

1 ADOPTER-DOG INTERACTIONS AT THE SHELTER: BEHAVIORAL AND
2 CONTEXTUAL PREDICTORS OF ADOPTION

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25 Abstract

26 Millions of unwanted pets enter animal shelters each year in the USA, but only a portion leave
27 alive. Previous research has found that morphology and in-kennel behavior influence adoption.
28 The current study evaluated whether any behaviors exhibited by dogs during an out-of-kennel
29 interaction with a potential adopter predicted adoption. In addition, we evaluated whether other
30 predictors such as the morphology of the dog, intention to adopt a dog that day, and location of
31 the interaction influenced adoption. Finally, the study assessed correspondence between the
32 potential adopters' answers on a questionnaire and the dogs' behavior during the interactions.
33 The behavior of shelter dogs in out-of-kennel interactions with potential adopters was observed
34 ($n = 250$). After each interaction, visitors were given a questionnaire to indicate their reasons for
35 adopting or not adopting that specific dog. The vast majority of shelter visitors only requested to
36 interact with only a single dog and the average duration of interaction was 8 min. Only two
37 behaviors: ignoring play initiation by and lying in proximity to the potential adopter, but no
38 morphological variables, influenced adoption decisions. Dogs that were adopted spent half as
39 much time ignoring play initiation by and twice as much time lying in proximity to the adopter
40 than dogs that were not adopted. The probability (p) of adoption was higher in a smaller outdoor
41 concrete area ($p = 0.423$) than in both a large grass area ($p = 0.320$) or an indoor room ($p =$
42 0.229). Intention to adopt a dog that day resulted in the highest probability of adoption ($p =$
43 0.586), whereas an intention to not adopt resulted in a low probability ($p = 0.102$). Dogs that
44 were labeled as not social by non-adopters after an interaction had higher scores than average in
45 ignoring play initiations. However, non-adopter reports did not exactly correspond with the dogs'
46 behavior during the interactions. Our findings may be used to develop targeted training programs
47 for shelter dogs.

48 **Key words:** Shelter; Dog; Overpopulation; Behavior; Adoption

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50 CONTEXTUAL PREDICTORS OF ADOPTION

51 **1. Introduction**

52 Unwanted animals are surrendered to animal shelters by the millions in the USA. The
53 American Society for the Prevention of Cruelty to Animals (ASPCA) estimates that
54 approximately 60% of shelter dogs are ultimately euthanized in shelters (ASPCA, 2014). Even if
55 a dog enters a shelter which does not euthanize healthy animals, a long stay in an impoverished
56 environment presents significant welfare concerns (Wells, 2004). Thus, one way to improve the
57 welfare of dogs is by increasing their chances of getting out of the animal shelter – i.e.,
58 improving their adoption rates. To the best of the authors' knowledge, only three studies
59 experimentally modified shelter dog's behavior in the hopes of increasing their likelihood of
60 adoption. Luescher and Medlock (2009) found that in- and out-of the kennel obedience training
61 improved dogs' chances of adoption. These authors trained a variety of different behaviors, such
62 as walking on a head halter, sitting on cue, not jumping on people, not barking in the kennel, and
63 staying in the front portion of the kennel. The large variety of behaviors trained prevents
64 conclusions as to which specific behaviors influenced adopters. Protopopova et al. (2012)
65 assessed whether training shelter dogs on a social behavior, specifically gazing into the eyes of
66 adopters, increased adoption rates. Although the experimental manipulation did increase gazing
67 toward experimenters, this did not significantly increase adoption rates. Herron et al. (2014)
68 found that training several in-kennel behaviors (gazing, approaching the front of the cage, sitting
69 or lying down in the cage, and not barking) increased several of these behaviors in shelter dogs,
70 but did not alter their adoption rates. Unfortunately, these three studies do not provide clear
71 conclusions on the effects of training.

72 The above mentioned training interventions were based on assumptions about which
73 behaviors are attractive to adopters; however, no previous studies have empirically evaluated
74 which, if any, spontaneous behaviors of dogs in shelters influence adopter decisions. Wells and
75 Hepper (1992) attempted to answer this question indirectly through the use of a choice procedure
76 consisting of photographs of dogs that differed in one specific way. The study suggested that
77 people prefer dogs that are labeled as “not barking” versus “barking” and “positioned in the front
78 of the cage” versus “back of the cage.” Wells and Hepper (1992) also found that when asked
79 what determines a dog’s attractiveness for adoption, participants answered that temperament is
80 the most important factor, followed by size, sex, appearance, and age. Waller et al. (2013) found
81 an intriguing correlation between the frequency of inner brow lifts and length of stay at the
82 shelter. The authors suggested that this pedomorphic facial expression encouraged adoption.

83 When potential adopters are selecting a dog, in-kennel behaviors may influence further
84 inspection of the dog, but the next set of interactions occur outside of the kennel. These out-of-
85 kennel interactions may be very important to adopters as this is where their adoption decision
86 may be finalized. Weiss et al. (2012) asked adopters what behaviors their adopted dog engaged
87 in during the first meeting. Adopters reported that dogs approached and greeted, licked, jumped
88 on, and wagged their tails during the meeting. The authors suggested that these behaviors might
89 have influenced adopters’ choices. The current study aimed to extend these findings and
90 investigate adopter behavior and choice directly.

91 The first objective of this study was to examine which, if any, behaviors that a dog
92 exhibited during an out-of-kennel interaction with a potential adopter predicted adoption. The
93 second objective was to examine whether any other variables, such as the morphology of the dog
94 and location of the interaction influenced adoption. We were also interested whether the reported

95 intention to adopt a dog that day had an influence on the likelihood of adoption, as it is possible
96 that some portion of the visitors that enter an animal shelter simply desire to observe or play with
97 the animals. The third objective was to evaluate agreement between reasons behind a decision to
98 adopt as reported on questionnaires and the dogs' behavior during the interactions.

99 **2. Materials and methods**

100 2. 1. Animals and housing

101 Two-hundred- fifty interactions between dogs available for adoption and potential
102 adopters were observed. This study used a total of 151 dogs, which were housed at the Alachua
103 County Animal Services (ACAS: Gainesville, FL, USA) from May to October 2013 and 154
104 separate potential adoptive individuals or families. ACAS is an open-admission county animal
105 shelter, which functions both as animal control and adoption facility. Adoptable dogs comprised
106 seized and surrendered dogs which were determined to be safe and healthy by staff.

107 Dogs were housed in rows of adjacent kennels with cement walkways at front and back.
108 Dogs were housed singly or in pairs in 1.0 m width x 4.6 m length x 2.1 m height kennels with
109 two-thirds of the pen outdoors and the rest indoors. The dogs could be viewed by the public from
110 the outside walkway. All kennels had cement floors and 1.2 m tall cement walls that were
111 connected to the ceiling of the kennel with a chain-link fence. Each kennel contained a water
112 dish, a food dish, and a Kuranda bed (Kuranda USA, Annapolis, MD, USA) in the inside portion
113 of the kennel. Staff fed the dogs and cleaned kennels daily before 9:30 h. Volunteers at the
114 shelter exercised, trained, and played with the dogs approximately one to three times per week
115 on the shelter premises.

116 A cage card was attached to each kennel that noted the dog's name, identification
117 number, age, breed (as determined by shelter staff), mode of intake (surrendered by the owner,

118 found as a stray, or confiscated by animal control), and, infrequently, a few words on the history
119 of the dog.

120 Independent rescue organizations frequently visited the shelter and selected dogs to enter
121 into their programs. Dogs were marketed by the shelter staff and volunteers on their website,
122 several national online databases, local news channels, and through a popular online social
123 networking site. The standard adoption fee was \$30 but was waived for 2 of the 6 months of this
124 study.

125 2.2. Data collection

126 An experimenter (AP or a research assistant) waited for a potential adopter to select a dog
127 from the row of adoptable dogs and escorted the adopter, dog, and any shelter volunteers or staff
128 (who were unaffiliated with the study) to an out-of-kennel interaction area, as per the usual
129 protocol of the shelter. There were three possible interaction areas: a 25.6 m x 11.0 m grassy area
130 that contained a small pool, benches, agility equipment (a ramp, a tire jump, and a long narrow
131 bench), toys, trees, and bushes; an adjacent 7.6 m x 4.3 m concrete area with a small pool, chairs,
132 and toys; or an indoor room (9.1 m x 7.3 m) with couches, a rug, a table, and toys. Compared to
133 the other areas, the grassy area was significantly more enriched; it was larger, contained more
134 items in the area and many more surfaces that may have contained left-over odors from other
135 dogs. The interaction area was determined by the volunteer or staff member who was escorting
136 the potential adopter and dog. Generally, the volunteers and staff preferred the outdoor grass
137 area. If the dog had not yet completed the vaccination protocol, was recently spayed or neutered,
138 or was under 1 year of age, the interaction occurred in the concrete or indoor area.

139 The experimenter asked the potential adopter for permission to videotape the dog for a
140 study during the interaction. If the adopter agreed, the experimenter began recording. If the

141 adopter disagreed, the experimenter did not videotape the session (one potential adopter
142 disagreed and was removed from the study). The interactions were videotaped with a Kodak™
143 PlaySport Zx5 video camera using the WVGA mode at 30 fps (Kodak Company, Rochester, NY,
144 USA). During the interaction, the experimenter did not interact with the dog or the adopter and
145 remained as far as possible from both the dog and adopter. The experimenter answered any
146 questions about the dog briefly, taking care to not make any remarks regarding the dog's
147 behavior, looks, or adoptability. The video recording ended when the potential adopter indicated
148 his/her decision whether or not to adopt the dog. In order to obtain demographic information on
149 shelter visitors and provide more insight into the adoption process, after the interaction, the
150 potential adopters were led to a desk and asked to fill out a brief questionnaire (Appendix I). The
151 questionnaire data were descriptive in nature and not included in the logistic model to predict
152 adoption likelihood. The questionnaire asked about the gender and age of the adopter, the
153 number of people in the family, the number of children in the family, the presence of other pets
154 in the home, the intended purpose of the dog under consideration, and whether the adopter came
155 in intending to adopt any dog that day. Finally, the questionnaire asked the adopter to select a
156 reason for adopting or not adopting the particular dog by circling one or more of the following:
157 "behavior", "looks", "right/ wrong age", and "right/ wrong breed". If the potential adopter
158 circled "behavior", the adopter was then also asked to describe the behaviors that were attractive
159 or unattractive. After the interaction, the experimenter noted the breed, sex, age, coat length,
160 size, color, mode of intake (stray, owner-surrender, or confiscated), the area where the
161 interaction occurred (grass, concrete, or indoor), and whether or not the dog was adopted. If the
162 adopter expressed interest to interact with more than one dog, the adopter was asked to complete
163 a separate questionnaire for each dog immediately after each interaction.

164 Behaviors of the dog were coded on an ethogram (Table 1) from the video recordings by
165 research assistants, who had been trained to criterion (minimum 90% interobserver agreement on
166 four practice videos). Behaviors were coded with a partial interval recording method using 5 s
167 time bins. The proportion of bins in which a behavior occurred was calculated for each
168 interaction. Twenty-five percent of videos (62/250) were coded by two coders independently to
169 calculate interobserver reliability. An agreement was scored when two observers agreed on an
170 occurrence or nonoccurrence of a behavior in each time bin.

171 ---Table 1 here---

172 Information about the dog, as listed on the kennel card, was also recorded, including
173 color (tan, black, brindle, black and white, black and tan, gray, and merle), coat length (short or
174 long), mode of intake (owner surrendered, stray, confiscated, or recently returned to the shelter),
175 and size (small - approximately 0.35 m, medium- approximately over 0.35 m and under 0.60 m,
176 and large -approximately over 0.60 m in height at the withers). The sex of the dog (male or
177 female) was recorded from the kennel card; some dogs were not yet sterilized, but would be
178 before leaving with an adopter. The age of the dogs were recorded from the estimates provided
179 by shelter veterinarians. We based our age categories on the work of Clevenger and Kass (2003),
180 who used two categories, split around first birthday, but subdivided their “juvenile” category
181 (dogs less than 1 year of age) into “puppy” – dogs up to 4 months, and “juvenile” – between 5
182 and 11 months since in our own experience at the research facility, visitors and staff clearly
183 discriminated between young juveniles and older juveniles. Five months was chosen as a cutoff
184 because it reflected staff and visitor perception of the month at which there was evident
185 maturation from a younger puppy to an older juvenile. The primary breed of the dog was
186 recorded from the label on the dogs’ respective cage cards as determined by shelter staff. The

187 breeds were grouped together into seven breed or morphological types (Ratters, Fighting Breeds,
188 Hounds, Working Breeds, Herding Breeds, Sporting breeds, and Lap Breeds) as described in
189 Protopopova et al. (2012). Very few, if any, dogs were pure bred, and therefore these breed
190 groupings represent one way to group dogs based on phenotype, behavior, and public opinion.

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

193 2.3. Statistical analysis

194 All statistical analyses were performed using the statistical package SPSS[®] (International
195 Business Machines Corp., Armonk, NY, USA). Proportions of each behavior were calculated for
196 each interaction. Behaviors that occurred in less than 5% of interactions (<12 of the 250
197 interactions) and/ or had a low interobserver agreement were removed from analysis. The
198 interactions were divided into two groups: culminating in an adoption or non-adoption.

199 Descriptive statistics were used to quantify demographic information of potential
200 adopters as reported through the surveys. The frequency of reporting that “looks,” “breed,”
201 “age,” or “behavior” was important in the decision to adopt or not adopt, based on the
202 questionnaire responses, was calculated. In addition, we calculated the frequency of the words
203 used to describe the behavior of the dog after the interaction and to justify their decision.

204 All morphological and behavioral variables that might have influenced adoption, along
205 with the dog identity as predictors (as some dogs interacted with several potential adopters),
206 were entered into a logistic regression model through Wald backward elimination with criteria
207 for inclusion set at $P < 0.25$ and for removal set at $P > 0.05$ (Mickey and Greenland, 1989). The
208 dependent variable was outcome (adoption or non-adoption). All behavioral variables, size, coat
209 length, sex, and age were treated as covariates, and individual dogs, breed, color, and intake type

210 were treated as categorical predictors. Thus, the final model contained 29 behavioral and eight
211 morphological variables of the dogs and the dogs themselves as predictors. Questionnaire data
212 were not included in the model.

213 Chi-square analyses were used to evaluate whether the interaction area or prior intention
214 to adopt or not adopt influenced adoption decisions.

215 To evaluate whether the subsamples of dogs labeled as “too active” or “not social” were
216 different from the overall population of non-adopted dogs, a multivariate General Linear Model
217 was fitted to two dependent variables (lie in proximity and ignore play initiation) and two
218 independent variables (dogs that were labeled “too active” and dogs that were labeled “not
219 social”). These two independent variables were chosen because they were the highest frequency
220 descriptors of non-adoption. The two dependent variables were chosen as they predicted the
221 likelihood of adoption.

222 **3. Results**

223 Out of 250 sampled interactions, 88 resulted in adoption (35.2%). Aggression never
224 occurred in any interactions and was therefore removed from further analysis. All other
225 behaviors occurred in more than 5% of interactions and were retained in the analysis.

226 The interobserver agreement ranged from 88% (for “Exploration”) to 100% (for
227 “Rejecting Food”, “Mouthing Person”, “Whining”, and “Barking”). All other behaviors had
228 average interobserver agreement above 90%. No behaviors were removed from analysis due to
229 low interobserver agreement.

230 **3.1 Shelter Visitor Demographics**

231 Two people did not complete the questionnaire, resulting in 248 completed
232 questionnaires. The majority of potential adopters were female (57.6%). The largest percentage

233 (37.2%) were less than 25 years of age, 23.2% were between 26 and 35, 15.6% were between 36
234 and 45, 14.4% were between 46 and 55, 4.8% were between 56-65, and 4.0% were older than 66
235 years of age. Of the shelter visitors, 14% lived alone, 31% lived with one other person, and the
236 rest (54%) lived with more than two people. A small majority did not have any children in the
237 home (53.6%). The small majority potential adopters already had other pets in the home (57.6%).

238 About half of shelter visitors reported not having an intention to adopt a dog during that
239 visit (47.2%). One-hundred-fifty-five different people or families interacted with the dogs during
240 the study. Almost two-thirds of potential adopters interacted with only one dog (64.5%), 21.9%
241 interacted with only two dogs, 6.5% interacted with three dogs, 3.2% interacted with four dogs,
242 2.6% interacted with five dogs, and 0.6% interacted with six and seven dogs each.

243 3.2. Reported Reasons for Adopting or Not Adopting

244 Of 88 interactions that resulted in an adoption, 82 questionnaires contained a rationale for
245 adoption. Table 2 lists the given reasons and the frequency of descriptive words used by adopters
246 to explain their decision in adopting that specific dog. Of 162 interactions that resulted in no
247 adoption, only 70 contained a rationale for choosing not to adopt. Table 2 also lists the reasons
248 for not adopting and the frequency of descriptive words used by visitors to explain why they did
249 not adopt that particular dog.

250 ---Table 2 Here---

251 3.3 Shelter Dog Demographics

252 One-hundred-fifty-one different dogs were taken out of their kennels by potential
253 adopters during the study. Most dogs were taken out only once (61.6%), 22.5% of dogs were
254 taken out twice, 10.6% were taken out three times, 2.0% dogs were taken out four times, 2.0%

255 dogs were taken out five times, 0.7% of dogs were taken out six times, and 0.7% of dogs were
256 taken out seven times.

257 The majority of dogs were male (56.4%) and adults (60.0%). Only 9.6% were puppies
258 and 30.4% were juveniles. Most dogs were medium sized (64.8%), 30% were small, and 5.2%
259 were large. The largest color category was red (48.8%), white followed next (12.8%), followed
260 by brindle (10.0%), black (8%), black and tan (6.8%), black and white (6.4%), merle (3.2%),
261 tricolor (3.2%), and the smallest category was gray (0.8%). The majority of dogs had a short coat
262 (77.2%). The two most frequent breed types were fighting (32.8%) and sporting (26.4%),
263 followed by hounds (16.4%), herding (9.6%), working (8.4%), toy (3.6%), and ratters (2.8%).
264 The majority of dogs were strays (64.4%), 28.0% were owner surrendered, 4.4% were
265 confiscated, and 3.2% were recent returns.

266 Most of the interactions happened in the smaller enclosed outdoor concrete area (56.8%),
267 followed by the adjacent large grass area (33.2%), and the indoor room (10.0%). The average
268 duration of an interaction was 7.9 min (range: 1.0 – 40.7 min). There was no difference in the
269 duration between interactions ending with an adoption and non-adoption (mean +/- SD, 8.7 +/-
270 7.5 min, and 7.5 +/- 5.3 min, respectively; Mann-Whitney *U* statistic = 1.0, *df* = 1, *P* > 0.1).

271 3.4. Predictors of Adoption

272 3.4.1. Morphological and behavioral predictors

273 A test of the full logistic regression model against a constant only model was statistically
274 significant, indicating that the predictors as a set reliably distinguished between interactions that
275 resulted in adoption and non adoption (chi-square = 13.16, *df* = 2, *P* < 0.001). Prediction success
276 overall was at 67.2% (97.5% for non-adoption and 11.4% for adoption). The Wald criterion
277 demonstrated that only ignoring play initiation by the potential adopter and lying in proximity to

278 the potential adopter made a significant contribution to prediction (Table 3). The odds ratio
279 indicated that dogs that lay in proximity were 14.47 times more likely to be adopted than those
280 that did not, after accounting for the only other behavior remaining in the model (ignoring play
281 initiation). The odds ratio for ignoring play initiation was less than 0.001, indicating that that
282 behavior was associated with very low odds of being adopted, after controlling for the other
283 significant behavior (laying in proximity).

284 ---Table 3 here ---

285 Dogs that were not adopted ignored play initiations by the potential adopter twice as
286 much (mean proportion +/- SD, 0.040 +/- 0.057) than adopted dogs (mean proportion +/- SD,
287 0.020 +/- 0.036), and lay in proximity to the potential adopter half as much (mean proportion +/-
288 SD, 0.030 +/- 0.086) as adopted dogs (mean proportion +/- SD, 0.060 +/- 0.131). There was no
289 correlation between ignoring play and lying in proximity ($\rho = -0.08$, $P > 0.1$).

290 3.4.2. Other predictors

291 The area where interaction took place significantly influenced adoption decisions.
292 Interactions in the smaller concrete area resulted a probability of adoption of 0.423, whereas
293 interactions in the indoor room resulted in a probability of 0.320, and interactions in the large
294 enriched grass area resulted in a probability of 0.229 (chi-square = 9.37, $df = 2$, $P < 0.01$).

295 Stated intention to adopt or not adopt influenced adoption decisions of shelter visitors.
296 The interactions of potential adopters, who reported not intending to adopt a dog that day,
297 resulted in a probability of adoption of 0.102; whereas, interactions of potential adopters, who
298 reported an intention to adopt a dog that day, resulted in a probability of 0.586 (chi-square =
299 62.99, $df = 1$, $P < 0.001$).

300 3.5. Sensitivity of non-adopter descriptions

301 A multivariate General Linear Model found that being labeled “too active” did not
302 predict a dog’s tendency either to ignore play or lie in proximity ($F(1) = 0.102$, $P > 0.1$ and $F(1)$
303 $= 2.73$, $P > 0.1$ respectively). Dogs that were labeled as “too active” ($n = 13$) had an average
304 proportion of ignoring play of 0.02 ($SD = 0.02$) and had an average proportion of lying in
305 proximity of 0.08 ($SD = 0.19$). Dogs that were not labeled as “too active” ($n = 143$) had an
306 average proportion of ignoring play of 0.03 ($SD = 0.04$) and had an average proportion of lying
307 in proximity of 0.03 ($SD = 0.08$). However, dogs labeled “not social” were more likely to ignore
308 play, but not less likely to lie in proximity ($F(1) = 38.6$, $P < 0.001$ and $F(1) = 2.09$, $P > 0.1$
309 respectively). Dogs that were labeled as “not social” ($n = 25$) had an average proportion of
310 ignoring play of 0.09 ($SD = 0.09$) and had an average proportion of lying in proximity of 0.006
311 ($SD = 0.01$). Dogs that were not labeled as “not social” ($n = 131$) had an average proportion of
312 ignoring play of 0.03 ($SD = 0.04$) and had an average proportion of lying in proximity of 0.03
313 ($SD = 0.08$).

314 **4. Discussion**

315 More than one-third of all interactions sampled during the 6 months of this study resulted
316 in an adoption. The most typical shelter visitor that requested to interact with a dog was female,
317 under 25 years of age, lived in a household with more than two people and had other pets. About
318 half of the potential adopters did not have children in the home. Many shelter visitors did not
319 intend to take a dog home that day. Close to 47% of people who requested to interact with a dog
320 reported not having an intention to adopt that day.

321 An interesting finding was that the average duration of interactions was quite short – only
322 8 min. This corresponds to previous research that found that adopters only spend 20-70 s
323 evaluating a dog in the kennel (Wells and Hepper, 2001).

324 One surprising finding was that the vast majority of potential adopters only took out a
325 single dog. About one-fifth of adopters interacted with two dogs and only about a tenth of
326 potential adopters interacted with more than two dogs. This finding suggests that adopters are
327 selecting dogs based on their in-kennel presentation and only take the dog out to confirm their
328 choice. This corresponds to our finding that our model based on behavioral variables was only
329 able to predict failure, but not success, of adoption. In addition, while morphology has been well
330 established to influence adoption (e.g. Protopopova et al., 2012), no morphological variables,
331 such as breed, age, size, sex, intake type, coat length, or coat color influenced adoption decisions
332 during an out-of-kennel interaction. Our results suggest that adopters make a decision to adopt
333 prior to interacting with a dog, but this decision can be reversed based on the dog's behavior
334 outside of the kennel.

335 Only two behaviors predicted the likelihood of adoption during an interaction with a
336 potential adopter: ignoring play initiation by and lying down in proximity to the potential
337 adopter. Dogs that lay down in proximity to adopters were approximately 14 times more likely to
338 be adopted and ignoring play initiation was associated with a very low likelihood of adoption.
339 Previous authors have suggested that sociability is a desirable trait in shelter dogs (Sternberg,
340 2003) and many researchers in the field of comparative cognition attribute the success of
341 domestic dogs in human societies to their evolved social cognitive abilities (e.g. Hare et al.,
342 2002). Protopopova et al., (2012) did not find that training a sociable behavior increased
343 adoption rates significantly but this may have been due to a poor choice of sociable behavior -
344 gazing. In the present study, adopted dogs did not attend more to potential adopters. It is possible
345 that training a different social behavior, such as lying down in proximity to the adopter, would

346 have increased adoption rates. Future research should experimentally investigate the ability of
347 the two behavioral variables (lying down and ignoring play initiation) to influence adoption.

348 The derived model based on the two behavioral variables was much more accurate in
349 predicting non-adoption than adoption. These results suggest that adopters were more sensitive
350 to undesirable than to desirable behaviors.

351 Most adopters justified their reasons for adopting a dog in the questionnaire. The majority
352 of people reported that the behavior and the overall look of the dog was a reason for adoption.
353 Previous survey research has reported similar findings. Wells and Hepper (1992) found that
354 people reported temperament as the most important variable in adoption, but Weiss et al. (2012)
355 found that adopters reported that appearance was the single most important reason for adoption.
356 We found in the present study that adopters reported playfulness/ activity as the most important
357 behavioral reason for adopting. This was followed by calmness and friendliness. Interestingly,
358 only about half of the people in this study reported that age and breed were reasons for adoption;
359 however, a growing body of research suggests that breed and age are important correlates of
360 adoption (e.g. Normando et al., 2006; Protopopova et al., 2012; Brown et al., 2013). This
361 discrepancy may reflect the limitations of questionnaire data in identifying the specific variables
362 that are influencing adoption decisions.

363 To the best of our knowledge, no previous research has asked people to report on why
364 they did not adopt a particular dog after an interaction. We found that shelter visitors reported
365 behavior as the main reason for not adopting. Specifically, the two most common responses were
366 that the dog was not attentive and too active. The most common “other” reason for not adopting
367 was that the adopter was still looking or did not feel ready to adopt. The second most common

368 “other” reason was needing to bring family members, including any resident dogs, to meet the
369 new dog.

370 We found that more adoption happened in the smaller outdoor concrete area than in either
371 the large grass area or an indoor room. All puppies were required to be shown in either the
372 concrete area or the indoor room; however, age alone could not have been responsible for these
373 results, as age was not a predictor of adoption in our study. It is possible that a larger grass area
374 permitted dogs to engage in unattractive behaviors more easily (e.g. the dogs spent more time in
375 exploratory behavior away from the potential adopter); however, both the outdoor concrete area
376 and the indoor area were large enough to permit the dog to freely move away from the adopter.
377 Future research should experimentally investigate the effects of the space in which pre-adoption
378 interaction occurs on dog’s outcomes.

379 The most accurate predictor of adoption was intention to take a dog home that day.
380 Interactions with shelter visitors, who reported the intention to adopt a dog that day, resulted in
381 58.6% adoptions. It is noteworthy that, while this represents the majority of interactions, there
382 were still many people who left the shelter without a dog even though they stated they were
383 ready to adopt. About half of all visitors did not intend to adopt a dog that day. It is possible that
384 some of the visitors never intended to adopt a dog, but were simply visiting the shelter for
385 entertainment; however, even though the majority of people who did not intend to adopt did not
386 adopt, one tenth of their interactions still resulted in an adoption. It is therefore possible that with
387 targeted interventions shelters would be able to convince visitors to adopt an animal even when
388 they did not intend to adopt. However, precautions would have to be made to avoid heightened
389 return rates based on impulsive adoption decisions. A possible alternative explanation of the high
390 predictive value of the intention to adopt a dog is the possibility that the adopters, after deciding

391 to adopt, indicated retrospectively that they were ready to take the dog home. This confound
392 could be avoided in future studies by assessing intention to adopt prior to any interactions.

393 Our results suggest that visitors were somewhat able to report on the behaviors they were
394 sensitive to during an interaction. Dogs that were labeled as not social by non-adopters also had
395 higher scores than average in ignoring play initiations. However, adopter reports did not
396 completely match the dogs' behavior during the interactions. Non-adopters listed hyperactivity
397 as a main deterrent to adoption; however, no active behaviors predicted non-adoption. This was
398 perhaps due to a large number of adopters who specifically reported that activity was a main
399 reason for adoption. Our findings suggest that sole reliance on survey data may not reveal a
400 complete picture of the adoption process. Future research should continue to utilize observational
401 and experimental methods to investigate adoption in animal shelters.

402 One limitation of the current study was that we aggregated data across different people.
403 Our sample size was too small to investigate the influence of demographic variables on
404 behavioral selection of dogs. It is possible that adopters with small children will select dogs
405 based on different criteria than single adopters. Similarly, age, socioeconomic, and other
406 variables may influence choice. Future research should investigate whether it may be possible to
407 match dogs to the right owners based on demographic information. It is also important to note
408 that the current study assessed preferences only in a single geographical location. It would be
409 beneficial to replicate the current study in a variety of different locations in order to assess if the
410 reported trends appear universal or are specific to location type (such as in urban versus rural
411 shelters, small versus large cities, etc.).

412 **5. Conclusion**

413 Our results suggest that adopters make a decision to adopt prior to interacting with a dog,
414 but this decision can be reversed based on the dog's behavior during a brief (8 min) interaction
415 outside of the kennel. As long as the dog spends time lying in proximity to and not ignoring play
416 initiation by the adopter, the likelihood of adoption is high. Our results suggest that a smaller
417 interaction area and a desire to adopt a shelter dog that day are predictive of adoption. However,
418 a proportion of visitors left without adopting a dog even when they intended to, which implies
419 that this portion of the population may be amenable to targeted programs designed to improve
420 shelter dog adoption.

421

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