. The 11.1% difference in adoptions between the training group and control group did not reach statistical significance. The 30.8% increase in
adoption rates in the training group was compensated by a decrease of rescue rates by 26.4%; therefore, no decrease in euthanasia rates was observed. The average length of stay in the training, feeding, and the control groups were 16.6 (SD = 11.3), 19.2 (SD = 15.1), and 18.2 days (SD = 10.4) respectively.

Breed and mode of intake were significant predictors of outcome, but not length of stay, whereas color, size, and sociability were significant predictors of length of stay, but not outcome.

Breed was a significant predictor of outcome ($F_{\text{outcome}} (1) = 7.8, P = 0.006$) (Fig. 2-2). Specifically, toy breeds (e.g. Pug, Rat Terrier, Chihuahua, Maltese, Jack Russell Terrier, Welsh Corgi, etc.) were never euthanized, whereas 5.3% of shepherd mixes (e.g. German Shepherd Dog, Australian Shepherd, Anatolian Shepherd, Husky mixes, etc.), 16.7% of small hounds (e.g. Beagle, Basset Hound mixes), 23.1% of lab mixes (e.g. Labrador retriever, Golden retriever, excluding lab/pit bull mixes), 23.5% of cattle dog mixes (Australian Cattle Dog mixes), 38.8% of medium hounds (Black and Tan Hound, Bluetick Hound, Redbone Hound, Catahoula, Pointer, Plott Hound mixes, etc.), and 56.1% of pit bull type dogs (e.g. Boxer, American Pit Bull Terrier, Rhodesian Ridgeback, Rottweiler, American Bull Dog, Chinese Sharpei, Mastiff mixes, etc.) were euthanized. An independent-samples Kruskal-Wallis test revealed that the different breeds did not differ in sociability test scores (statistic = 5.6, df = 6, $P = 0.43$).

Mode of intake was a significant predictor of outcome ($F_{\text{outcome}} (1) = 3.8, P = 0.05$) (Fig. 2-3). Specifically, 22.2% of owner surrendered dogs (pet dogs relinquished by
Figure 2-1. Proportion of dogs adopted, rescued, and euthanized by experimental condition.
Figure 2-2. Proportion of dogs adopted, rescued, and euthanized by breed.
Figure 2-3. Proportion of dogs adopted, rescued, and euthanized by mode of intake.
their owners), 31.6% of stray dogs (stray dogs brought in by the public and stray dogs captured by animal control officers), and 61.5% of confiscated dogs (dogs given up to animal control officers on site and dogs seized by animal control officers) were euthanized. An independent-samples Kruskal-Wallis test revealed that owner-surrendered, stray, and confiscated dogs did not differ in sociability test scores (statistic = 1.3, df = 2, P = 0.53).

Size was a significant predictor of length of stay (F_{length of stay} (1) = 4.6, P = 0.03) (Fig. 2-4). Specifically, small dogs stayed on average for 15.5 days, medium dogs stayed on average for 20.0 days, and large dogs stayed on average for 26.3 days. An independent-samples Kruskal-Wallis test revealed that small, medium, and large dogs did not differ in sociability test scores (statistic = 3.7, df = 2, P = 0.16).

Color was also a significant predictor of length of stay (F_{length of stay} (1) = 3.8, P = 0.05) (Fig. 2-5). Black dogs stayed on average for 23.2 days, whereas white dogs stayed on average for 15.7 days. An independent-samples Kruskal-Wallis test revealed that different colored dogs did not differ in sociability test scores (statistic = 3.5, df = 7, P = 0.84).

Sociability was a significant predictor of length of stay (F_{length of stay} (1) = 4.8, P = 0.03). A Spearman correlation test revealed that sociability was negatively correlated with length of stay ($r^2 = -0.19$, P = 0.05). However, sociability scores did not predict adoption $F_{outcome} (1) = 0.04$, P = 0.85. The mean scores for the different conditions were 7.6 (SD = 6.9) for adopted dogs, 7.9 (SD = 7.6) for rescued dogs, and 8.3 (SD = 7.5) for the euthanized dogs. Interobserver agreement between the live-coded sociability scores and the video-coded scores was 91%.
Figure 2-4. Length of stay of dogs by size. Dots show individual data and lines show group averages and standard errors.
Figure 2-5. Length of stay of dogs by color. Dots show individual data and lines show group averages and standard errors.
Due to the smaller sample size used, a Kruskal-Wallis test and a Spearman correlation were used to analyze baseline looking rates. The independent-samples Kruskal-Wallis test revealed that looking rates did not differ between dogs that were adopted, rescued, or euthanized (statistic = 1.81, df = 3, P = 0.40). However, there was a statistically significant correlation between looking rates and length of stay ($r^2 = -0.24$, $P = 0.05$). This correlation is supported by a strong correlation between looking rates and sociability test scores (Spearman $r^2 = 0.63$, $p < 0.0001$). The interobserver agreement for the baseline looking rates was 78%.

**Discussion**

Although our experimental manipulation did increase gazing towards humans in the dogs in the training group, this did not increase adoption rates by a statistically significant margin. Additionally, taking shelter dogs out of their kennel and giving them treats daily did not increase their adoption rates.

A post hoc analysis revealed that the data had only 26% power to detect a significant difference ($\alpha = 0.05$) between the proportion of adoptions in the training group and the control group. Two hundred and sixty-seven subjects would have been needed in each condition to reach 80% power. This analysis emphasizes that the treatment effect is very small even if present, thus limiting the utility of this intervention as an efficient and cost-effective means of improving adoption rates.

This study did observe several factors that influenced adoption rates and lengths of stay, but these were largely morphological and background factors. Breed and mode of intake were correlated with adoption rate. Pit bull type dogs were the least adopted, whereas toy breeds were the most adopted. Confiscated and stray dogs were adopted
less frequently than dogs relinquished by their owners. Color and size were correlated with length of stay. Black and brindle dogs had the longest length of stay, and white and black/white dogs had the shortest length of stay. Size was positively correlated with length of stay.

Even though baseline looking rates and sociability were correlated with length of stay, they did not correlate with adoption rates. Adopted dogs did not spend more time looking at people, which suggests that adopters do not consider gaze as an important factor as breed and mode of intake when making adoption decision. This is consistent with our observation that higher sociability scores also did not affect adoption rates.

These results suggest that adopters may be more influenced by morphological traits and the history of the dogs than by their behaviors. In order to test the hypothesis that adopters prefer physically attractive dogs, a follow-up experiment was conducted to test whether adopters would rate adopted dogs higher in physical attractiveness than dogs that were euthanized.
CHAPTER 3
EXPERIMENT 2

Through correlational data, Experiment 1 suggested that a dog’s morphology and background are important in predicting adoption. Experiment 2 aimed to test whether physical attractiveness determines adoption rates directly. Our prediction was that people would rate photographs of dogs that were adopted higher in attractiveness on a survey than photographs of dogs that were not adopted, even if they were not informed as to the animal’s outcome.

Materials and Methods

Thirty participants that walked into the Alachua County Animal Services for the purpose of adopting an animal or searching for a lost pet were recruited to participate in the survey. Participants were asked if they would participate in a research study by completing a brief survey about their opinions about images of shelter dogs. Each participant was asked to sign an informed consent form, led to a desk with a computer, and asked to complete the survey. No further directions were given. The survey showed 81 images of dogs in a random sequence (46 images of adopted and 35 of euthanized dogs). Under each image, three questions were displayed: “Is the dog attractive?”, “How much do you care about the dog?”, and “Is the dog pleasant?” Each participant was asked to answer each question under each image using a Visual Analog Scale (ranging from “very” to “not at all”) (Bradley & Lang, 1994). The first question targeted the variable of interest – the subjective measure of attractiveness, whereas the next two questions attempted to target the well-established variables of intensity and valence in human judgment. Intensity measures the strength of emotion to a particular object (e.g. a gun is high in intensity, whereas an umbrella is low intensity) and valence measures
the pleasantness of a particular object (e.g. a baby is high in valence, whereas a cemetery is low in valence) (Bradley & Lang, 1994). These two variables are necessary in order to place the novel variable in the context of known variables. The variable of attractiveness was hypothesized to be high in both intensity and valence. The participants were not told which dogs belonged to which outcome group. The participants were allowed to leave at any time, but incomplete data were excluded from analysis. All procedures were approved by the University of Florida Institutional Review Board.

**Statistical Analyses**

Data were normalized to correct for individual differences in the range of the scale used (normalized value = (original value - minimum)/ range) (Lykken, Rose, Luther, & Maley, 1966). Several people went through the whole survey without changing any of the scales for any image, presumably from indifference to the study or from inexperience with using computers (several individuals had trouble using a computer mouse). Therefore, interquartile ranges (IQR) for each participant were calculated and participants that had an IQR after standardization < 0.2 were excluded from further analysis in order to exclude data from participants who did not engage with the scale, resulting in n = 20.

Differences in the means of the ratings between dogs that were adopted from dogs that were euthanized were compared using a one-tailed t-test, as our hypothesis was that adopted dogs would have higher attractiveness scores than euthanized dogs.

**Results**

Participants reported that the dogs in the adopted group were more attractive than dogs in the euthanized group (t (75) = 1.84, P = 0.035) (Fig. 3-1). The average
rating for the adopted and euthanized group was 0.50 (SD = 0.08) and 0.46 (SD = 0.09) respectively.

The three variables of interest (attractiveness, intensity, and valence) were analyzed using Pearson’s correlation in order to determine the novel variable’s association with the known variables. As hypothesized, there was a positive correlation between the attractiveness variable and the valence variable (pleasantness) ($r^2 = .81$, $p < 0.0001$). In addition, there was a positive correlation with the attractiveness variable and the intensity variable (care) ($r^2 = .68$, $p < 0.0001$).
Figure 3-1. Normalized ratings of attractiveness of the images of dogs by outcome. Median, 5th and 95th percentiles are shown.
Discussion

Participants gave higher attractiveness scores to dogs that were adopted than to dogs that were euthanized. The positive correlations between the attractiveness variable and the valence and intensity variables offer support to the validity of the novel variable. Results from this experiment suggest that potential adopters are sensitive to the morphological characteristics of the dogs, and are influenced by these characteristics in the decision to adopt a dog from the shelter.
CHAPTER 4
GENERAL DISCUSSION

Training shelter dogs to look into the eyes of adopters did not increase adoption rates or decrease length of stay. Furthermore, letting dogs out of the kennels, giving them treats, and providing human interaction (as was done to the dogs in the feeding group) also had no effect on either adoption rates or length of stay.

Even though we were able to show that the dogs in the training group acquired the looking behavior, adoption rates did not go up. This suggests that the looking behavior is not one of the factors that influence adopters’ decisions. A weak negative correlation was present between baseline looking rates and length of stay; however, this correlation most likely arose not from adopters being sensitive to the looking behavior itself, but, instead, to the overall sociability of the dog. This is supported by our data, which show a strong positive correlation between sociability and baseline looking rates.

Sociability correlated with the length of stay. The more social dogs tended to stay for a shorter duration at the shelter. However, sociability had no effect on adoption rates. The more social dogs were not more likely to be adopted and were just as likely to be euthanized as the less social ones.

Age, sex, and location of the kennel were not correlated with length of stay and did not influence adoption rates.

Size and color also correlated with length of stay, but did not influence adoption rates. In support of the previous literature, small dogs had the shortest length of stay, followed by medium dogs, and then by large dogs. White dogs stayed the shortest, whereas black dogs stayed the longest. Previous research has suggested that the lighter-colored dogs are preferred over darker-colored dogs (Wells & Hepper, 1992;
Lepper et al., 2002). However, this was not consistent with all of our data. Red dogs had a similar length of stay as the brindle dogs. This would suggest that instead of being attracted to a specific color, adopters prefer dogs with unique coloration, which occur less frequently in the studied region. For example, in mid-Florida, the quintessential “Florida dog” is a tan colored, medium-sized, short-haired dog. This highlights the need to study adopter preferences across different regions and manifests the danger of universally recommending exclusion of certain colored dogs from being offered for adoption.

Breed and mode of intake were the only factors that influenced adoption rate. Pit bull type and hound type dogs had the lowest adoption rate, whereas toy breeds had the highest. In addition, euthanasia rates for pit bulls and hounds were highest, whereas not a single toy breed dog was euthanized. Interestingly, Labrador retriever mixes had much higher adoption rates and lower euthanasia rates than pit bull mixes. Considering that the average person is unlikely to accurately characterize a dog based solely on its phenotype, as well as the typically arbitrary decision by the shelter staff on the breed label of the dog, this difference in adoption rates is most likely due to public perceptions of the different breeds and not to actual preferences in morphology. Public perceptions on what makes a dog a good pet must also play a role in why dogs that were surrendered by the owner were more likely to be adopted than dogs that were found as strays or were seized by animal control. There were no indications that these populations of dogs were behaviorally different from each other, thus further suggesting the role of public perception of dog stereotypes in making the decision to adopt.
The second experiment revealed that the general morphology or the overall attractiveness of the dog is a factor that influences adoption rates. Participants labeled adopted dogs as more attractive than the dogs that were euthanized. The two experiments together suggest that adopters are influenced by readily observed factors the most, such as the overall look of the dog and what is written on the cage card, such as breed and mode of intake. This is consistent with the finding that adopters only spend on average 20 to 70 s evaluating a dog before making a decision (Wells & Hepper, 2001).

Educating the public about giving up preconceived notions about certain breeds and stray and confiscated dogs may be more effective in increasing adoption rates of those dogs. Alternatively, a potential solution may be to avoid writing the background information (i.e. if the dog was a stray or from a confiscation case) and breed on the cage card in order to allow these dogs an equal chance of adoption. Also, altering perceived morphology, such as making the overall look of the dog more pleasant with bandanas, collars, vests, distributing attractive photos, etc. may make a bigger impact, while keeping down costs, than attempting to alter the behavior of the dogs.

Length of stay and adoption rate are necessarily related: dogs cannot be adopted unless they are in residence. However, the different outcomes likely have at least partially different controlling variables. Adoption rates are entirely determined by the actions of adopters, assuming that a particular dog is available to potential adopters. Length of stay, on the other hand, is determined by actions of both adopters and shelter staff. Because the shelter staff make the euthanasia decisions, they can elect to keep an attractive dog around for longer. In this study, more attractive dogs actually had
shorter stays than less attractive dogs. This could be because length of stay is also influenced by an adopter’s actions. Adopters may select attractive dogs, thereby preventing them from having longer stays. The actions of rescue groups also influence length of stay, but not adoption rates. However, even when all rescued dogs are excluded from analysis in the multivariate GLM, the trends remain the same (breed and mode of intake influence adoption rates, whereas color, size, and sociability correlate with length of stay). Therefore, the complex interaction between the actions of adopters and shelter staff most likely account for the differentiation between the length of stay and adoption rate.

These results highlight the need for future studies to explicitly account for all of the different human populations (e.g. adopters, rescuers, and staff) in order to achieve readily usable results. The discrepancy between the length of stay and adoption rates make it clear that there are different actors in the shelter environment and that the final outcome for each dog arises from a combination of actions from all of these actors.

The results from this study and the past literature suggest that whereas training and human interaction may function as enrichment interventions, these interventions are unlikely to noticeably increase adoption rates while being cost-efficient. The intervention proposed by Luescher and Medlock (2009) would cost at least $4.3/ dog/ day (based on the amount needed to pay a professional animal trainer for 20 min, US Bureau of Labor Statistics, 2011). The intervention that we explored in this study would cost approximately $1.8/ dog/ day (the amount to pay a worker federal minimum wage for 15 min, US Bureau of Labor Statistics, 2011). Because animal shelters are often understaffed and financially strained, funding additional in-shelter programs may result
in the cutting of funds to other necessary shelter operations, such as animal care costs, veterinary costs, etc. Therefore, future studies should conduct a cost-benefit analysis to ensure that the proposed intervention is financially viable as well as adequately effective.

**Conclusion**

Training shelter dogs to look up into the eyes of adopters did not increase adoption rates. Other morphological and background factors were more important to adopters. Breed and mode of intake influenced adoption rates, whereas color, size, and sociability correlated with length of stay. Adopters were likely most influenced by variables that were readily observable in a few seconds, such as the overall look of the dog and the information that was written on the cage card.

Based on the data collected, animal shelters are advised to educate the public to give up preconceived notions about certain breeds of dogs as well as about dogs that were found as strays or confiscated by animal control. Future studies should account for all of the human populations that may influence the dogs’ outcomes in addition to conducting a cost-benefit analysis on the interventions to ensure financial viability.
LIST OF REFERENCES


BIOGRAPHICAL SKETCH

Alexandra Protopopova earned a Bachelor of Science in pre-veterinary and animal sciences and an additional Bachelor of Science in psychology with an emphasis on neuroscience from the University of Massachusetts Amherst. Alexandra graduated with Summa cum Laude with the highest distinction from the University. Alexandra received her Masters of Science in psychology from the University of Florida.

Alexandra began her research career studying primate cognition, but found her calling in canine cognition and behavior. Besides research, Alexandra’s interests include dog training, mentoring students, and teaching.

Alexandra is currently enrolled in a PhD program at the University of Florida where she studies the welfare of shelter and pet dogs. Alexandra currently resides in Gainesville, FL with her husband and her rescued bull terrier.