

1 **Original Research Paper**

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3 **Emotional eating in companion dogs: owners' perception and relation with feeding**
4 **habits, eating behavior and emotional state**

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23 **Abstract**

24 Emotional eating, or changes in eating behavior due to negative emotions, has been
25 demonstrated in humans and rodents, but not in dogs. The aim of the present study was
26 to survey owners' perceptions of the presence of emotional eating in their dogs, as a
27 first approach to investigate this phenomenon in companion dogs. A questionnaire was
28 administered via social media, including questions about general information, feeding
29 habits, eating behavior and related problems, temperament and emotional state. A
30 specific question for assessing the perceptions of owners on emotional eating in their
31 dogs (on a 0 to 4 scale) was included.

32 The vast majority of the 1,099 respondents (n=898, 81.7%) perceived that their dog
33 showed emotional eating at some level of intensity, with more than 40% of the surveyed
34 owners giving a 3 or 4 score. A Chi-square test showed significant associations ($p<0.05$)
35 between the intensity of emotional eating and several variables. Thus, achieving the
36 maximum score for owner-perceived emotional eating (4/4) was associated with the dog
37 being diagnosed with a medical condition, with the owners' awareness of the ideal
38 weight of his/her dog, and with particular feeding habits, including feeding the dog
39 exclusively with home-made food, once a day, and giving extras as a reward for
40 obedience. Furthermore, high owner-perceived emotional eating was related with being
41 a dependent and unhappy dog, as well as with not eating during the absence of the
42 owner. On the other hand, being a calm dog, both as a general condition as well as

43 during greetings or walk, and not presenting fear to other dogs or any kind of aggression
44 was associated with the absence of owner-perceived emotional eating in the studied
45 dogs (0/4). These results open a new research field on emotional eating in dogs to be
46 further explored in relation to its implication in obesity treatment and behavior problem
47 management.

48

49 **Keywords:** dog, behavior, emotional eating, emotions, feeding habits, owners.

50

51 **Introduction**

52 Emotional eating (also known as stress-induced eating) refers to a change in the eating
53 behavior as a way of coping with negative emotional states such as stress, anxiety or
54 depression (McMillan, 2013). In this sense, it can be seen as a learned emotional
55 regulation strategy through which negative moods increase the motivation to eat
56 (Blechert et al., 2014). Eating can, in turn, reduce these negative moods (Blechert et al.,
57 2014). Although this kind of eating is mainly linked to negative emotional states,
58 positive emotional states may also change the eating behavior in humans (Dubé et al.,
59 2005). Thus, emotional eating has been broadly defined as a trait-like style of food
60 intake in response to either negative or positive emotional states (Blechert et al., 2014).

61 Clinical studies in humans and experimental studies in laboratory animals have revealed
62 that emotional eating involves the intake of food with specific characteristics (Sominsky
63 and Spencer, 2014). These foods, the so-called “comfort foods”, consumed to obtain
64 psychological comfort and emotional wellness (Dubé et al., 2005), are rich in energy,
65 fat or sugar content (la Fleur et al., 2005; Zellner et al., 2006).

66 While emotional eating has been largely demonstrated in both humans and laboratory
67 animals, and related to overweight and obesity, it has not received as much attention in
68 dogs (Mc Millan, 2013). A number of studies have shown variability in eating behavior
69 among individual dogs or breeds (Hewson-Hughes et al., 2013), appetite (Sallander et
70 al., 2010) or feeding speed (Okamoto et al., 2009; Ohtani et al., 2015). However, to the
71 authors' knowledge, emotional eating in this species remains largely under-researched.
72 Considering the similarities among mammals in emotional and stress-related processes,
73 as well as in the coping mechanisms for stressful experiences, McMillan (2013) found it
74 reasonable to suggest the presence of emotional or stress-induced eating in pets. If this
75 is finally demonstrated, two issues would require special attention. First, the
76 identification of risk factors for weight gain in dogs should include the animals'
77 psychological well-being and, consequently, overweight and obesity should be
78 considered as a clinical sign of compromised mental health or undermined life quality in
79 some animals. Second, in the therapeutic approach to obesity, a restrictive diet in a dog
80 with stress-induced-eating would be counter-productive (McMillan, 2013).

81 Different questionnaires have been used to assess human eating behavior and eating
82 style -including emotional eating-, both in adults (van Strien et al., 2012) and in
83 children, either by means of children-directed questionnaires (Archer et al., 1991;
84 Bryant-Waugh et al., 1996; Maloney et al., 1988; Babbitt et al., 1995) or parents-
85 directed questionnaires (Braet and van Strien, 1997). In veterinary research, owner-
86 directed questionnaires are customary. The role of dog owners as caregivers with an
87 emotional bond with their dog has been considered similar to that of parents respect to
88 children (Pretlow and Corbee, 2016), and numerous previous studies have used owner-
89 directed questionnaires to assess various types of canine behaviors, such as C-BARQ
90 (Hsu and Serpell, 2003). Recently, Raffan and colleagues developed and validated an

91 owner-reported measure of eating behavior in dogs mainly focused on detecting factors
92 related to canine obesity. A first version of the questionnaire included a question related
93 to emotional eating in dogs, but it was later removed as it was not a commonly reported
94 phenomenon during the owner-interviews phase of the study (Raffan et al., 2015).

95 The aim of present study was to investigate owners' perceptions on the presence of
96 emotional eating in their dogs by using a questionnaire. In addition, the study analysed
97 animal feeding habits chosen by the owners, the eating behaviour of dogs and their
98 emotional state regarding the presence of emotional eating.

99

100 **Materials and methods**

101 The study was approved by the regional Ethical Committee of Clinical Research of
102 Aragón (CEICA). This committee did not require the inclusion of an informed consent
103 in the survey, as no personal data were collected.

104 *Questionnaire design and distribution*

105 The questionnaire was based on previously published owner- and parent-directed
106 questionnaires focused on emotional eating or obesity (e.g., DEBQ-Parent version from
107 Braet and van Strien, 1997; DORA questionnaire by Raffan et al., 2015), as well as on
108 the clinical experience of researchers in veterinary behavior clinic. It included a number
109 of questions grouped into four main sections ([see Supplementary data](#)):

110 (a) General information: breed, age, sex, reproductive status, body condition score (and
111 knowledge about the ideal weight of the dog), medical problems and treatments,
112 duration of walks and exercise intensity.

113 b) Feeding habits: type of food administered, patterns of feeding and administration of
114 extras (apart from routine meals).

115 (c) Eating behavior and related problems: time to finish the meal, voracity (with respect
116 to regular and palatable food), changes in eating behavior in the absence of owners,
117 signs of aggression related to food protection, and other eating related-problems such as
118 stealing (human) food and pica.

119 (d) Temperament and emotional state: evaluation of temperament (shyness,
120 nervousness, dependency and affection), quality of life and happiness, and behavior
121 problems such as *nervousness* (in the sense of excitability), separation-related problems,
122 fear of social stimuli and noises, and aggression toward other dogs or humans (family
123 members or strangers).

124 The questionnaire also included a specific question for rating the perception of owners
125 on emotional eating in their dogs (0-4): “To what extent is your dog’s eating behavior
126 related to his/her emotional state?” A concise explanation of the question was provided:
127 “Rate from 0 to 4 to what extent the dog’s way of eating changes (quantity, voracity...)
128 when the dog’s emotional state changes (sad, nervous, scared, stressed...), where 0
129 means “Not related at all” and 4 means “Closely related”.

130 With the aim of exploring possible difficulties in answering the questionnaire, a pilot
131 survey was conducted via face to face interviews to 80 dog owners (Lacoma et al.,
132 2015). A refined and definitive online version questionnaire was then elaborated, where
133 most questions were formulated as closed-ended scales (for instance, rating of voracity
134 on a 0-4 scale where 0= No voracious and 4= Very voracious, or rating of quality of life
135 into Very bad, Bad, Good or Very good). In addition, a clear and succinct explanation
136 after selected questions was included to avoid possible doubts when responding. The

137 question regarding body condition score, was supported by images of dogs
138 corresponding to the scoring scale (1-5).

139 The questionnaire was then published online by using commercially available software
140 (Google questionnaires, Google, USA) from December 2015 to January 2016. The
141 questionnaire was disseminated via e-mail to owners of patients attending the
142 Behavioral Medicine Service of the Veterinary Hospital of the University of Zaragoza,
143 as well as via an online social network (Facebook). Respondents were encouraged to
144 spread the invitation to participate with the aim of recruiting a larger number of
145 participants, promoting a snowballing sampling method. The survey software allowed
146 more than one submission per internet provider (IP) address, and respondents with more
147 than one dog were asked to provide answers about all their dogs.

148 *Statistical analysis*

149 A total of 1,157 questionnaires were received. Of these, 1,099 were included in the
150 study after discarding those with repeated or incomplete data and those where dogs
151 were under medical treatment affecting eating behavior: benzodiazepines, other
152 psychotropic drugs, phenothiazines, corticosteroids, amphetamines, progestogens,
153 dirilotapide, antihistamines, potassium bromide, cyclophosphamide, cyclosporine,
154 sodium levothyroxine, gabapentin and phenobarbital. With the aim of exploring the
155 relation between emotional eating and medical conditions, sick animals, including those
156 with gastrointestinal diseases, were not excluded. This decision was based on the study
157 by Raffan and colleagues (2015), who did not find any differences in food motivation
158 scores for dogs with higher gastrointestinal distress scores.

159 A descriptive analysis of each variable was performed. Quantitative continuous
160 variables such as age, [estimated](#) duration of walks and time needed to finish the meal

161 were grouped so that they could be considered categorical variables. Chi-square was
162 used to assess significant associations between variables, in particular, those related
163 with perceived emotional eating.

164 Calculations were carried out using the statistical program SPSS 15.0 for Windows
165 (SPSS, Inc., Chicago, IL, USA) / PSPP. $p < 0.05$ was considered significant.

166

167 **Results**

168 *General information*

169 Sex was distributed homogenously ($n=563$, 51.2% of females) and half of the dogs were
170 neutered ($n=555$, 50.5%). The age of the surveyed canine population ranged from 6
171 months to 13 years old (mean 4.8 ± 3.3). Crossbred dogs represented 39.7% of the
172 animals ($n=436$) and the rest belonged to 95 different breeds. The most frequently
173 represented pure breeds were Labrador retriever ($n=48$, 4.4%), golden retriever ($n=46$,
174 4.2%), German shepherd ($n=41$, 3.7%), boxer ($n=38$, 3.5%), Yorkshire terrier ($n=35$,
175 3.2%) and Border collie ($n=34$, 3.1%).

176 More than two thirds of the dogs were reported to be within their ideal weight ($n=837$,
177 76.2%), and overweight or obesity was reported in 14.5% of the dogs ($n=160$)
178 according to a standard classification of body condition score (Laflamme, 1997;
179 McGreevy et al., 2005). A quarter of the interviewed owners ($n=283$, 25.8%) admitted
180 to being unaware of the ideal weight of his/her dog.

181 Regarding physical activity, the mean (\pm SD) duration of daily walks totaled 96.9
182 minutes per day (± 72.6) and most dogs did a medium intensity exercise ($n=431$, 39.2%),
183 followed by high ($n=346$, 31.5%) and low intensity exercise ($n=322$, 29.3%). Exercise

184 intensity was significantly associated to body condition score ($p<0.001$), with
185 overweight being more frequent in dogs practicing low intensity exercise ($n=77$ of 322,
186 23.9% of them) rather than in those doing high intensity exercise ($n=24$ of 346, 6.9% of
187 them).

188 Among the surveyed dog population, 17.6% of the dogs ($n=193$) were reported as
189 having been diagnosed with a medical condition, and 50.3% of these ($n=97$) were under
190 medication not **directly** affecting the eating behavior, such as chondroprotective drugs,
191 NSAIDs, hepatic protective drugs or Angiotensin-Converting Enzyme Inhibitors. In
192 particular, 2.6% were suffering from gastrointestinal disorders, mainly food intolerance.

193 *Feeding habits*

194 Results regarding feeding patterns are described in Table 1. More than a half of the
195 owners ($n=601$, 54.7%) fed their dogs exclusively with commercial food, mostly dry
196 food ($n=871$, 82.5%). Many owners mixed the commercial food with home-cooked
197 food ($n=464$, 42.2%). Eighty percent of the owners ($n=879$) meal fed their dogs, **mostly**
198 twice a day ($n=549$, 62.6%). The prevalence of overweight dogs was significantly
199 higher in those fed *ad libitum* ($n=137$ of 879, 15.6% of them) than in those fed meals
200 ($n=23$ of 220, 10.5% of them) ($p<0.05$), regardless of the number of meals given.

201 Most owners ($n=1,062$, 96.7%) stated that they frequently (daily or almost daily, $n=648$,
202 61.0%) gave their dogs extra food apart from meals, mostly ($n=638$, 62.0%) commercial
203 dog treats and human food. These extras were administered after the dog responding to
204 a verbal request ($n=809$, 76.5%), at the owner's discretion ($n=511$, 48.3%) and the
205 dog's request ($n=159$, 15.0%).

206 *Eating behavior and related problems*

207 More than a half of dogs (n=500, 51.8%) finished their meal in less than 5 minutes. The
208 mode score value (0-4) for voracity was 4 (n=516, 47.0% of dogs) when giving the dogs
209 palatable extra food and 2 (n=328, 29.8% of dogs) when giving the dogs their regular
210 food (Figure 1). Dogs scored as very voracious (4/4) with their regular food showed
211 overweight significantly more frequently than those showing no interest at all (0/4) in
212 their food ($p<0.05$).

213 Approximately one third of the dogs (n=336, 30.6%) ate less or even nothing when
214 being alone at home. A small proportion of dogs (n=49, 4.5%) showed signs of
215 aggression (guarding, showing teeth, growling or biting) when the owner approached
216 their food, but when showing this behavior, it was significantly associated with showing
217 aggression toward the family members ($p<0.001$). Finally, the owners reported that
218 most dogs (n=857, 78.0%) stole human food whenever possible and also ingested grass
219 (n=950, 86.4%), stones (n=81, 7.4%), feces (n=421, 38.3%) and other materials (n=391,
220 35.6%).

221 *Temperament and emotional state*

222 Classification of dogs' temperament is described in Table 2. This classification was
223 presumably given comparing their dogs with the view of average dogs. In particular,
224 13.2 % of the owners (n=145) considered his/her dog as very timid, 26.4% as very
225 dependent (n=290) and 5.3% (n=58) as very nervous. A great proportion of the owners
226 perceived their dog as very affectionate (n=763, 69.4%).

227 More than a half of the surveyed owners (n=576, 52.4%) recognized a behavior problem
228 in their dogs and 40.9% of them (n=449) had sought professional help. Of the owners
229 who sought help, 46.8% (n=210) consulted a dog trainer, 40.5% (n=182) consulted a
230 veterinary surgeon, and 35.6% (n=160) consulted a specialist in canine behavior.

231 Information regarding behavioral problems is described in Table 3. The modal value for
232 nervousness was 2/4, with 30.6% of dogs (n=336) showing generalized nervousness,
233 30.6% (n=336) showing nervousness with toys, 27.9% (n=307) with food, and 35.6%
234 (n=391) during walks. The modal value for nervousness during the greetings was 3/4
235 (n=359, 32.7%).

236 Only a small proportion of the owners reported signs compatible with separation-related
237 problems when their dogs were left alone at home, including vocalization (n=369,
238 33.6%), destructiveness (n=224, 20.4%), inappropriate elimination (n=183, 16.7%) and
239 autonomic signs such as hypersalivation or trembling (n=75, 6.8%). The most
240 frequently observed fear in dogs was that to loud noises (n=673, 61.2%) followed by
241 fear to other dogs (n=533, 48.5%) and to people (n=450, 40.9%).

242 The most commonly reported type of aggression according to the target was that
243 directed toward other dogs (n=698, 63.5%), followed by aggression to unknown people
244 (n=399, 36.3%) and aggression to the family members (n=86, 7.8%).

245 Almost the totality of owners (n=1,088, 99.0%) considered their dog's quality of life as
246 being good or very good, and 97.1% of the owners (n=1067) considered that their dog
247 was happy. In addition, being an unhappy dog was significantly associated with owner
248 reports of behavior problems ($p<0.001$).

249 *Emotional eating*

250 81.7% of respondents (n=898) perceived that their dog showed emotional eating at
251 some level of intensity (Figure 2).

252 There were significant associations (Chi-square test; $p<0.05$) between the intensity of
253 emotional eating and variables related to general information, feeding patterns used by
254 the owners as well as to eating behavior and emotional aspects in the dogs.

255 Thus, the maximum score for emotional eating (4/4) was associated with being
256 diagnosed with a medical condition and also with the owners' awareness of the ideal
257 weight of his/her dog ($p<0.05$). It was also associated with feeding the dog exclusively
258 with home-made food, once a day, and giving extras as a reward for obedience
259 ($p<0.05$). Giving extras for no apparent reason was associated with the absence of
260 emotional eating in dogs (0/4) ($p<0.05$). It is possible that excitement at the time of the
261 food offering may prompt owners to interpret this excitement as being "happy", and
262 erroneously consider this as emotional eating. However, this would not explain why
263 giving extras for no apparent reason was not related to perceived emotional eating.

264 Giving the highest score in the dependency temperament trait (4/4) as well as not eating
265 during the absence of the owner were both associated with the highest score in
266 emotional eating ($p<0.05$). Owners who thought their dog was unhappy also felt they
267 had high emotional eating ($p<0.05$).

268 In contrast, not being voracious (0/4), lack of general nervousness and not being
269 excitable during greetings or walks was associated with the absence of emotional eating
270 ($p<0.05$). Lack of fear towards other dogs and lack of any kind of aggression was
271 associated with the absence of emotional eating ($p<0.05$).

272

273 **Discussion**

274 In this study, information related to feeding habits, eating behavior, emotional and
275 temperament aspects in dogs as well as other general data were obtained by means of an
276 online owner-directed questionnaire (n= 1099). In particular, a question related to
277 perceived emotional eating in the dogs was designed to assess this behavior. The dog
278 population included in the study was homogenous, the sex and the age of the dogs was
279 normally distributed. The percentage of sterilized/neutered animals in this study was
280 however slightly higher than in the general population (MAPAMA, 2015). The
281 distribution of represented breeds was similar to that in Spain, where crossbred dogs are
282 followed by the Yorkshire terrier, German shepherd and Labrador retriever breeds
283 (Veterinary Management Studies for QVET, 2014).

284 According to this survey, a great proportion of owners felt their dogs showed emotional
285 eating at some level, with more than 40% of respondents giving a 3 or 4 score (0-4) to
286 represent the relation between the way of eating and the emotional states of their dog.
287 This finding contrasts with a preliminary result published by Raffan et al. (2015), who
288 found only 1 out of 50 owners reporting differences in their dog's eating behavior
289 during "periods of stress".

290 In the present study, the percentages of dogs considered as overweight or obese were
291 similar to those obtained in studies carried out in other European countries and Australia
292 (Bland et al., 2009; Sallander et al., 2010; O'Neill et al., 2014; Raffan et al., 2015).

293 Nevertheless, all studies use owner's perception, which could be incorrect.

294 Discrepancies between veterinarian's evaluation of dogs' weight and the owner's
295 perception have been previously highlighted, and 30-40% of owners might
296 underestimate the body condition of their dogs (Case et al., 2001; Rohlf et al., 2010;
297 Larsen and Villaverde, 2016). If these estimates were applied to our data, then 40.2-
298 48.7% of the surveyed dog population would be overweight or obese, which coincides

299 with the general estimated dog obesity prevalence according to veterinary sources
300 (Rohlf, 2010; Courcier et al., 2010; Mao et al., 2013; Sapowicz et al., 2016).
301 Interestingly, the owner-reported awareness of the ideal weight of their dogs was
302 associated with assigning the maximum score for emotional eating. It is possible that
303 emotional eating was especially detectable by owners more concerned about the
304 emotional and physical health of their dogs. The maximum owner-assigned score for
305 emotional eating was also associated with owning a dog with a medical disease. Several
306 medical diseases involve painful conditions which may prompt animals to modify their
307 food intake, as suggested by previous studies in rodents indicating that pain causing
308 chronic stress may induce an increase in the food intake. In this line, Rowland and
309 Antelman (1975) demonstrated that chronic stress induced by mild tail pinch several
310 times a day in the presence of sweetened milk induces polyphagia, weight gain and
311 obesity.

312 Most dogs were fed dry food (combined or not with home-cooked food) twice a day,
313 agreeing with previous studies (Laflamme et al., 2008; Bland et al., 2009; Sapowicz et
314 al., 2016). However, in the present study, the percentage of dogs fed *ad libitum* (20%)
315 was higher than that found in previous studies (Bland et al., 2009). The prevalence of
316 overweight dogs was significantly higher in those eating *ad libitum* than for the meal
317 fed group. This finding also contrasts with other previous studies (Courcier et al., 2010;
318 German, 2010; Linder and Mueller, 2014). A possible explanation for this finding in
319 [these studies](#) is that overweight [may not be](#) really related with *ad libitum* feeding, but
320 with the type of food administered and the frequency of giving extras apart from regular
321 meals. Thus, frequency, type, or quantity of treats have been previously considered as a
322 risk factor for obesity (Robertson, 2003; Courcier et al., 2010; German, 2010; Linder
323 and Mueller, 2014).

324 It is important to highlight that virtually all the surveyed owners reported that they
325 frequently administered extra food to their dogs apart from their regular meals on a
326 daily basis or almost in a daily manner. The main reason for administering treats was as
327 a reward for obedience, but also for no apparent reason or at the dog's demand.

328 Similarly, previous studies have shown that owners give multiple types of treats to their
329 dogs, making their diet more varied or less boring, or simply to keep them "happy"
330 (Rohlf et al., 2010; White et al., 2016). In the present study, both feeding the dog
331 exclusively with home-made meal and using food for rewarding obedience was related
332 to the maximum score in emotional eating. Apart from being more aware of physical
333 health of their animals, as previously mentioned, those owners that perceive high
334 emotional eating may also be more implicated in feeding and training of their dogs.

335 The expression of affection toward their dogs might also underlie this common practice
336 of administering extras or human food (White et al., 2011). In this sense, a co-
337 dependence similar to that of children and parents has been suggested in pets. Pretlow
338 and Corbee (2016) highlighted a novel theory that posits that obesity in pets and
339 children may be due to 'treats' and excessive meal amounts given by the owner or the
340 parent to obtain affection from the pet or child, respectively, which foster eating
341 addiction and results in parental co-dependence. If this theory is confirmed, the role of
342 co-dependence in emotional eating, both in owners and dogs, should be further
343 explored.

344 As expected, voracity was higher when administering more palatable foods, such as
345 treats or human food. However, according to the owners' perceptions, being (very)
346 voracious was not related with emotional eating. [Binge](#) eating, especially of comfort
347 food, has been associated with emotional eating in both humans and rodents. Emotional
348 difficulties and neurobiological factors have been demonstrated to have a role in the

349 etiology of eating and weight disorders in these species (see Turton et al., 2017 for a
350 review). In the case of dogs, disinhibited eating, either habitual or emotional, might be
351 limited by the lack of free access to palatable or comfort foods (McMillan, 2013). Breed
352 may also explain a great voracity in the absence of a (negative) emotional basis. In the
353 case of Labrador retrievers, a deletion in the POMC gene has been associated with
354 greater weight, adiposity and food motivation (Raffan et al., 2016).

355 On the contrary, not being voracious was associated with lack of owner reports of
356 emotional eating. It could be argued that those dogs not motivated by food might not
357 use eating as a strategy for coping with stressful situations or negative mood states.

358 Apart from resulting from an excess of energy intake, obesity is due to an imbalance
359 between energy intake and expenditure (Courcier et al., 2010). The present study
360 showed that the prevalence of overweight was significantly higher in those dogs
361 following a low intensity exercise (just walking with the owner) than those highly
362 exercised (running with the owner or with other dogs). Owners who provide infrequent
363 or low-intensity forms of exercise for their dogs are more likely to have obese dogs than
364 those who exercise their dogs more frequently or more vigorously (Rohlf et al., 2010).
365 Exercise has been suggested to also have the effect of reducing stress, which becomes a
366 confounding variable in understanding factors driving food intake (McMillan, 2013).
367 However, an association of exercise with emotional eating was not observed in the
368 present study, even if more exercised dogs could be expected to be “protected” from
369 experiencing emotional eating.

370 More than a half of the surveyed population recognized a behavior problem in their
371 dogs, a lower proportion than that previously reported in other studies conducted in
372 Spain (i.e., 92% by González-Martínez et al., 2011; 69% by Luño et al., 2012). This

373 difference may be due to methodology since we were not focused on prevalence of
374 behavior problems. As in previous studies (Luño et al., 2012), dog trainers were more
375 commonly consulted by the owners than were veterinarians and behaviorists.

376 While only a small proportion of the surveyed owners reported signs compatible with
377 separation-related problems in their dogs, owner reports of being a dependent dog and
378 not eating during the absence of the owner were associated with the highest scores in
379 emotional eating. Being a calm dog as a general condition and during greetings and
380 walks, and not being fearful or aggressive toward social stimuli, were associated with
381 the absence of emotional eating.

382 These results suggest a relationship between behavior problems, chronic stress, and
383 emotional eating. Most owners considered their dogs happy and their quality of life
384 good or very good. Dogs that were classified as unhappy had a high proportion of
385 emotional eating. In this sense, being an unhappy dog in this study was significantly
386 related to presenting behavior problems and possibly, with chronic stress. Whether dogs
387 showing behavior problems and being unhappy do increase or decrease their food intake
388 remains unexplored. In this regard, stress may affect this eating behavior in both
389 directions. Human studies show that 80% of people change feeding behaviors during
390 stressful periods, and of these, 50% increase and 50% decrease their food intake
391 (Gibson, 2006; Torres and Nowson, 2007). The direction of the effect depends on many
392 factors, including the severity of the stressor, the excitation level, the psychological
393 pattern of the individual and the type of food available (Greeno and Wing, 1994). It's
394 likely that the same patterns pertain to dogs.

395 The present study has some limitations, one of them related to the inherent subjectivity
396 of the respondents when answering a survey. Although each question was carefully

397 formulated and some of them were accompanied by an explanation, it is possible that
398 some owners did not fully understand some questions. In addition, a "do not know/do
399 not answer" option was not offered. Finally, it is important to mention that duration of
400 walks as well as the time to finish meals were just estimations and, therefore, this could
401 have biased results.

402

403 **Conclusions**

404 The present study shows that a large proportion of owners perceive that their dogs
405 present emotional eating, or a change in food intake in response to stress or (negative)
406 emotional states. Emotional eating is linked to some feeding habits and eating behavior.
407 Suffering from medical disease or behavior problems, or being considered as an
408 unhappy dog were related to high owner perception of emotional eating. These
409 preliminary results suggest that emotional eating in dogs be further explored in relation
410 to obesity and behavior problems. Future research should focus on developing more
411 accurate measurements of emotional eating in dogs and in physiological measures of
412 these behaviors.

413

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416 language support.

417

418 **Ethical statement**

419 The study was approved by the regional Ethical Committee of Clinical Research of
420 Aragón (CEICA). This committee did not require that an informed consent was
421 included in the survey, as no personal data were collected.

422

423 **Conflict of interest statement**

424 The authors declare that no conflicts of interest exist in any financial, personal or other
425 relationships with other people or organizations within the years of beginning the
426 submitted work that could inappropriately influence, or be perceived to influence, the
427 work.

428

429 **Authorship**

430 The idea for the paper was conceived by Jorge Palacio. The experiments were designed
431 by Sylvia García-Belenguer, Jorge Palacio, Belén Rosado and Isabel Luño. The
432 experiments were performed by Belén Rosado and Isabel Luño. The data were analyzed
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437

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