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Rehabilitation program for urban free ranging dogs in a shelter environment can improve behavior and welfare

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26 displaying relaxed body posture, thus a positive emotional state, in home environment on the
27 1st day.

28 Findings of this study showed that a standardized rehabilitation program including
29 training and adaptation to home environment might be beneficial for some urban free ranging
30 dogs to improve their behaviors and welfare in shelter environment. Moreover, it can be
31 suggested that urban free ranging dogs can easily be trained and adapted to humans in case
32 where they did not have intense fear and/or aggression.

33

34 **Keywords:** Dog shelter; rehabilitation; training; urban free ranging dogs

35

36 **Introduction**

37 Urban free ranging dogs comprise mongrel dogs which mostly live in urban areas. In contrast
38 to feral dogs which actively avoid human habitat, those dogs are dependent on garbage as
39 well as on shelter which are intentionally or unintentionally provided by people (Boitani et.
40 al., 2007; Vanak and Gompper, 2009). Urban free ranging dogs can be classified into two
41 categories according to their social bond with people: social dogs which were possibly
42 abandoned or born in human settings and dogs with lower degree of social interaction and
43 tolerance towards humans (Boitani et. al., 2007). Since free ranging dogs live as scavengers
44 and are dependent on humans for their sustenance, they should be able to survive in a highly
45 competitive environment with limited resources (Boitani et. al., 2007; Majumder et. al.,
46 2014). However, these dogs often suffer from malnutrition, diseases, in particular parasitic
47 infections (Aslantas et. al. 2005; El-Tras et. al., 2011), and may be injured or killed in traffic
48 accidents (DeBalogh et al., 1993, Serpell, 1996). It is further reported that only a few free
49 ranging puppies reach adulthood (Pal et al., 1998). In many countries, urban free ranging dogs
50 are brought to dog shelters in order to be castrated and temporally accommodated. However,

51 since mongrel dogs kept in dog shelters are often not considered as first choice by adopters,
52 many of them could spend their entire life far from human household environment (Salgirli
53 Demirbas et. al., 2014) or are euthanized, in some countries. It is well known that shelter
54 environment is distressful for dogs due to several factors including unfamiliarity, restricted
55 mobility, exposure to noise, lack of predictability and control over daily situations and
56 isolation from other dogs and humans (Tuber et. al., 1999; Menor-Campos et.al., 2011).
57 Therefore, welfare of urban free ranging dogs is compromised in most developing countries.

58 Early socialization with humans has a significant effect on future behavior of dogs
59 (Scott and Fuller, 1965). Ruiz-Izaguirre et. al. (2014) showed that most of the pups willingly
60 approached the unfamiliar people, whereas most of the adult free ranging dogs did not
61 approach to within 20 cm of unfamiliar people even after repeated visits. One study has
62 suggested that urban free-ranging dogs can be adaptable to live with people in home
63 environment, although they initially showed timidity and fear during the post homing period
64 (Salgirli Demirbas et. al., 2014). Moreover, hyper-attachment was reported as the most
65 common behavior problem displayed by urban free-ranging dogs once rehomed. Aggression
66 towards people was less likely to be reported, but the possibility of aggressive dogs being
67 adopted from street or shelter would be low, so these results may be misleading.

68 Various studies have showed that increased social contact with humans and training
69 improve welfare of shelter dogs as predictability and control over the environment increased
70 through constant interactions with people and training (Hubrecht, 1993; Wells, 2004; Coppola
71 et. al., 2006; Luescher, 2008). Training is further found to be effective to decrease the number
72 of dogs relinquished (Scarlett et. al., 1999; Kwan and Bain, 2013). Many authors have
73 claimed that sociability of shelter dogs is important for adoption success since sociable dogs
74 are perceived as friendly and intelligent dogs by potential adopters (Sternberg et. al., 2003;
75 Wright et. al. 2007). It has been further suggested that behavior of a dog is more important

76 than its physical appearance for adoption (Wells and Hepper, 1992). Hence, one may argue
77 that training and socializing of urban free ranging dogs during their shelter life would increase
78 the success of adoption and welfare of the dogs in post adoption period.

79 The objectives of this study were: (1) to assess the welfare of urban free ranging dogs
80 subjected to a standardized rehabilitation protocol by observing changes in emotional states
81 and body language, (2) to assess their responses to training and (3) to assess their adaptability
82 to people and their new home environment. To best of our knowledge, this is the first effort
83 to assess responses of urban free ranging dogs to a standardized rehabilitation program
84 including daily social interactions, training and adaptation to home environment.

85

86 **Materials and methods**

87

88 *Animals and housing*

89 Eight urban free ranging dogs (5 males, 3 females) kept in a dog shelter in Ankara, Turkey
90 were chosen for this study. All of the dogs had been collected from metropolitan areas of
91 Ankara. They were brought to the shelter on different days and spent minimum of two months
92 in the shelter before the experiment. Seven dogs were adults while 1 dog (Keş) was juvenile
93 (approximately 4 months old) when brought to the shelter. The shelter staff noted that one of
94 these dog (Karam) was fed by paper collectors in streets while another dog (Kes) had spent
95 some free time out of the cage with shelter staff because he was very young upon entering the
96 shelter.

97 The dogs were divided into two groups based on reactions to a short test situation
98 derived from the Shelter Quality Welfare Assessment Protocol (Barnard et. al., 2014).
99 Accordingly, 4 dogs which showed aggressive or fearful body posture were categorized as

100 Group 1, while four dogs which showed friendly-neutral or friendly-submissive body posture
101 were categorized as Group 2 (Table 1).

102 All of the dogs were moved to a special unit that consisted of four pens each of which
103 was 150 cm wide and 200 cm long. All pens are opened to an outdoor area which was 90
104 square meter. All dogs had free access to the outdoor area except the feeding time. The unit
105 also included a container. The container was designed as a home environment which had been
106 decorated as a living room with two sofas and a dog bed. The dogs were only taken to the
107 container during the training.

108

109 Table 1. Demographics of the dogs

110

111 *Experimental procedure*

112 *Test persons*

113 Two veterinary surgeons who would take part in the rehabilitation program as trainers had
114 taken a course on dog behavior and training, which lasted for 2 months, before the experiment
115 started. The course was given by a lecturer who had PhD degree on animal behavior and
116 welfare as well as 7 years of experience on dog behavior. The lecturer had visited the
117 rehabilitation center once a week in order to evaluate the program. This lecturer as well as a
118 PhD student from the University assessed behaviors of the dogs together with the veterinary
119 surgeons at the beginning as well as at the end of 6 weeks of the rehabilitation.

120

121 *Adaptation to the unit*

122 The 1st week was considered as an adaptation week for habituating the dogs to the
123 rehabilitation unit and to each other. During that week, the dogs only with the dog keeper
124 during feeding and cleaning times. Body languages of the dogs were scored by the veterinary

125 surgeons with respect to their reactions to the dog keeper in the beginning and the end of the
126 adaptation week, using the scoring system presented on Table 2. The emotional states of the
127 dogs based on observations during their daily routine were qualitatively described by the
128 evaluators in the beginning and end of this week. To evaluate the emotional states of the dogs,
129 a chart including six emotional states, i.e., happy, sad, angry, nervous, excited and scared was
130 used. This chart was developed considering tertiary emotions described by Shaver et. al.
131 (2001). Thus, both qualitative and quantitative assessments were used to score the behaviors
132 of the dogs.

133

134 Table 2. Scoring system and descriptions for body language (developed from Shelter Quality
135 2014).

136

137 *Training protocol*

138 The training protocol included “protocol for deference” (Overall, 2013), basic obedience, i.e.,
139 sit, wait, lie down and heel signals as well as leash training. Protocol for deference can be
140 described as a simple protocol aiming to help dogs to have predictable and consistent
141 relationship with humans. With this protocol, the dogs learned to display appropriate
142 behavior, i.e., sit calmly and look at the people, when they wanted to engage in social
143 interaction with people (Overall, 2013). Positive reinforcement methods, i.e., clicker, verbal
144 praise and dog treats were used during training. Basic obedience training was started once the
145 dog successfully completed the “Protocol for deference”.

146 Petting sessions including different body parts such as top of the head, back, belly and
147 hind limbs were also conducted as long as the dog was displaying relaxed body posture.

148

149 *Adaptability to home environment*

150 After the training protocol was completed, the home environment was introduced to the dogs
151 The first phase was entering and staying in an indoor environment. The aim for the dogs was
152 to enter and stay in the living container with relaxed/neutral body posture, before the second
153 phase, i.e., the living room concept, was introduced. During the first phase only the entrance
154 or hall of the container was used. This part of the container was separated from the living
155 room with a door. In the second phase, sofa, carpet and dog bed were introduced to the dogs.
156 The “go to your bed” signal was also taught to the dogs. In addition, other previously taught
157 signals were practiced indoors.

158

159 Figure 1. Training in the home environment

160

161 *Assessment of the protocol*

162 At the end of the 6 weeks of rehabilitation, the dogs were evaluated with respect to their
163 interactions with humans, responses to training and adaptability to the home environment. To
164 this end, each dog was observed and recorded separately in different contexts: (i) approaching
165 the dog in a friendly manner by a familiar and an unfamiliar person, (ii) training context and
166 (iii) in home environment (Table 3).

167

168 Table 3. Assessment of the protocol

169

170 *Statistical analysis*

171 Descriptive statistics were used to analyze the data. Cohen's κ was run to determine if there
172 was agreement between evaluators' judgements on scoring of body language and emotion. For
173 the group comparison, the Mann-Whitney test was used. A value of $P < 0.05$ was considered
174 statistically significant.

175

176 **Results**177 *Adaptation to the unit*

178 There was high agreement between the veterinary surgeons regarding their judgments on
179 scoring of emotions ($\kappa = 1.000$, $p < 0.0001$; $\kappa = 0.846$, $p < 0.0001$) and body language ($\kappa =$
180 1.000 , $p < 0.0001$) during the 1st and 2nd evaluations (Table 4). During the 2nd evaluation,
181 body language of only 1 dog was different in comparison to that in the 1st evaluation. Body
182 language of this dog was assessed as aggressive in the 1st evaluation while it was described as
183 friendly and neutral in the 2nd evaluation.

184

185 Table 4. Descriptions of body language and emotions of the dogs during the adaptation week

186

187 *Assessment of rehabilitation*188 *Body language and emotion*

189 Reactions of the dogs to familiar/unfamiliar test persons were evaluated during the main
190 assessment (Table 5). Descriptions of the dogs' general emotional states during the last week
191 of the program were also made by the veterinary surgeons. There was high agreement
192 amongst the evaluators regarding their judgments on descriptions of emotions ($\kappa = 1.000$, $p <$
193 0.0001) as well as on scoring of body language ($\kappa = 1.000$, $p < 0.0001$) during the main
194 assessment.

195 Seven dogs (7/8) were displaying relaxed body posture while touching of different
196 body parts during the main assessment.

197

198 Table 5. Descriptions on body language and emotions of the dogs

199

200 *Training*

201 The mean time to response for “Protocol for deference” (Overall, 2013) was recorded as six
202 days (range: 1-17 days). No statistical significant differences were found between groups in
203 response to the training protocol (Mann-Whitney’s U test, $p \geq 0.05$). Six of the dogs (6/8)
204 completed the obedience training in one month. All six dogs were classified as “cooperative”
205 considering their responsiveness to training ($\kappa = 1.000$, $p < 0.0001$). They were able to
206 respond “sit”, “stay”, “lie down” and “heel” signal on as well as off leash. Two dogs from the
207 Group 1 were not able to complete the rehabilitation protocol. One of these dogs was only
208 responding “sit” signal during the main assessment. The other dog could not start training as
209 she had extreme fear towards people at the beginning. Systematic desensitization and counter
210 conditioning were applied to this dog instead of training during the rehabilitation.
211 Consequently, this dog was willingly approaching familiar people and making nose contact
212 with them during the assessment.

213

214 *Adaptability to home environment*

215 One dog from the Group 2 could not be assessed for his adaptability to home environment
216 because he was adopted during the rehabilitation program.

217 A significant difference was found between groups in adaptability to home
218 environment (Mann-Whitney’s U test, $p < 0.05$). None of the dogs in Group 1 was evaluated as
219 relaxed whereas all dogs in Group 2 were displaying relaxed body posture on the 1st day of
220 training in home environment. During the main assessment, however, two dogs from the
221 Group 1 as well as three dogs from the Group 2 displayed neutral body posture in the home
222 environment. Moreover, 3 dogs from the Group 2 and 1 dog from the Group 1 were able to
223 respond “go to your bed” signal in the home environment. Mean time to response “go to your
224 bed” signal was recorded as two days (range: 1-4 days) in these four dogs.

225

226 Discussion

227 This study was designed to test the ability of urban free ranging dogs to benefit from a
228 rehabilitation program which had been developed for improving welfare and behaviors of
229 these dogs in shelters.

230

231 *Body language and emotion*

232 The dogs in the study included adult urban free ranging dogs which had spent critical periods
233 of their lives in streets so it was not surprising that only two dogs were classified as friendly
234 after the first evaluation to a short test situation based on the Shelter Quality Welfare
235 Assessment Protocol (Barnard et. al., 2014). It's possible that these had a more positive
236 experience with people in comparison to many of the street dogs.

237 In contrast to a previous report suggesting that dogs display more relaxed body posture
238 in the presence of people on their fifth days in captivity (Wells and Hepper, 1992), after the
239 adaptation period of one week, body language of only one dog changed in a positive way
240 during the interaction with people. Moreover, none of the descriptions of emotional states of
241 the dogs had changed by the end of this week. This finding might be explained by the fact
242 that the dogs in our study had already lived in a shelter environment before being transported
243 to the rehabilitation unit and were already familiar with the shelter context. Although they
244 had more opportunities to have normal social interactions such as play and affiliation with
245 their counterparts in the new unit, one-week seems to be a short period in which to change the
246 behaviors and emotional states of these dogs in a positive way.

247 According to Ruiz-Izaguirre et. al. (2014), In one study of adult free ranging dogs,
248 which had care givers responsible of feeding them, most did not approach to within 20 cm of
249 unfamiliar people even after repeated visits (Ruiz-Izaguirre et al., 2014). In our study, only
250 one dog who had extreme fear towards people, did not completely approach familiar or

251 unfamiliar people after the application of the protocol. Interestingly, all of the other dogs
252 expressed friendly and neutral body postures when interacting with familiar people at the end
253 of the program. Moreover, emotional states of these seven dogs were described as happy by
254 both veterinary surgeons when they considered their daily interactions during the last week of
255 the program. Many authors suggest that qualitative assessments have significant value on
256 interpretation of behavior during the assessment of animal welfare (Goodwin, 1999;
257 Wemelsfeder et. al., 2000; Boissy et. al, 2007; Wemelsfeder, 2007). Considering the
258 qualitative assessments of dogs' emotions at the beginning and end of the program, we
259 suggest that welfare of most of the dogs improved after the application of the rehabilitation
260 program. This result was consistent with previous studies suggesting that training improves
261 the dog's behavior as well as its interaction with people (Wells, 2004; Luescher, 2008).
262 Moreover, it is also known that since unpredictability and lack of environmental control are
263 important stress factors for individuals (Coover et. al., 1971; De Boer et. al., 1989), training is
264 an important component for improving welfare of dogs by providing more controllable and
265 predictable environment (Veissier and Boissy, 2007). Human contact may also be responsible
266 for this result. Various studies have reported that human contact has positive effect on
267 reducing stress and, thus, improves welfare in shelter environment (Tuber et. al., 1996;
268 Hennessy et. al., 1998; Coppola et. al., 2006).

269 During the main assessment, one dog with aggression (Capkin) was still showing
270 defensive aggression towards unfamiliar test persons. Another dog with extreme fear towards
271 people (Mestan) was also evaluated as fearful during the main assessment, but she showed
272 considerable improvement in comparison to the 1st evaluation. Fearful reactions to short test
273 situations might be correlated with fearful/defensive behavior in, as suggested by Weiss and
274 Greenberg (1997), in the absence of specific, targeted intervention. These findings also
275 indicate that the length of the rehabilitation program should be longer, at least for the dogs

276 who had intense fear and/or aggression towards people. It might be more effective to add
277 another step to the program that includes daily interactions with unfamiliar people. Further
278 studies that investigate different rehabilitation programs in terms of length and content are
279 needed to better define the effect of these programs on fearful urban free ranging dogs.

280

281 *Training*

282 In our study, most of the dogs completed the training protocol successfully within the one
283 month, although they probably had had earlier improper socialization with people. These dogs
284 were described as “cooperative” with respect to their reactions to training by both veterinary
285 surgeons. This finding parallels that of a recent study which reported that urban free ranging
286 dogs are trainable and adaptable to people (Salgirli Demirbas et. al., 2014).

287 Puppies habituate themselves to living and non-living objects in their environment
288 during the critical period in which early social exposure occurs. A stimulus rich environment
289 is important during periods of socialization and exposure (Scott and Fuller, 1965). One may
290 easily assume that urban free ranging dog puppies are exposed to a number of different
291 stimuli during the critical period of their lives. Socialization and social exposure positively
292 affects training (Pfaffenberger and Scott, 1959; Batt et. al. 2008; Duffy and Serpell, 2009), so
293 living in an urban area during the critical periods, even in the absence of socio-positive
294 interaction with people, might be better for puppies than to be raised in an environment with
295 limited human contact. However, further studies are needed to support this hypothesis.

296 One dog which did not successfully complete the training program was easily
297 distracted by outdoor stimuli. Due to the time limit, no specific care or intervention could be
298 provided for this dog. However, all assessors described the behavior and emotional state of
299 this dog as friendly and happy.

300

301 *Adaptation to home environment*

302 The only significant difference between groups was in adaptability to the home environment.
303 None of the dogs from the group 1 displayed relaxed body postures whereas all dogs from
304 group 2 were displaying relaxed body posture in home environment in the 1st day. This
305 difference between groups may explained by differences in novelty seeking tendencies of two
306 groups possibly associated with the personality trait of extraversion (Cloninger et. al. 1993;
307 De Fruyt et. al., 2000; Pawlak et. al., 2008). If dogs in Group 1 were more nervous, they
308 might be more cautious and anxious in a novel environment in comparison to those in the
309 Group 2.

310

311 *Limitations*

312 The small sample size and lack of control group, i.e., dogs without any treatment can be noted
313 as limitations of this study. Further studies including increased group sizes and the control
314 group would allow for the verifying the results of the current study.

315

316 *Conclusion*

317 The findings of this study provide verification of trainability and adaptability of urban free
318 ranging dogs to humans. While responses of dogs to short test situations are good predictors
319 of fear in in the immediate future, one-time temperament tests may not be reliable for
320 predicting future behavior of the dogs in home environment over a longer term.

321 Standardized rehabilitation programs including social contacts with their own species
322 and with humans, and training, help to improve behavior and welfare of the urban free
323 ranging dogs kept in shel in this small study. These findings needed to be replicated in larger
324 studies.

325

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332

333 Conflicts of Interest

334 The authors declare no conflicts of interest. The idea for the article was conceived by
335 Yasemin Salgirli Demirbas. The rehabilitation program was designed by Yasemin Salgirli
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337 program was performed by Yasemin Salgirli Demirbas and Etkin Safak. The data were
338 analyzed by Yasemin Salgirli Demirbas and Gonçalo Graça De Pereira. The article was
339 written by Yasemin Salgirli Demirbas and Gonçalo Graça De Pereira.

340

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TABLES

Table 1. Demographics of the dogs

Name	Estimated age	Gender	Behavior during the 1st assessment
Capkin	2 years old	M	Defensive aggression
Dazor	2 years old	M	Offensive aggression
Mestan	3 years old	F	Fearful
Cesur	2 years old	M	Defensive aggression
Kes	1 years old	M	Friendly
Naida	3 years old	F	Neutral
Pitir	1 years old	M	Friendly
Karam	2 years old	F	Friendly

Table 2. Scoring system and descriptions for body language (developed from Shelter Quality 2014).

Scoring system	Body language	Descriptions
0a	Neutral-friendly	No signs of fear or aggression, posture is neutral, relaxed looking at or ignoring the assessor, or friendly/sociable, decreasing distances and/or greeting the assessor.
0b	Friendly-submissive	Signs of submission associated to low posture and backward ears, looking at the assessor, friendly/sociable decreasing distances and/or greeting the assessor
1	Fear	Signs of fear, associated to low or very low postures, often increasing distances or hiding from assessor, ears back, eye contact brief and indirect, tail hangs low or tacked between legs.
2	Defensive aggression	Sign of fear and of defensive aggression, body lowered, weight over rear legs, tail down tense or tucked between legs, hackles raised, ears back, pupils dilated, muzzle tense, nose wrinkled, snarled teeth exposed.
3	Offensive aggression	Signs of aggression, weight forward, tail stiff, raised, ears erect forward, bared teeth and

lips curled, eyes staring,
hackles may be up

Table 3. Assessment of the protocol

Test steps

Familiar person in front of the cage: A familiar person approaches the dog in a friendly manner, i.e. crouching and talking nicely to the dog when the dog is in the cage.

Familiar person outside: The dog is held on a leash by the trainer. A familiar person enters the outdoor training area and calls the dog with a cheerful voice.

Unfamiliar person in front of the cage: An unfamiliar person approaches the dog in a friendly manner, i.e. crouching and talking nicely to the dog when the dog is in the cage.

Unfamiliar person outside: The dog is held on a leash by the trainer. An unfamiliar person enters the outdoor training area. He/she stands still without keeping an eye contact with the dog. In case that, the dog approaches in a friendly manner, he/she first allows the dog to sniff her hand and then gently pets the dog. If the dog displays an aggressive or fearful body posture, the test person leaves the area.

Training context: The dog's responses to commands such as "sit, lie down, wait and heel" are assessed on and off leash.

Home environment: The dog's body posture and responses to basic commands are assessed in the home environment.

Table 4. descriptions on body language and emotions of the dogs during the adaptation week

Name	Group		Body language		Qualitative assessment on emotions	
			1 st evaluation	2 nd evaluation	1 st evaluation	2 nd evaluation
Capkin		1	Aggressive	Aggressive	Angry	Angry/Nervous
Dazor		1	Aggressive	Aggressive	Nervous	Nervous
Mestan		1	Fearful	Fearful	Scared	Scared
Cesur		1	Aggressive	Friendly-neutral	Nervous	Nervous
Kes		2	Friendly-neutral	Friendly-neutral	Happy	Happy
Naida		2	Friendly-submissive	Friendly-neutral	Nervous	Nervous
Pitir		2	Friendly-submissive	Friendly-submissive	Nervous	Nervous
Karam		2	Friendly-neutral	Friendly-neutral	Excited	Excited

Table 5. Descriptions on body language and emotions of the dogs

Name	Body language	Emotions
Capkin	Friendly-neutral (f)/aggressive (u)	Happy

Dazor	Friendly-neutral (f-u)	Happy
Mestan	Fearful (f-u)	Nervous
Cesur	Friendly-neutral (f-u)	Happy
Kes	Friendly-neutral (f-u)	Happy
Naida	Friendly-neutral (f-u)	Happy
Pitir	Friendly- neutral (f-u)	Happy
Karam	Friendly-neutral (f-u)	Happy

*f: familiar person; u: unfamiliar person



ACCEPTED MANUSCRIPT



Highlights

- Urban free ranging dogs are trainable and adaptable to humans.
- Standardized rehabilitation programs including social contacts with their own species as well as with humans and training help to improve behavior and welfare of the urban free ranging dogs kept in shelter.