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The effects of the Spanish COVID-19 lockdown on people, their pets and the human-animal bond

Jonathan Bowen^{1,2}, Elena García¹, Patricia Darder¹, Juan Argüelles⁴, Jaume Fatjo^{1,3*}

¹Chair Affinity Foundation Animals and Health, Department of Psychiatry and Forensic Medicine, School of Medicine, Autonomous University of Barcelona, 08193 Bellaterra (Barcelona), Spain; jaume.fatjo@uab.es

²Queen Mother Hospital for Small Animals, Royal Veterinary College, Hawkshead Lane, North Mymms, Hertfordshire AL9 7TA, UK; jbowen@rvc.ac.uk

³IMIM-Mar Health Park, Neuropsychiatry and Drug Addiction Institute (INAD), 08003 Barcelona, Spain.

⁴Cardenal Herrera-CEU University C/Tirant lo blanc 7. 46115 Alfara del Patriarca, Valencia Spain.

* Correspondence: jaume.fatjo@uab.es

Abstract

The purpose of this study was to investigate the effects of the Spanish confinement for the control of the COVID-19 pandemic on the behavior of pet cats and dogs, and the support that pets provided to their owners. We found that the quality of life owners was strongly influenced by the lifestyle and emotional effects of the confinement, and that pets provided them with substantial support to mitigate those effects. However, pets showed signs of behavioral change that were consistent with stress, with dogs that had pre-existing behavioral problems being the most affected.

Keywords

COVID-19, confinement, SARS-CoV-2, dogs, cats, welfare, behaviour, human-animal bond.

Introduction

On January 30th 2020, the World Health Organization declared a Public Health Emergency related to the outbreak of a new coronavirus (SARS-CoV-2). Twelve days later the name for this new disease was announced (COVID-19) and just four weeks after that, the outbreak was upgraded to a pandemic. In response, many countries implemented unprecedented restrictions on the movement, work and leisure activities of their citizens, with the aim of reducing the reproduction number of the virus (R_0).

This study looked at the effects of the initial confinement period on Spanish pet owners, their pet cats and dogs, and on the relationship between them. We were interested in understanding how the human-animal relationship might help pet owners to cope with the effects of the confinement, given that approximately 24% of Spanish households have at least one dog and 11% have at least one cat (FEDIAF, 2018).

Previous studies have looked at the psychological consequences of different degrees of quarantine and self-isolation related to infectious disease outbreaks, such as SARS, MERS and

44 Ebola. Separation from friends and relatives, the loss of freedom, fear of the disease and
45 boredom can all have negative effects on quality of life and health. Commonly reported effects
46 include stress, anxiety, low mood, depression, irritability, insomnia, and difficulties with the
47 resumption of normal life after the end of the period of confinement (Brooks et al, 2020;
48 Hawryluck, 2004).

49
50 Research on human-animal relationships suggests that companion animals can be a source of
51 social support for people and can help them to cope with difficult situations (McNicholas and
52 Collis, 2006; Wood et al, 2015). Most studies have focused either on very specific scenarios (e.g.
53 people suffering from specific illnesses, going through a process of bereavement, or animal
54 assisted interventions), or on pet owners, using scales that measure overall attitudes about
55 human-animal relationships. The ongoing COVID-19 crisis offers an opportunity to explore the
56 role of companion animals as sources of social support at a time when the vast majority of the
57 population is being exposed to the same social and environmental challenges.

58
59 However, companion animals can also experience the negative consequences of a period of
60 home confinement; the quality of life of dogs and cats is highly influenced by the characteristics
61 of their physical and social environment, and the behavior and lifestyle of their owners, all of
62 which would be substantially changed during an official lockdown (Fatjó and Bowen, 2020).

63
64 Spain was chosen as the subject of this survey because it had a well-defined confinement policy
65 that was strictly enforced. On March 14, 2020, an official lockdown act entered into force in
66 Spain, which included the following measures; social distancing, the closure of schools and
67 universities, banning of mass gatherings and public events and the suspension of all non-
68 essential economic activities (BOE-A-2020-3692). The lockdown act did allow dog owners to
69 walk their dogs, but only one person could walk the dog at a time, the animal had to be on a
70 leash at all times, and dogs were not allowed to interact with people or other dogs.

71
72 The effects of confinement in Spain were therefore likely to be more consistent than in other
73 countries. For example, in the UK there was a period of advisory isolation and social distancing,
74 followed by a gradual shutdown as businesses chose to close and furlough their staff, and finally
75 an official lockdown when all but essential shops and businesses were closed. However,
76 although there was a very stringent lockdown in Spain, many people chose to self-isolate in
77 Spain before the official announcement.

78

79 **Materials and Methods**

80 **Subjects and recruitment**

81 The study used an online survey to collect a convenience sample of respondents, which was
82 deemed the safest approach, given the movement restrictions and the risk of infection that
83 would result from a more traditional face-to-face public survey. A link to the online
84 questionnaire was circulated through social media and online forums for pet owners, veterinary
85 clinics, animal shelters and charities.

86

87 At the start of the survey respondents were asked to confirm that they were residents of Spain,
88 and that they agreed to the terms of the study. In addition, the survey tool was able to provide

89 information about the country of the respondent, and this information was used to exclude any
90 responses that were not from Spain. This was deemed to be important because the confinement
91 regulations differ markedly between countries. Respondents who were aged under 18 were also
92 excluded.

93

94 **Materials**

95 A questionnaire was developed by the authors to collect information from dog and cat owners
96 on the effect of confinement on both the family and the pet. The questionnaire included
97 multiple choice and Likert scale questions with options to enter additional text information for
98 some of the items. A full copy of the questionnaire can be found in the supplementary material
99 (Appendix A). The time required to complete the questionnaire was estimated to be 16 minutes.

100

101 The survey consisted of several sections. The first section collected information about the
102 respondent and their household; the respondent's sex, age group, family role, the composition
103 of the household (numbers of 18-64 year-old adults, 65+ year-old adults, and different ages of
104 children), and the number of resident pet cats and dogs. Respondents were also asked about
105 their type of home (house or flat/apartment), size of home (small, medium or large), outdoor
106 space (garden, patio or balcony), whether the home was large enough for the residents to carry
107 out activities independently, and whether it provided sufficient light and fresh air. A subjective
108 rating of size of home was chosen instead of the size in square meters, because this was
109 considered to be an easier question to answer that was more reflective of the respondent's
110 perception of their environment.

111

112 The second section asked about the effect of the confinement on the respondent and their
113 household; the number of weeks they had been confined, for how much longer they expected
114 the official confinement period to continue, and which people in the household were able to
115 work from home or had permission to go to work. It also asked about the negative financial,
116 emotional, health and lifestyle impact of the official confinement on the household, and the
117 effect the confinement had had on the respondent's overall quality of life.

118

119 It would have been possible to calculate the duration of a respondent's official confinement
120 from the date of completion of the survey and the date of the introduction of mandatory
121 confinement (official lockdown). However, it was expected that some people would have
122 engaged in voluntary self-isolation at home, in accordance with unofficial advice that preceded
123 the official lockdown by several weeks. Other people who initially had permission to work
124 outside the home might have entered confinement later (for example, due to emergence of
125 disease signs). So, it was decided only to use the respondent's declared confinement period in
126 the study.

127

128 In the third section, the survey focused on one of the pets in the household, and the
129 respondent's relationship with it. The major part of this section was a modified version of the
130 Cat/Dog-Owner Relationship scale (C/DORS), developed by the authors for the measurement of
131 the human-animal bond between cats or dogs and their owners (Howell, et al. 2017). C/DORS is
132 a development of the Monash Dog-Owner Relationship scale (MDORS; Dwyer et al., 2006),
133 which is based on Richard Emerson's social exchange theory (Emerson, 1976). This theory

134 proposes that the stability of a relationship is the product of the balance between its perceived
135 costs and benefits.

136
137 MDORS and C/DORS measure three independent dimensions of the owner-pet relationship;
138 interaction between owner and pet, perceived emotional closeness and perceived costs. The
139 interaction dimension describes the way a person shares time with a pet in terms of day-to-day
140 activities like play, grooming and social activities. The emotional closeness dimension describes
141 how dependent on the pet the person is, and how much emotional support the person derives
142 from the relationship. The perceived costs dimension evaluates the degree to which the pet
143 affects the owner's financial and time budgets, and overall lifestyle; for example how much it
144 costs to care for, and how it prevents the person from doing things they would otherwise want,
145 or need, to do.

146
147 Some items from C/DORS were removed because they related to activities that were not
148 permitted during the official lockdown, such as taking the pet to visit people. The item asking
149 about the respondent's emotional reaction to the death of their animal was also removed, as this
150 was considered to be potentially distressing for people to answer during the present crisis.

151
152 Respondents were also asked directly about the effect the confinement had had on their pet's
153 quality of life, their relationship with their pet, and how much their pet had helped them
154 during the period of the confinement. They were also asked about whether they had been
155 angry with their pet more often recently, since the confinement. We wanted to get information
156 about tension between the owner and the pet, but we chose not to ask a direct question about
157 the use of punishment. This was because, in our experience, respondents are put off by such
158 questions and may not answer truthfully. So, we chose to ask the question "Recently, how often
159 have you been mad at your dog/cat", with a 7-point response from "much less than before the
160 confinement" to "much more than before the confinement".

161
162 It might be expected that the confinement period could lead to the development, or worsening,
163 of problem behavior in cats and dogs. Respondents were therefore presented with a short list of
164 behavior problems that were common to both cats and dogs, including family-directed
165 aggression, aggression toward resident conspecifics, destructiveness, house-soiling, and noise
166 fear. They were asked to indicate which problems had got better, stayed the same or got worse
167 during the confinement (with the option to indicate that the animal had never shown each
168 problem behavior). In addition, respondents were asked about species-specific behavior
169 problems; for example, cat owners were asked about urine marking, and dog owners about
170 aggression to other dogs during walks and problems with being left alone at home.

171
172 Apart from these specific behavioral problems, respondents were also asked to indicate which
173 of a set of general changes in behavior their cat or dog had exhibited, including being more
174 nervous, more stressed, more relaxed, more excitable, more calm, more attention-seeking, more
175 demanding, more frustrated and more irritable since the confinement. These are subtle changes,
176 some of which would be expected to lead to conflict between the pet and owner, and which
177 could, over time, lead to the development of behavior problems. It was expected that these
178 general changes would be more likely to be affected by the confinement than the prevalence of
179 the specific problem behaviors.

180 Respondents were not given specific guidance on how to assess these general changes, as this
181 would have lengthened the survey and we intended only to use the negative changes to
182 calculate a composite score to represent the owner's overall impression.

183
184 Respondents were presented with a set of likely confinement-related concerns and asked which
185 of these were of concern to them. These included eight concerns that were common to both cat
186 and dog owners; concerns about the pet's health, being able to obtain food for the pet, accessing
187 medicine and veterinary care, concerns about prohibitions on the pet going outside, as well as
188 concerns about weight gain, children not respecting the pet's space and need for rest, the effect
189 that the loss of routine might have on their pet and how the pet might cope with going back to
190 normal life after the confinement. Prior to the study, the authors had been asked by their
191 clinical clients about how difficult it might be for their pets to adapt to normal life after the
192 confinement was over, so this was presented as one of the concerns in this section. One point
193 was given for each of the eight common owner concerns that were common to both dogs and
194 cats, and then summed to produce a composite score "owner concerns score" for each
195 respondent.

196
197 For the questions on problem behavior, general changes in behavior and concerns, respondents
198 were also given the opportunity to write any additional comments into a text box.

199
200 Dog owners were asked how often they walked their dogs each day before the confinement, as
201 well as for an approximate total duration of daily walks. Cat owners were asked about their cats'
202 outdoor access before and during the confinement.

203
204 Respondents with multi-pet households were asked to answer the pet-specific questions about
205 the cat or dog whose name was first in alphabetical order. This was done in order to randomize
206 the selection of pet, to avoid bias toward a particular pet that the person felt strongly about or
207 was concerned about.

208

209 **Statistical analysis**

210 Normality of distribution was tested using a D'Agostino-Pearson test. When comparisons were
211 made between groups, an appropriate test was chosen; Chi square for binary variables, and
212 either a t-test or the non-parametric equivalent for continuous or ordinal data, depending on
213 the distribution of the data. Correlations were tested using Pearson correlation or Spearman
214 rank correlation, again depending on the distribution of data. All cluster analysis was carried
215 out using a two-step clustering method with the distance measure being log-likelihood, and the
216 clustering criterion being Akaike's information criterion. Silhouette measure was used to assess
217 model quality. For binary logistic regression, the "enter" method was used. Omnibus measures
218 of model quality and overall percentage of correct classification were used to assess model
219 quality. The software packages used for the statistical analysis were SPSS version 25 (IBM) and
220 Prism version 8.4 (GraphPad).

221

222 **Results**

223 All responses with incomplete information were excluded from the initial population of 1329
 224 responses from adults located in Spain, leaving a total of 1297 complete responses for the
 225 analysis.

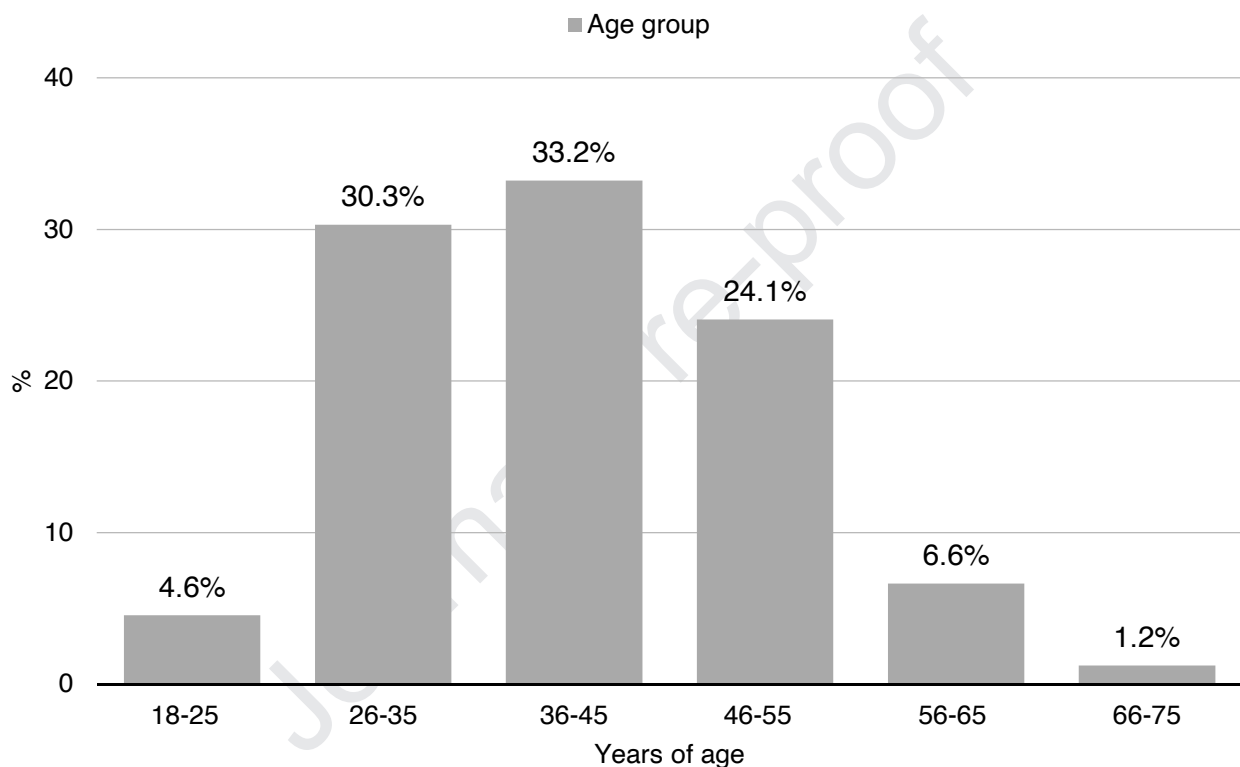
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227 Demographics

228 Of the 1297 surveys, 794 owners reported about a dog (61.2%) and 503 about a cat (38.8%). As
 229 is common in online surveys, the majority of respondents were female (90.5%). Figure 1 shows
 230 the percentage of people in each age group. The majority of households had one or two 18-64
 231 year-old resident adults, and 36.1% had one or more children from one of the age groups (see
 232 Table 1 for complete breakdown of household age composition).

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235

236 Figure 1. Age composition of the respondent population.

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	Number in each group						
	None	1	2	3	4	5	6 or more
Children 0-5 yoa	83.7%	7.6%	0.06	1.2%	0.01	0.3%	0.1%
Children 6-12 yoa	89.8%	7.3%	2.2%	0.4%	0.2%	0.2%	0.1%
Children 13-17 yoa	90.4%	8.2%	1.2%	0.1%	0.1%	0	0
Adults 18-64 yoa	2.5%	0.29	0.55	8.9%	0.04	0.2%	0.2%
Adults 65+ yoa	90.4%	6.7%	2.7%	0.2%	0	0	0

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242 Table 1. Breakdown of household composition of the sample population.

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With regard to household role, 55.9% of respondents identified themselves as adults without children, 32% as parents, 11.2% as son/daughter and 0.5% as grandparents.

Seventy-four-point three percent of households had at least one dog, and 57% at least one cat, with the majority of households having one cat or dog (see Table 2).

Four hundred and four people reported having at least one dog and one cat (31.15%).

Respondents were free to choose whether to answer about a dog or a cat. Of the 404 people who had both dogs and cats, 235 (58.2%) chose to report about a dog and 169 about a cat (41.8%).

	Number of pets						
	None	1	2	3	4	5	6 or more
Dogs	25.8%	44.2%	17.8%	7.7%	1.8%	0.9%	1.9%
Cats	43.1%	23.4%	20.0%	8.5%	3.1%	1.0%	2.0%

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Table 2. Numbers of dogs and cats per household.

Most respondents lived in an apartment (74.7%) rather than a house (25.3%), with 56.9% describing their home as medium sized, 21.3% as large and 21.8% as small. Ninety-two-point six percent of respondents said that their home was large enough for all family members to have the space to carry out activities separately, and 93.5% said that they had the feeling that they had enough light and air at home. Most homes (72.3%) had some kind of outdoor space, be it a garden, terrace, internal patio or balcony (see Table 3).

No outdoor space	27.7%
Garden	18.0%
Terrace	29.3%
Indoor patio	9.6%
Balcony	29.8%

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Table 3. Availability of outdoor space at the respondent's home.

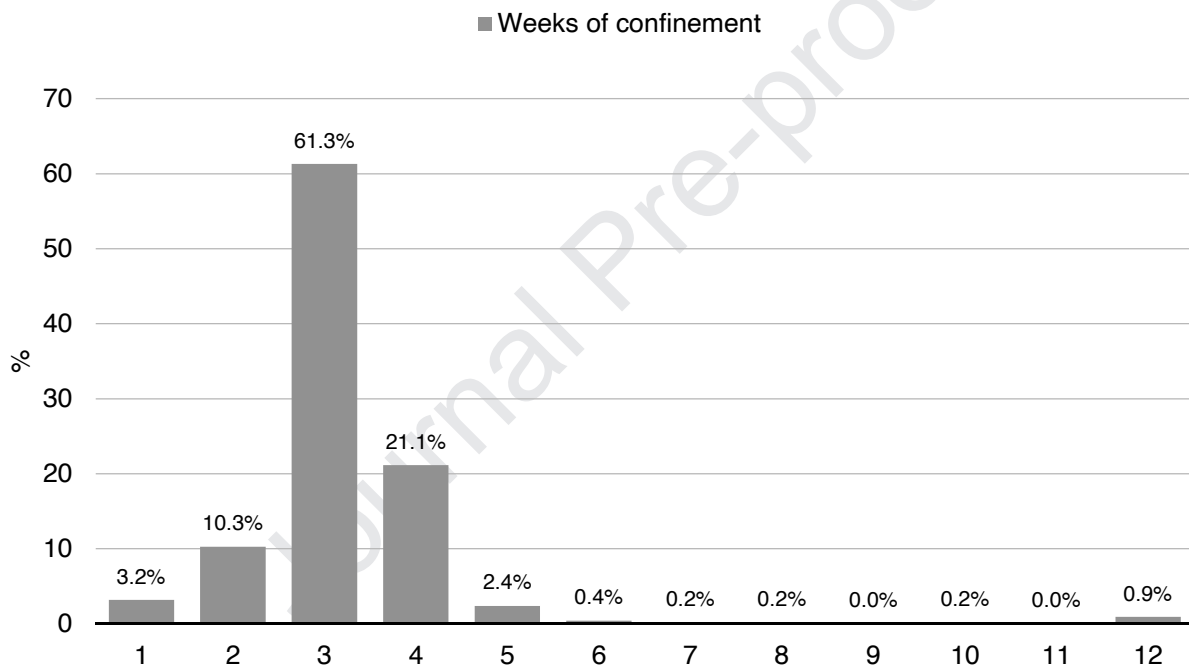
Although the official lockdown applied to all residents of Spain, essential workers were permitted to continue to go to work. In the present study, in only 8.1% of households were all members still permitted to go out to work. In the largest proportions of households all residents

276 were confined and none were able to work from home (23.8%), and in 21.3% of households all
 277 residents were confined and some were able to work from home (see Table 4).
 278

We are all confined and none of us work from home	23.8%
We are all confined and some of us work from home	21.3%
We are all confined and we all work from home	15.7%
Some of us are confined, and some of us have permission to go out to work	31.1%
We all have permission to go out to work	8.1%

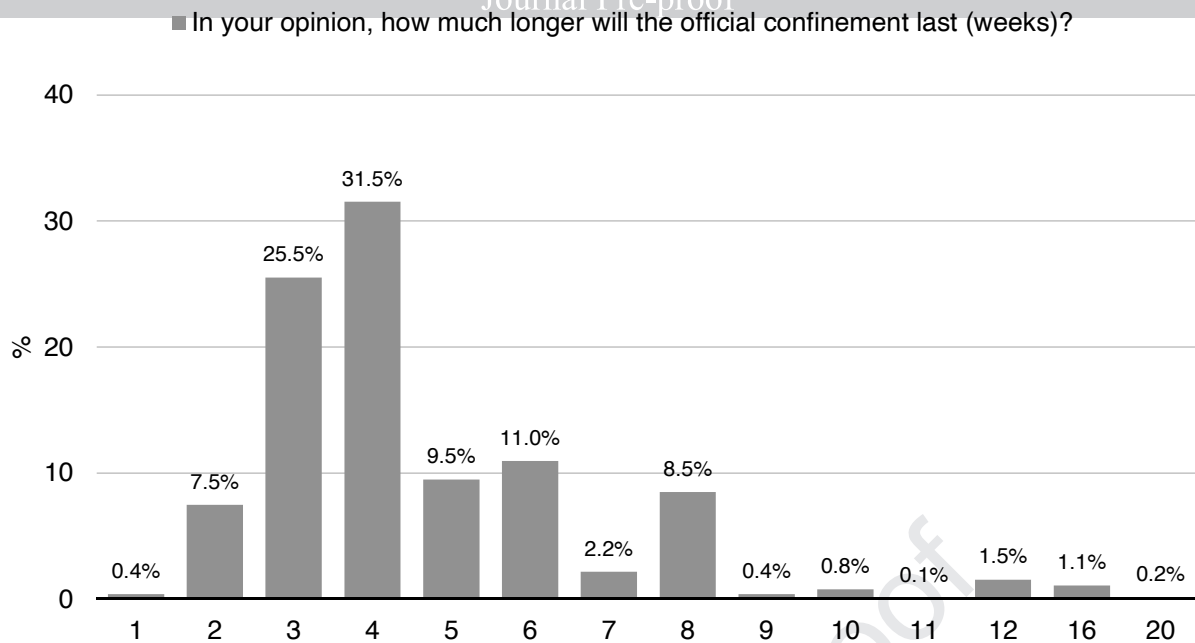
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Table 4. Level of confinement for members of the household.



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Figure 2. Number of weeks of confinement at the time of the survey.

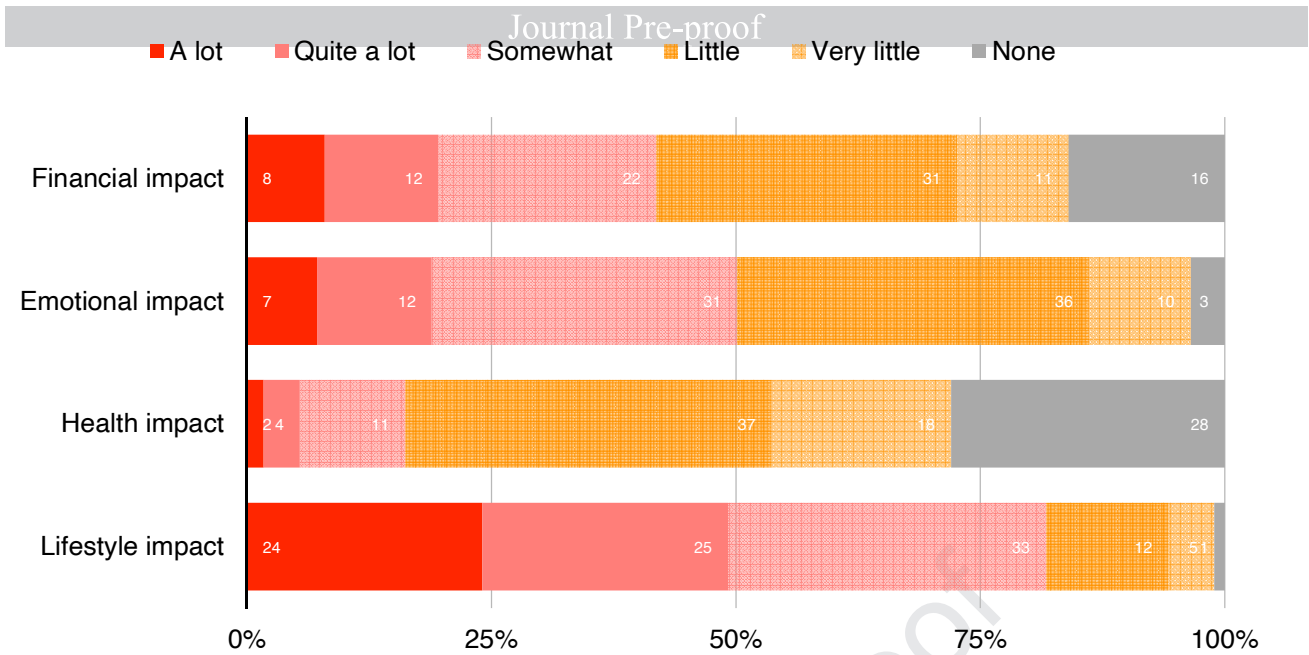


289 Figure 3. Expected number of additional weeks of confinement at the time of the survey.
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 291

292 Some individuals would have self-isolated before the official lockdown, and some would have
 293 experienced a change of working status during the lockdown; for example due to a change in
 294 working role that would affect their right to go to work, or because of illness that would require
 295 them to be quarantined. So, the duration of a respondent's confinement period would not align
 296 perfectly with the official date of lockdown. The mean duration of confinement reported was
 297 3.2 weeks (SD 1.19), and the mean expected further duration of the lockdown was 4.6 weeks
 298 (SD 2,37). Figures 2 and 3 provide a summary of the range of durations of confinement and
 299 expected confinement respectively.
 300

301 **The effects of the confinement on the pet owner and the household**

302 The confinement period would be expected to have economic, emotional, health and lifestyle
 303 impact on households. In response to the question "what negative impact has the official
 304 confinement had on your household, 49.2% of respondents indicated that there had been "a lot"
 305 or "quite a lot" of negative lifestyle impact on their household. The levels of economic,
 306 emotional and health impact were somewhat lower (see figure 4).
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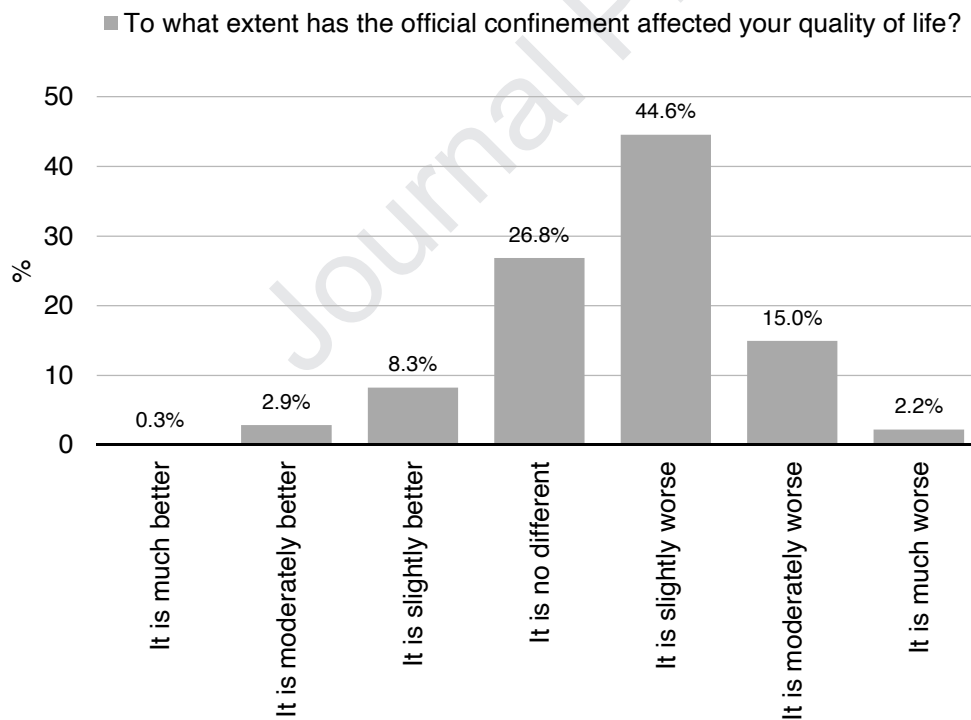
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311 Figure 4. Perceived negative impacts of the official confinement on the household.

312

313 Respondents were also asked to provide an overall indication of the effect of the confinement
314 on their quality of life. A summary of responses is presented in figure 5.

315



316

317 Figure 5. Effect of confinement on the respondent's quality of life.

318

319 The most common response was that the respondent's quality of life was slightly worse (44.6%),
320 with 26.8% indicating no change. Comparing those who reported any change in quality of life,
321 61.8% said that their quality of life had got worse, and 11.4% that it had got better.

322

323 In order to understand the contribution these different impacts on the household might have
 324 on overall individual quality of life, Spearman Rank correlation was carried out between these
 325 variables (the data was not normally distributed).

326
 327 While all correlations were significant, the strongest correlation was between household
 328 lifestyle impact and overall quality of life ($r = -0.38$), followed by emotional impact ($r = -0.34$),
 329 see Table 5. Although significant, the correlation between negative economic impact and
 330 quality of life was very weak.

331
 332

Correlation with "To what extent has the official confinement affected your quality of life?"	Spearman r	p (two-tailed)	95% confidence interval
Negative economic impact	-0.1	0.0002	-0.16 to -0.05
Negative emotional impact	-0.34	<0.0001	-0.39 to -0.29
Negative health impact	-0.21	<0.0001	-0.27 to -0.16
Negative lifestyle impact	-0.38	<0.0001	-0.43 to -0.33

333
 334

335 Table 5. Contribution of the different dimensions of impact to the overall individual quality of
 336 life. The sign of all these correlations is negative because the various household impacts were
 337 scored positively according to the level of impact (none=0, a lot=5)

338

339 **The effects of the confinement on the human-animal bond**

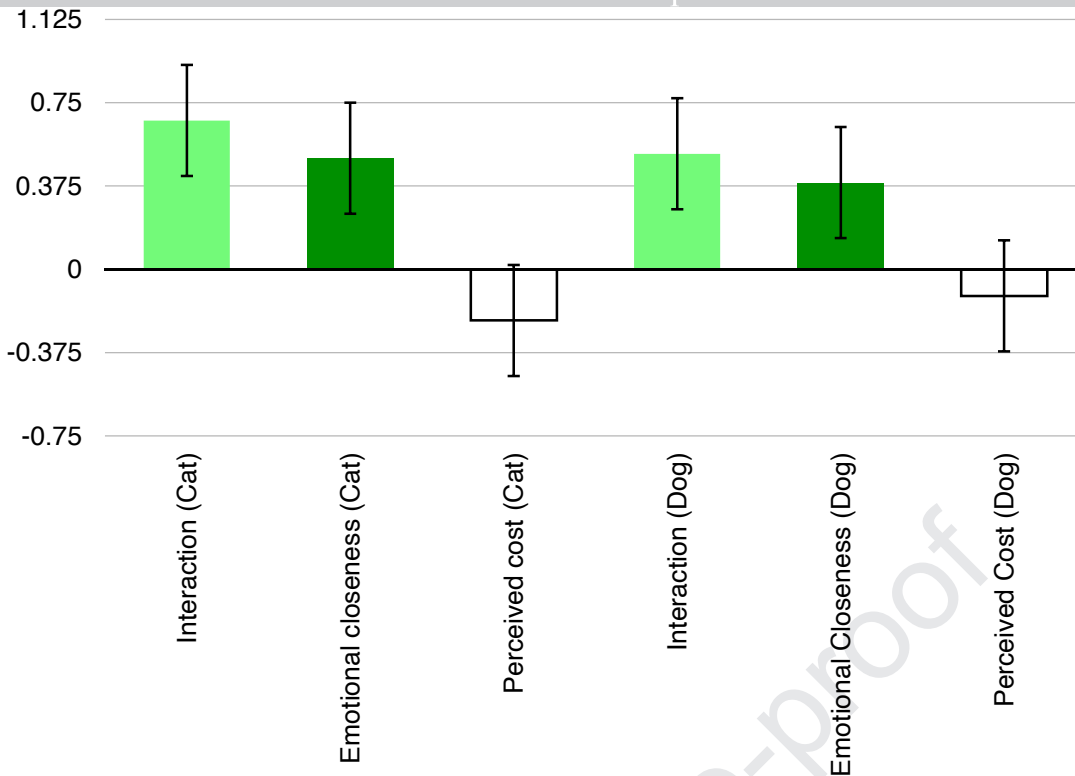
340 Each item of C/DORs was scored from -2 to +2 ("much less than before the confinement" to
 341 "much more than before the confinement"), with zero being "no more or less than before the
 342 confinement". A score for the three subscales of C/CORS (interaction, emotional closeness &
 343 perceived costs) was calculated from the average of items for that subscale. Unlike in the
 344 original MDORS and C/DORS scoring protocols, "Perceived costs" was scored so that high
 345 scores indicated an increased negative effect on the owner.

346

347 The mean scores for the subscales were; interaction 0.58 (SD=0.45), emotional closeness 0.34
 348 (SD=0.42), and perceived costs -0.16 (SD=0.382). This indicates a general increase in the
 349 emotional bond in this population, together with an increase in interaction and an overall
 350 reduction in perceived costs. All values were significantly different from zero; using a single
 351 sample Wilcoxon signed rank test p was less than 0.0001 for all tests, sum of ranks (W) was
 352 639050, 630332, -205155 respectively for interaction, emotional closeness, and perceived costs.

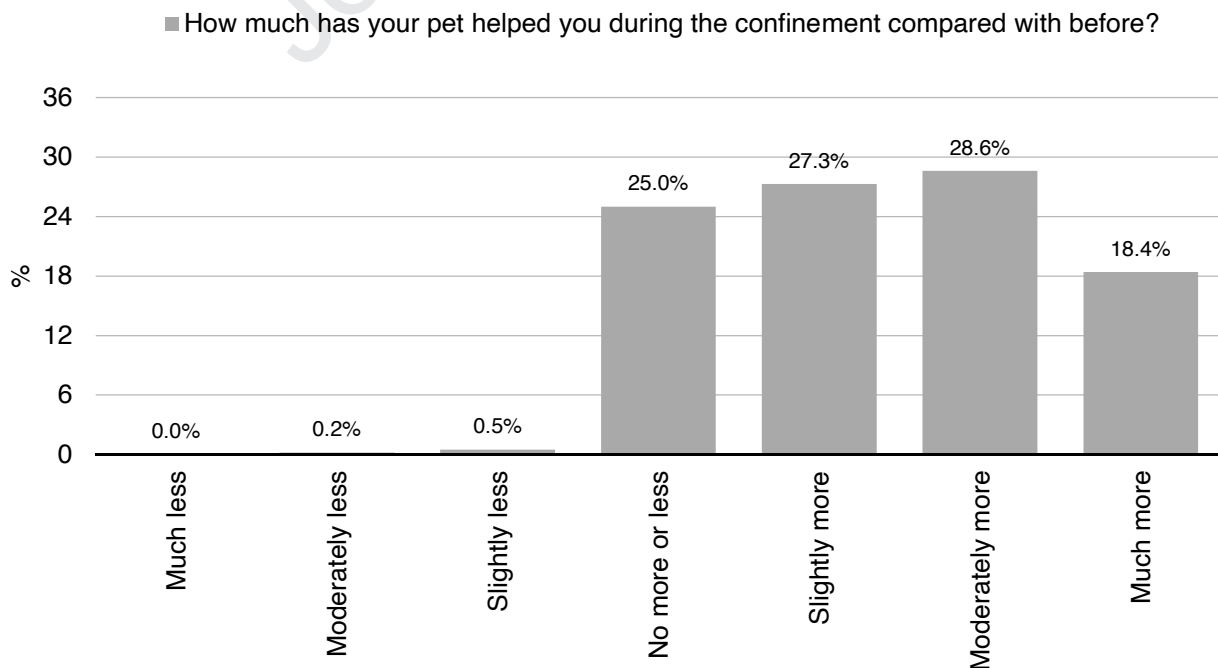
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354 Values for the three subscales were also examined independently for cats and dogs and a
 355 comparison was made between the two species. For both cats and dogs the values were found to
 356 be significantly different from zero (no change) using a single sample Wilcoxon signed rank test
 357 ($p < 0.0001$ for all tests). There was also a significant difference between cats and dogs for the
 358 values for all three subscales (Mann-Whitney test. $p < 0.0001$ for all tests, with Mann-Whitney U
 359 being 163029, 168375, and 152174 for interaction, emotional closeness, and perceived costs
 360 respectively). Figure 6 shows the comparison of C/DORS subscale scores between cats and dogs.



361
 362 Figure 6. Comparing C/DORS subscale scores between cats and dogs. Columns show the mean
 363 and whiskers the standard deviation.

364
 365 We also asked respondents to answer the question “How much has your pet helped you during
 366 the confinement compared with before?”, with a 7-point response from “much less” to “much
 367 more”. Forty-seven percent of people indicated that their pet had helped them moderately more
 368 or much more. For 25% of respondents there was no change, and for only 0.7% was there a
 369 perceived reduction in support from the pet (see fig 7).



371

372 Figure 7. Responses to the question “How much has your pet helped you during the
373 confinement compared with before?”

374

375 The concerns of owners

376 Owners were presented with a range of concerns about the effect of the confinement on pet
377 ownership. The commonest concern for dog owners was prohibition of going on walks (61.7),
378 and the commonest concern for cat owners was access to veterinary care and medication
379 (39.6%). See Table 6 for a summary.

380

Type of concern	None (owner had no particular concerns)	Pet's health	Getting food for the pet	Access to veterinary care and medication	Prohibition of outdoor access for the pet (dog walking or cats outside)	Weight gain (pet)	People in the house (e.g. children) don't respect pet's space and rest	Loss of routine might affects the pet's behavior	The pet won't adapt to situation after confinement ends	Concerns that walking the dog increasing the risk of infection
Dog owners	8.6%	27.7%	15.9%	26.7%	61.7%	25.7%	2.9%	39.3%	39.0%	7.3%
Cat owners	25.4%	27.6%	24.5%	39.6%	3.0%	7.4%	3.2%	16.3%	37.0%	NA

381

382

383 Table 6. Percentage of owners reporting specific concerns about the effects of the confinement
384 on aspects of pet ownership.

385

386 Factors that influence the effect of the confinement on the quality of life of the owner

387 Binary logistic regression was used to identify which factors influence the owner's quality of
388 life. To do this a comparison was made between people who rated their quality of life as having
389 got worse (n=801), versus those who rated their quality of life as having stayed the same or got
390 better during the confinement (n=496).

391

392 The model passed an omnibus test of model coefficients (Chi square=269.3, df=41, p<0.0001),
393 and had a correct classification rate of 72.9% (see Table 7). In this case the full table is
394 presented, to indicate which variables were not significant.

395

396

	B	S.E.	Wald	df	p	Odds ratio (QoL Same or better than pre-confinement)	95% C.I. for Odds ratio	
							Lower	Upper
Age group (owner)			10.665	5	0.058			
Sex (Female)	0.291	0.222	1.719	1	0.19	1.338	0.866	2.069
Number of children 0-5yoa	0.094	0.086	1.199	1	0.273	1.098	0.929	1.299
Number of children 6-12 yoa	-0.012	0.131	0.009	1	0.926	0.988	0.764	1.278
Number of children 13-17 yoa	0.06	0.188	0.103	1	0.748	1.062	0.734	1.537

Number of adults 18-64 yoa	-0.055	0.092	0.361	1	0.548	0.946	0.791	1.133
Number of adults 65+ yoa	0.074	0.2	0.136	1	0.712	1.076	0.728	1.592
Family role of owner			1.855	3	0.603			
Number of resident dogs	0.073	0.063	1.321	1	0.25	1.076	0.95	1.218
Number of resident cats	0.088	0.06	2.116	1	0.146	1.092	0.97	1.229
Type of home (apartment)	0.198	0.196	1.02	1	0.312	1.219	0.83	1.788
Outdoor space score	0.09	0.042	4.532	1	0.033	1.094	1.007	1.189
Size of home	0.043	0.114	0.144	1	0.704	1.044	0.835	1.306
Perception of home environment score	0.007	0.189	0.002	1	0.969	1.007	0.695	1.46
Confinement level			2.398	3	0.494			
Number of weeks of confinement so far	0.094	0.056	2.785	1	0.095	1.098	0.984	1.226
Expected further duration of official confinement	-0.011	0.029	0.148	1	0.7	0.989	0.935	1.046
Negative economic impact	0.015	0.05	0.095	1	0.758	1.015	0.921	1.119
Negative emotional impact	-0.189	0.074	6.481	1	0.011	0.827	0.715	0.957
Negative health impact	-0.139	0.063	4.811	1	0.028	0.871	0.769	0.985
Negative lifestyle impact	-0.508	0.065	61.495	1	0	0.602	0.53	0.683
Species (Cat)	-0.426	0.201	4.488	1	0.034	0.653	0.44	0.969
Change in emotional closeness (C/DORS)	0.075	0.256	0.086	1	0.769	1.078	0.652	1.782
Change in interaction (C/DORS)	0.302	0.217	1.936	1	0.164	1.352	0.884	2.069
Change in perceived costs (C/DORS)	-0.005	0.21	0	1	0.982	0.995	0.66	1.501
Effect of confinement on pet's quality of life	0.333	0.066	25.163	1	0	1.396	1.225	1.59
Effect of confinement on owner's relationship with their pet	-0.141	0.097	2.114	1	0.146	0.869	0.718	1.05
Frequency of getting mad with the pet	0.035	0.088	0.16	1	0.689	1.036	0.872	1.23
Degree to which pet helps owner through the confinement	-0.212	0.078	7.301	1	0.007	0.809	0.694	0.943
Total number of problem behaviors getting worse	-0.095	0.074	1.627	1	0.202	0.91	0.787	1.052
Total number of problem behaviors present but unchanged	-0.04	0.035	1.321	1	0.25	0.961	0.898	1.028
Owner concerns score	-0.051	0.05	1.062	1	0.303	0.95	0.861	1.047

General changes in behavior score	0.018	0.066	0.078	1	0.78	1.019	0.895	1.159
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Table 7. Binary logistic regression results for the comparison between owner quality of life groups. Odds ratios indicate the likelihood of the respondent being in the group for which QoL was the same or better than before the confinement.

BLR enables the influence of each variable to be quantified individually, even in the face of multiple other potentially confounding factors within the dataset. Only variables with $p < 0.05$ were significant in the model; other variables were not influential.

The reference outcome for the odds ratios in this table is “same or better owner quality of life since the confinement”. Odds ratios relate to the increased, or decreased, likelihood of being in that group. Odds ratios greater than one indicate that increased values for that variable were associated with an increased likelihood of being in the reference group. For example, for every one-point increase in outdoor space score, from 0 to 10, the respondent was 9.4% more likely to be in the “same or better owner quality of life since the confinement” group.

Odds ratios of less than one indicate that with increasing values for that variable there is less likelihood of being in the reference group (in this case, greater likelihood of being in the “worse owner quality of life since the confinement” group). For example, for every one point increase, from 0 to 5, in score for negative emotional impact, negative health impact and negative lifestyle impact the respondent was 20.1%, 14.8% and 66.2% less likely, respectively, to be in the “same or better owner quality of life since the confinement” group (i.e. 20.1%, 14.8% and 66.2% *more* likely, respectively, to be in the “worse owner quality of life since the confinement” group). These values can be calculated from the inverse of the odds ratio.

Dog owners were 53.2% more likely to be in the same/better quality of life group. For every one-point improvement in the quality of life of the pet, from -3 to +3, the owner was 1.4 times more likely to be in the same or better owner quality of life since the confinement group. For every one-point increase in score for how much the pet had provided the respondent with comfort since the confinement, from -3 to +3, the respondent was 23.5% more likely to be in the worse owner quality of life group.

Factors influencing the level of support the owner obtained from the pet during the confinement

A second general model including all respondents was created, with the level of support the person obtained from their pet (“How much has your pet helped you during the confinement, compared with before?”) as the outcome factor. A two-step cluster was performed for this variable. The model was forced to generate two clusters (high and low support from the pet. The high support made up 47% of the population (mean score 2.4), with 53% being in the low support group (mean score 0.5). The silhouette value for the model was 0.7 (good).

Binary logistic regression was performed using the same variables as in the quality of life model, but with “How much has your pet helped you during the confinement, compared with before?” removed from the equation (because it was the outcome variable), and confinement effect on general quality of life was included.

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The model passed an omnibus test of model coefficients (Chi square=525.1, df=41, p<0.0001), and had a correct classification rate of 75.6%. The summary table (8) below, only includes those variables which were significant in the model. Full tables of the BLR results are available in appendix B.

	B	S.E.	Wald	df	p	Odds ratio (high support group)	95% C.I. for Odds ratio	
							Lower	Upper
Sex (Female)	0.54	0.253	4.545	1	0.033	1.716	1.045	2.819
Effect on overall quality of life (owner)	-0.297	0.081	13.541	1	0	0.743	0.635	0.871
Change in emotional closeness (C/DORS)	2.535	0.289	76.78	1	0	12.62	7.158	22.25
Change in interaction (C/DORS)	0.87	0.23	14.355	1	0	2.387	1.522	3.744
Change in perceived costs (C/DORS)	-0.599	0.248	5.841	1	0.016	0.549	0.338	0.893
Effect of confinement on pet's quality of life	0.143	0.071	4.046	1	0.044	1.153	1.004	1.325
Effect of confinement on owner's relationship with their pet	0.249	0.106	5.553	1	0.018	1.282	1.043	1.577

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Table 8. Summary of binary logistic regression results for support the owner obtained from the pet (only significant associations are reported). Odds ratios indicate the likelihood of the respondent being in the group for which the pet provided more support during the confinement.

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Female respondents were 1.72 times more likely to be in the group that gained most support from the pet. For every one-point improvement in the owner's quality of life since the confinement (from -3 to +3), the respondent was 34.5% more likely to be in the low support from pet group. For every one-point increase in score for emotional closeness and interaction the respondent was 12.6 times and 2.4 times more likely to be in the high support from pet group respectively. For every one-point increase in score for perceived costs a respondent was 82.1% more likely to be in the low support from pet group. For every one-point increase in the pet's quality of life (from -3 to +3) a respondent was 1.15 times more likely to be in the high support from pet group. For every one-point increase in the strength of the relationship with the pet (from -3 to +3) a respondent was 1.28 times more likely to be in the high support from pet group.

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The effects of the confinement on the behavior and quality of life of dogs

Regarding the perceived effect of confinement on the dog's overall quality of life, 62.1% of respondents considered it had got worse, whereas 19.3% thought it was better.

470 For 65.4% of participants the relationship with their dog did not change, for 28.8% it improved
 471 and for 5.8% it became worse during the confinement.

472

473 The commonest behavior problems that were getting worse were annoying or excessive
 474 vocalization (24.7%), and fear of loud or unexpected noises (16.9%), see Table 9 for a summary
 475 of behavior problems in the population and how they changed during the confinement. These
 476 are presented graphically in figure 8.

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Categories of problematic behavior	Presence and severity of the problem in relation to confinement			
	Never present (%)	Same as before (%)	Improved (%)	Got worse (%)
Aggression towards family members	78.5	14.9	2.8	3.9
Aggression towards people who do not live in the house	69.0	22.7	2.9	5.4
Aggression towards other dogs in the home	83.3	13.5	1.6	1.6
Aggression towards other animals living in the house	83.4	13.0	1.1	2.5
Aggressiveness towards other dogs during walks	46.0	37.4	5.2	11.5
Destructiveness	61.1	24.6	7.9	6.4
Urination/defecation in the house	64.1	19.9	5.4	10.6
Vocalization	35.1	37.4	2.8	24.7
Fear of loud or sudden noises	30.2	51.3	1.6	16.9
Problems being left alone at home	54.7	28.5	5.0	11.8

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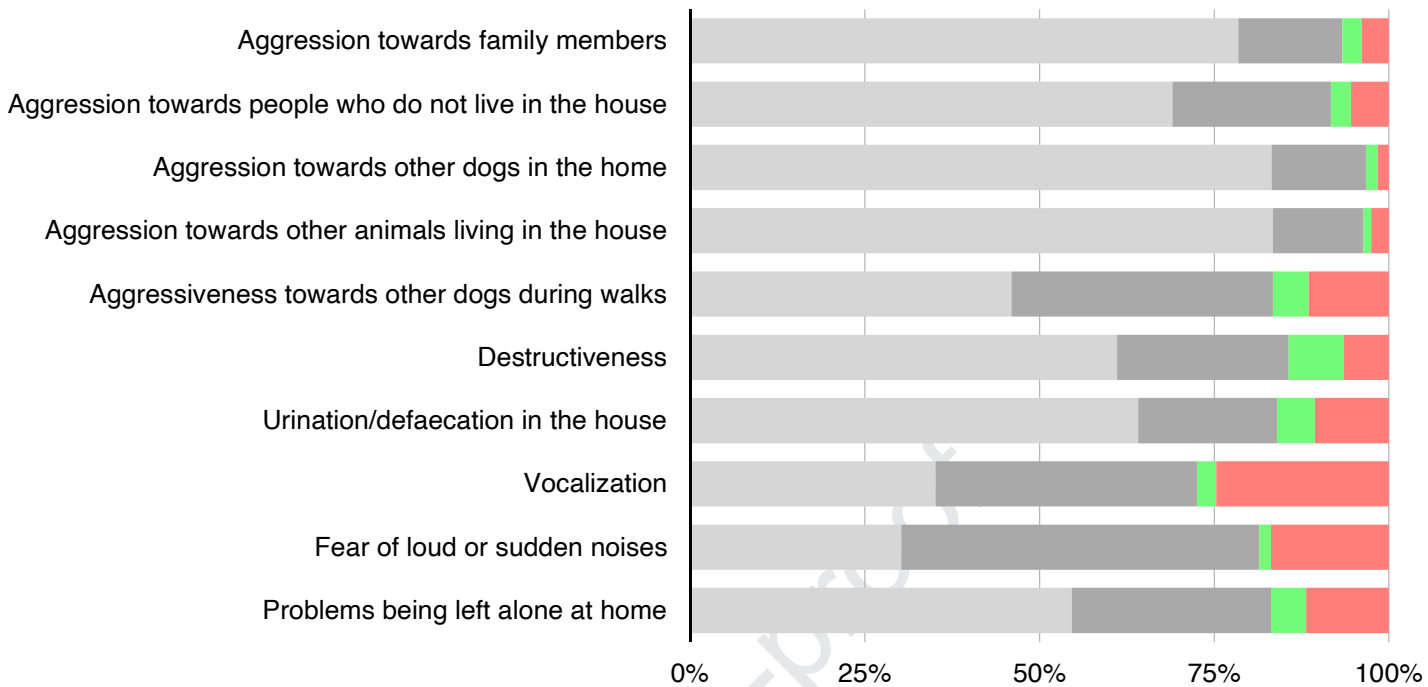
481 Table 9. The problematic behaviors of dogs and how they changed during the confinement.

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Never present Present as before Improved Got worse

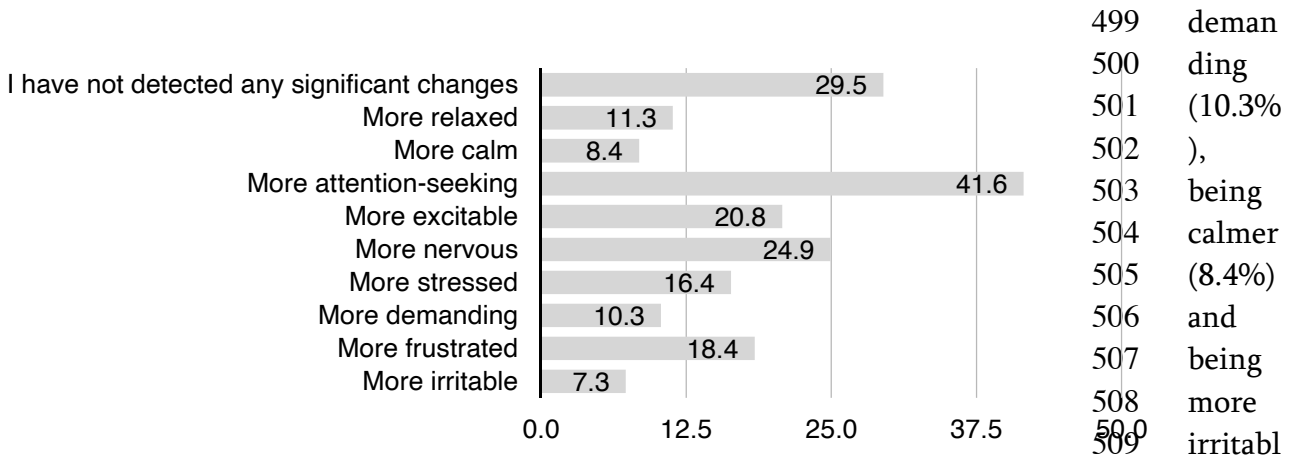


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Figure 8. Illustration of the problematic behaviors of dogs and how they changed during the confinement. “Never present” indicates cases for which the behavior was not observed in the animal either before or during the confinement.

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We also asked owners to provide information about general changes in behavior that were not specific behavioral diagnoses. With respect to these broader changes, 29.5% respondents reported no significant changes in the dog’s behavior during confinement. The most common general aspect of behavior reported to be higher during confinement was attention-seeking (41.6%), followed by being more nervous (24.9%), being more excitable (20.8%), being more frustrated (18.4%), being more stressed (16.4%), being more relaxed (11.3%), being more



510 e (7.3%). See figure 9.

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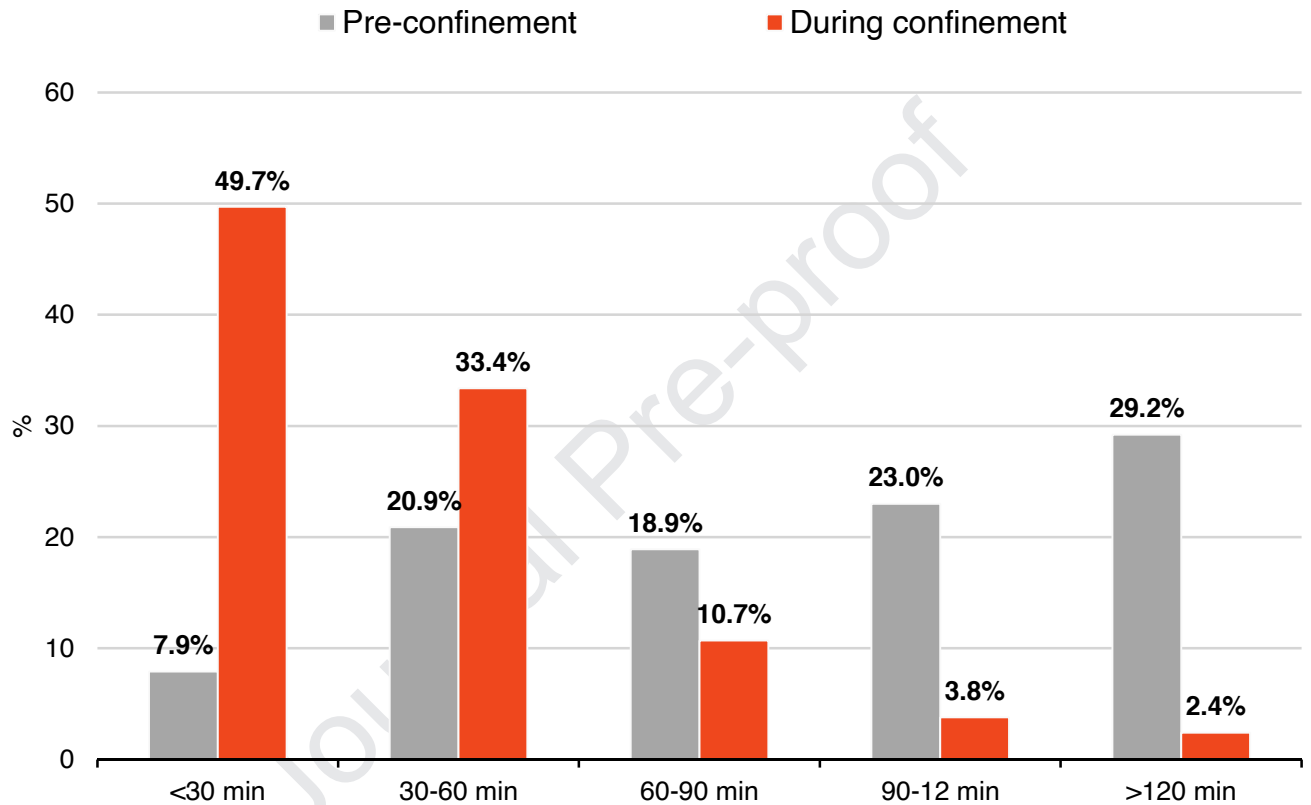
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516 Figure 9. General behavioral changes in dogs during the confinement, showing the percentages
 517 of owners who reported an increase in each behavior.

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519 Prior to the confinement, dogs went on an average of 3 walks per day (SD=1.14) compared with
 520 2.5 walks per day during the confinement (SD=1.19). This difference was, however, not
 521 significant. There was a clear reduction in the duration of walks during the confinement
 522 (Wilcoxon matched-pairs signed rank test, two-tailed $p < 0.0001$, $W = -75495$). Figure 10 shows
 523 the amount of time dogs spent outside before and during the confinement period.



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525

526 Figure 10. Amount of time each day that dogs spent outside before and during the confinement.

527

528 **Factors associated with how dogs were coping with the confinement**

529 A score for general negative changes in behavior was calculated, with one point awarded for
 530 each of “more nervous”, “more stressed”, “more excitable”, “more attention-seeking”, “more
 531 demanding”, “more frustrated” and “more irritable”. This created a score from 0 to 7 for each
 532 pet. This score is reflective of underlying changes in behavior that could be indicative of the
 533 pet’s ability to cope.

534

535 A two-step clustering procedure was performed using this general change score as the variable.
 536 The model was forced to generate two clusters. Silhouette value was 0.7. Sixty-two-point eight
 537 percent of dogs showed at least one general change in behavior. Those animals with high scores
 538 were considered to be coping less well with the confinement.

539

540 A binary logistic regression model was created with membership of the low or high general
 541 changes group as the outcome variable. The model passed an omnibus test of model coefficients
 542 (Chi square=319.1, df=44, $p<0.0001$), and had a correct classification rate of 86.8% (see Table
 543 10).
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	B	S.E.	Wald	df	Sig.	Odds ratio (of not coping well)	95% C.I. for Odds ratio	
							Lower	Upper
Age group (owner)			5.383	5	0.371			
Sex (Female)	0.312	0.49	0.406	1	0.524	1.366	0.523	3.571
Number of children 0-5yoa	-0.081	0.191	0.18	1	0.671	0.922	0.635	1.34
Number of children 6-12 yoa	-0.053	0.269	0.038	1	0.845	0.949	0.56	1.608
Number of children 13-17 yoa	-0.184	0.394	0.218	1	0.641	0.832	0.384	1.802
Number of adults 18-64 yoa	-0.119	0.168	0.496	1	0.481	0.888	0.639	1.235
Number of adults 65+ yoa	-0.071	0.32	0.05	1	0.823	0.931	0.497	1.742
Family role of owner			2.904	3	0.407			
Number of resident dogs	0.015	0.138	0.012	1	0.912	1.015	0.775	1.329
Number of resident cats	0.165	0.111	2.198	1	0.138	1.179	0.948	1.466
Type of home (apartment)	0.323	0.389	0.689	1	0.406	1.381	0.644	2.962
Outdoor space score	0.077	0.081	0.904	1	0.342	1.08	0.921	1.267
Size of home	-0.333	0.205	2.625	1	0.105	0.717	0.479	1.072
Perception of environment score	0.154	0.304	0.255	1	0.614	1.166	0.642	2.117
Confinement level			0.607	3	0.895			
Number of weeks of confinement so far	-0.059	0.121	0.236	1	0.627	0.943	0.743	1.196
Expected further duration of official confinement	0.002	0.054	0.001	1	0.97	1.002	0.901	1.115
Negative economic impact	-0.13	0.092	2.008	1	0.157	0.878	0.733	1.051
Negative emotional impact	-0.034	0.136	0.063	1	0.801	0.966	0.74	1.262
Negative health impact	0.235	0.11	4.618	1	0.032	1.266	1.021	1.569
Negative lifestyle impact	0.216	0.133	2.629	1	0.105	1.241	0.956	1.612
Effect on overall quality of life of owner	0.052	0.153	0.117	1	0.732	1.054	0.781	1.422
Change in emotional closeness (C/DORS)	0.445	0.443	1.01	1	0.315	1.56	0.655	3.715
Change in interaction (C/DORS)	0.709	0.391	3.285	1	0.07	2.033	0.944	4.376
Change in perceived costs (C/DORS)	0.118	0.402	0.086	1	0.769	1.125	0.512	2.472

Effect of confinement on pet's quality of life	-0.553	0.134	17.144	1	0	0.575	0.443	0.747
Effect of confinement on owner's relationship with their pet	-0.054	0.174	0.097	1	0.756	0.947	0.674	1.332
Frequency of getting mad with the pet	0.6	0.181	11.005	1	0.001	1.822	1.278	2.598
Degree to which pet helps owner through the confinement	-0.157	0.14	1.252	1	0.263	0.855	0.649	1.125
Total number of problem behaviors getting worse	0.663	0.095	48.289	1	0	1.941	1.61	2.34
Total number of problem behaviors present but unchanged	0.066	0.066	0.989	1	0.32	1.068	0.938	1.216
Owner concerns score	0.438	0.089	24.09	1	0	1.549	1.301	1.845
Walks per day during confinement (dog)	0.273	0.145	3.54	1	0.06	1.314	0.989	1.748
Duration of time spent outside during confinement (dog)	0.02	0.169	0.015	1	0.904	1.021	0.733	1.421
Change in number of walks per day during confinement (dog)	-0.056	0.132	0.178	1	0.673	0.946	0.731	1.225
Change in duration of time outside during confinement (dog)	-0.127	0.123	1.058	1	0.304	0.881	0.692	1.121

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Table 10. Binary logistic regression results for how dogs were coping during the confinement. Odds ratios indicate the likelihood of the dog being in the group that was coping less well with the confinement (high score for general behavior change).

For every one-point in health impact on the owner, from 0 to 5, the dog was 1.3 times more likely to be in the coping-poorly group (higher score for general changes). For every one-point increase in the pet's quality of life, as evaluated by the owner, the dog was 74% more likely to be in the coping-better group. For every one-point increase in score for how often the respondent was getting mad with their dog, the dog was 1.8 times more likely to be in the coping-poorly group. For every additional behavior problem that was getting worse, dogs were 1.9 times more likely to be in the coping-poorly group, and for every one-point increase in owner concerns, from 0 to 8, the dog was 1.5 times more likely to be in the coping-poorly group.

Factors associated with worsening behavior in dogs

Dogs were given a score of 1 for every behavior problem that was worsening, giving a score from 0 to 10. The list of behaviors included were aggression toward family members, aggression to non-resident people, aggression to resident conspecifics, aggression to other species in the home, aggression to other dogs on walks, destructiveness, elimination problems, problematic vocalization, fear of loud of unexpected noises, and problems being left alone at home. Only one dog obtained the maximum score of 10. Two-step clustering was used to split the population, with two clusters emerging naturally (the model was not forced). The silhouette value was 0.8, which was very good. The two clusters were dissimilar in size, with one

570 including 75.7% of dogs, and the other 24.3%. In the larger cluster the mean score for the
 571 number of worsening behaviors was 0.28. For the smaller group the mean score was 3.04.

572
 573 A binary logistic regression model was created to compare these two groups. The model passed
 574 an omnibus test of model coefficients (Chi square=312.77, df=43, p<0.0001), and had a correct
 575 classification rate of 84.0%. The variables in this model were the same as in the previous model
 576 of how dogs were coping, but behavior problems scores were excluded as they related to the
 577 outcome variable. Only those variables which were significant are presented in Table 11.

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	B	S.E.	Wald	df	p	Odds ratio (group with more behavior problems worsening)	95% C.I.for EXP(B)	
							Lower	Upper
Confinement level			9.349	3	0.025			
Confinement level: All at home, none working from home.	1.602	0.565	8.042	1	0.005	4.961	1.64	15.006
Confinement level: All at home, some working from home.	1.563	0.532	8.638	1	0.003	4.771	1.683	13.526
Confinement level: All at home, all working from home.	1.413	0.517	7.46	1	0.006	4.108	1.49	11.325
Change in emotional closeness (C/DORS)	1.633	0.407	16.065	1	0	5.117	2.303	11.368
Frequency of getting mad with the pet	0.398	0.167	5.698	1	0.017	1.489	1.074	2.063
General behavioral changes score	0.793	0.093	72.366	1	0	2.21	1.841	2.654

580

581 Table 11. Summary of binary logistic regression results for worsening problems in dogs during
 582 the confinement. (only significant associations are reported). Odds ratios indicate the likelihood
 583 of the dog being in the group whose behavior problems were worsening more during the
 584 confinement (high score for number of worsening behaviors).

585

586 In this model confinement status was influential. Dogs in homes with all family members at
 587 home, either none working from home, some working from home or all working from home,
 588 were 4.9, 4.8 and 4.1 times more likely to be in the group with more behavior problems that
 589 were getting worse, respectively.

590

591 For every one-point increase in score for emotional closeness, from -2 to +2, a dog was 5.1 times
 592 more likely to be in the group with more behavior problems that were getting worse. Likewise,
 593 for every one-point increase in how often the respondent was getting mad with their dog, the
 594 dog was 1.5 times more likely to be in the group with more behavior problems that were
 595 getting worse. For every one-point increase in general changes score the dog was 2.2 times
 596 more likely to be in the group with more behavior problems that were getting worse.

597

Factors associated with worsening specific behaviors in dogs

598 Most behavior problems in dogs and cats were not common, and even fewer got worse during
 599 the confinement. So, it was not possible to create meaningful models to assess associations with
 600 worsening problems. However, 196 out of the 794 dogs in the study (24.7%) showed an increase
 601 in problematic vocalization. This was a large enough group to merit further analysis.
 602

603

604 A binary logistic regression model was created to compare dogs with an increase in problematic
 605 vocalization with those that showed no change. The model passed an omnibus test of model
 606 coefficients (Chi square=266.45, df=43, p<0.0001), and had a correct classification rate of 82.4%.
 607 The variables in this model were the same as in the previous model of how dogs were coping,
 608 but with behavior problems scores excluded as they related to the outcome variable. Only those
 609 variables which were significant are presented in Table 12.
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	B	S.E.	Wald	df	Sig.	Odds ratio (vocalization getting worse)	95% C.I.for EXP(B)	
							Lower	Upper
Number of adults 18-64 yoa	0.322	0.147	4.789	1	0.029	1.38	1.034	1.842
Change in emotional closeness (C/DORS)	0.836	0.391	4.569	1	0.033	2.307	1.072	4.965
Frequency of getting mad with your pet	0.31	0.155	3.998	1	0.046	1.363	1.006	1.847
Number of walks per day during confinement	-0.278	0.129	4.617	1	0.032	0.757	0.588	0.976
General behavioral changes score	0.738	0.089	68.985	1	0	2.092	1.758	2.49

612

613 Table 12. Summary of binary logistic regression results for worsening problem vocalization in
 614 dogs during the confinement. (only significant associations are reported). Odds ratios indicate
 615 the likelihood of the dog being in the group that was showing worsening problems of
 616 vocalization.
 617

618

618 For every additional person aged 18-64 yoa in the household, a dog was 1.4 times more likely to
 619 be in the worsening problematic vocalization group. For every one-point increase in increased
 620 emotional closeness, from -2 to +2, a dog was 2.3 times more likely to be in the worsening
 621 vocalization group. For every one-point increase in score for how often the respondent was
 622 getting mad with their dog, the dog was 1.4 times more likely to be in the worsening
 623 vocalization group. A dog was 32% less likely to be in the worsening vocalization group for
 624 every additional walk they went on each day (from 0 to "9 or more" walks each day). For every
 625 one-point increase in general changes in behavior score, from 0 to 7, a dog was 2.1 times more
 626 likely to be in the worsening vocalization group.
 627

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The effects of the confinement on the behavior and quality of life of cats

629 Regarding the perceived effect of confinement on the cat's overall quality of life, 57.3% of
 630 respondents considered it better, whereas 8.4% thought it was worse.

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For 52.1% of participants the relationship with their cat did not change, for 46.3% it improved and for 1.6% it became worse during the confinement.

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Table 13 summarizes the behavior problems in the cat population and how they changed during the confinement. Figure 11 presents this information graphically.

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Categories of problematic behavior	Presence and severity of the problem in relation to confinement			
	Never present (%)	Same as before (%)	Improved (%)	Got worse (%)
Aggression towards family members	78.3	16.5	3.6	1.6
Aggression towards people who do not live in the house	85.5	13.3	0.8	0.4
Aggressiveness towards other cats living in the house	64.4	29.4	4.0	2.2
Destructiveness (e.g. scratching furniture)	37.4	57.7	3.4	1.6
Urination/defecation in the house outside the litterbox	70.8	20.9	5.6	2.8
Fear of loud or sudden noises	19.7	70.6	3.4	6.4
Hiding and avoiding contact with people	44.3	49.5	3.6	2.6
Aggression towards other cats outside the house	81.7	17.5	0.4	0.4
Urine marking	84.9	11.1	2.6	1.4

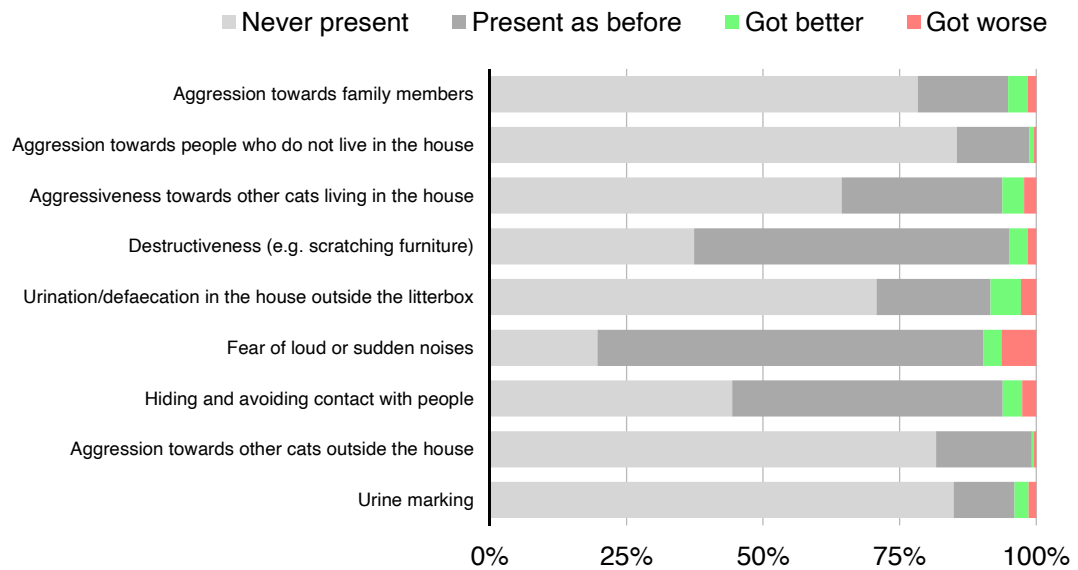
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Table 13. The problematic behaviors of cats and how they changed during the confinement.

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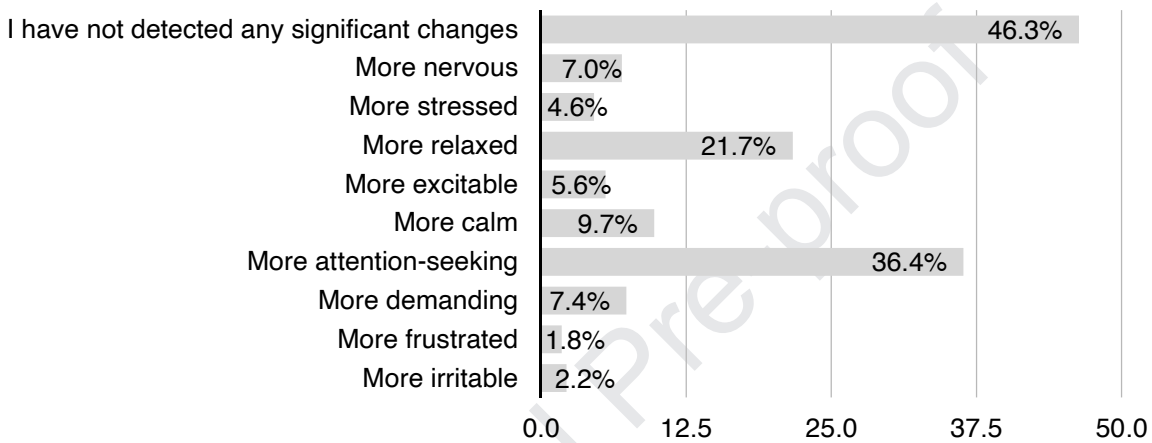
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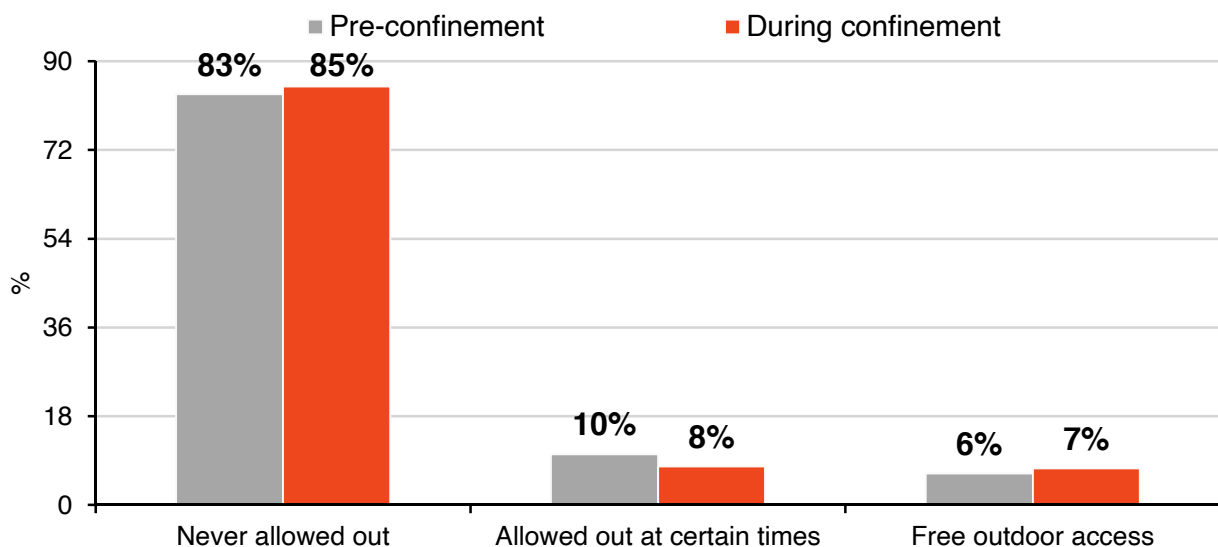
646 Figure 11. Illustration of the problematic behaviors of cats and how they changed during the
 647 confinement. "Never present" indicates cases for which the behavior was not observed in the
 648 animal either before or during the confinement.

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 652 Respondents were asked to report on the same general behavior changes for cats and dogs. In
 653 cats, 46.3% respondents reported no general changes in the cat's behavior during confinement.
 654 The most common general aspect of behavior that was reported to be higher during
 655 confinement was attention-seeking (36.4%), followed by being more relaxed (21.7%), being
 656 calmer (9.7%), being more demanding (7.4%) and being more nervous (7%). See figure 12.
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 661 Figure 12. General behavioral changes in cats during the confinement, showing the percentages
 662 of owners who reported an increase in each behavior.

663
 664 Outdoor access for cats did not differ between before and during the confinement period.
 665 Figure 13 shows the percentages of cats with not outdoor access, limited and free outdoor
 666 access.



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670 Figure 13. Outdoor access of cats before and during the confinement.

671

672 **Factors associated with how cats were coping with the confinement**

673 A two-step clustering procedure was performed using this general change score as the variable.
674 The model was forced to generate two clusters. Silhouette value for the model was 0.8, which is
675 very good.

676

677 Forty-three-point three percent of cats showed at least one general change in behavior. As with
678 dogs, those animals with high scores were considered to be coping less well with the
679 confinement.

680

681 A binary logistic regression model was created with membership of the low or high general
682 changes group as the outcome variable. The model passed an omnibus test of model coefficients
683 (Chi square=150.6, df=42, $p<0.0001$), and had a correct classification rate of 71.0%. The same
684 variables were included in this model as the one for dogs, except that the variables relating to
685 dog walks were replaced with the equivalent variables for outdoor access during the
686 confinement and change in outdoor access (from prior to the confinement). Table 14 only
687 presents those variables which were significant in the model.

688

689

	B	S.E.	Wald	df	p	Odds ratio (of not coping well)	95% C.I. for Odds ratio	
							Lower	Upper
Number of resident cats	-0.256	0.112	5.237	1	0.022	0.775	0.622	0.964
Change in emotional closeness (C/DORS)	0.927	0.443	4.383	1	0.036	2.527	1.061	6.017
Total number of problem behaviors getting worse	1.426	0.34	17.619	1	0	4.164	2.139	8.105
Owner concerns score	0.242	0.09	7.304	1	0.007	1.274	1.069	1.519

690

691 Table 14. Summary of binary logistic regression results for how cats were coping during the
692 confinement. (only significant associations are reported). Odds ratios indicate the likelihood of
693 the cat being in the group that was coping less well with the confinement (high score for
694 general behavior change).

695

696 For every additional cat in the household, cats were 30% more likely to be in the coping-better
697 group (low number of general changes). For every one-point increase (from -2 to +2) in
698 emotional closeness, cats were 2.5 times more likely to be in the coping-poorly group. For every
699 additional behavior problem that was getting worse, cats were 4.2 times more likely to be in the
700 coping-poorly group. For every one-point increase in owner concerns (from 0 to 8), a cat was
701 1.3 times more likely to be in the coping-poorly group.

702

703 **Factors associated with worsening behavior in cats**

704 The percentage of cats with worsening behavioral problems of each type was generally very
705 low, and the gross dissimilarity in group sizes made analysis likely to be misleading.

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Discussion

Being a convenience sample, the population for this study has a number of biases. The majority of respondents were female, which is similar to previous studies of pet ownership in which recruitment was voluntary (Diverio et al., 2016; Dwyer et al., 2006; Elzerman et al., 2019). There is evidence that women are more willing to participate in online surveys than men (Smith, 2008), and that they may use social media differently (Joinson, 2008; Duggan & Brenner, 2012). In addition, in a study of communication between veterinarians and clients in companion animal practice, a similar female bias was found in respondents, with the implication that women were more engaged with issues related to the pet (Shaw, 2012). All age groups were represented in the study; quite often there is an over-representation of a younger demographic in online surveys, which was not the case in this study.

Of the total of 9.4 million cats and dogs in Spain in 2018, the split was 67% dogs to 33% cats (FEDIAF, 2018), which is quite similar to the split of percentages of the respondents in this study; 61.2% responded about a dog and 38.8% about a cat.

In Spain, the lockdown was strictly imposed, with police enforcement of restrictions on who could leave the house and for what purposes. For example, only one person from a household could go shopping for food or other essentials, such as medication. Dog owners could go out to walk their dogs, but only for short periods. The majority of people in the survey lived in an apartment with a limited amount of outdoor space. So, for this population confinement represented a substantial change in lifestyle and we would expect that there would be significant pressure on relationships within households, including between people and their pets.

When the data was collected for this study, the average time of confinement was 3.2 weeks, which may be regarded as quite short. However, previous studies indicate that periods of quarantine and home confinement as short as 10 days have been associated with negative psychological consequences (Hawryluck et al., 2004). Respondents in this study also reported having been confined for periods that did not match with the official lockdown. This indicates that many people chose to self-impose restrictions on the amount of contact they had with other people, which could be related to the feelings of anxiety and uncertainty surrounding the disease. In addition, three weeks is sufficient time for people to get a sense of the effect of the confinement on them, but without any certainty about when the confinement might end; on average, people expected to be confined for a further month and a half, but more than ten percent of people indicated that they expected to be confined for a further 8 or more weeks. So, we would propose that even though the duration of confinement was quite short, it is highly likely that people would already have been experiencing considerable stress.

After only a few weeks, we might not expect a dramatic change in the behavior of pets, such as the development of new behavior problems like owner-directed aggression, but we might expect changes in existing problem behaviors and this is what we found. For example, owners reported that 24.7% of dogs that already had a problem of excessive or annoying vocalization, became worse, and this could be due to a number of reasons from territoriality to stress and

751 frustration. However, it is possible that the main reason for the perceived increase in
752 problematic vocalization was that people were at home to hear it.

753
754 However, we must accept that the lockdown will not suddenly end, with people going back to
755 their previous lifestyles. It will go on, in some form, for months. For example, according to
756 current estimates from the Spanish Government, children would not be able to return to school
757 out until September 2020, and it may be even longer before dogs are able to interact with each
758 other, or with people, on walks. We should be aware that more general changes in the animals'
759 disposition could, over time, lead to more serious problems. So, we included a panel of questions
760 about changes in the pet's general behavior.

761
762 As a result, we observed an increase in underlying, general dimensions of behavior such as
763 being more excitable, nervous, irritable, demanding or attention-seeking that could easily lead
764 to other problems if the lockdown continued or these changes were mishandled by owners.

765
766 Animals that were showing more of these signs could be considered to be coping worse, and at
767 greater risk of worsening behavior or the development of new problems, so we compared
768 groups with more versus less general behavioral changes, and more versus less problem
769 behaviors using binary logistic regression.

770
771 In the BLR model of general behavioral changes in dogs, there was a positive association
772 between the dog not coping well and negative health impact of the confinement on the owner,
773 frequency of the owner getting mad with the pet, the number of behavior problems getting
774 worse and the owner concerns score. There was a negative association with the effect of the
775 confinement on the pet's quality of life, as evaluated by the owner (i.e., pets with improved
776 quality of life were less likely to be in the group that was coping less well).

777
778 It is interesting that negative health impact on the household was a factor in general changes, as
779 health would be a substantial source of stress for households. Not only are people concerned
780 about the risk of infection and any potential signs of infection they might observe in household
781 members, but also about how to deal with existing health problems and new, non-COVID,
782 related health problems. The implication is that such household stresses are having an effect on
783 pets.

784
785 The owner concerns score relates to a range of potential problems that could arise from the
786 confinement, such as difficulty accessing veterinary care, obtaining food for the animal, the
787 animal gaining weight, and having difficulty adapting to normal life after the confinement.
788 Apart from pointing to specific problems that pet owners might face, it could be considered that
789 these are also an indication of an underlying state of worry or anxiety; people who have a
790 greater number of concerns, and therefore have a higher score for this variable in the analysis,
791 could be suffering from increased anxiety. The current COVID-19 outbreak has created levels
792 of uncertainty unparalleled in our recent history, being a reflection of a combination of fear of
793 the disease and anxiety about its short and long-term potential consequences. Fear of the
794 unknown has been described as one of the basic elements of anxiety and a fundamental
795 component of anxiety-related disorders (Carleton, 2016).

796

797 Our results point to a pattern of increased general behavioral changes, that probably result from
798 household stress and a reduced quality of life, which could lead to greater conflict with the
799 owner, a potential increase in anger and punishment from the owner, and therefore to an
800 increased likelihood of worsening behavior over time. The owner's psychological status and use
801 of punishment have already been found to be associated with problem behavior (Dodman et al.,
802 2018).

803
804 Overall, cats seem to be coping much better than dogs with the situation of confinement. One
805 reason may be that most cats in our sample were already indoor cats; the confinement had little
806 or no effect on their physical environment. Dogs, on the other hand, have experienced a
807 significant reduction in the duration of walks and, due to the confinement act, cannot interact
808 with people and dogs when they are outside. However, both cats and dogs are now sharing
809 their homes with people for a much greater amount of time, and the range of people they
810 interact with is much reduced. An alternative explanation is related to the salience of effects:
811 behavior changes in cats, particularly those related to stress, are often expressed as a reduction
812 in the frequency and/or intensity of certain behaviors, which may be less obvious to owners
813 (van der Leij, 2019).

814
815 In the BLR model for cats, there was a positive association between the cat not coping well and
816 an increase in emotional closeness (C/DORS), the total number of problem behaviors getting
817 worse, and owner concerns score. There was a negative association with the number of resident
818 cats, meaning cats were more likely to be doing well if there were other cats in the household.

819
820 Evidence from a study by Ramos et al (2013) suggests that many cats find certain forms of
821 human contact stressful, which would support the finding that increased emotional closeness
822 was associated with cats coping less well in the present study. The emotional closeness subscale
823 includes items like "How often do you kiss your pet", "I would like to have my pet near me all
824 the time", and "My pet is there whenever I need to be comforted". The majority of cats in the
825 present study live entirely indoors, making them unable to avoid this increased human contact.

826
827 The association between cats doing better and the number of resident cats is puzzling but in the
828 same study by Ramos, the authors found no difference in glucocorticoid metabolites between
829 cats living in single, double or group housing. There is also the possibility that some of the signs
830 of not coping that we included in the composite measure are behaviors that are inhibited in
831 stressful situations.

832
833 Taken as a whole, our findings suggest that general changes in behavior such as excitability and
834 being more attention seeking or demanding, could be seen as risk factors or even early
835 indicators of more serious future behavior problems.

836
837 Our study did not attempt to look at behavioral changes in detail, only as part of an overall
838 impression of the situation; a detailed study on the behavioral effects of the confinement is
839 definitely needed.

840

841 However, in the BLR model there was a positive association between worsening behavior and
842 confinement level of the household, increase in emotional closeness (C/DORS), increase in
843 frequency of getting mad with the pet and score for general behavioral change.

844

845 Again, there were associations with the frequency of the owner getting mad with the dog and
846 general behavioral changes. However, in this model we also see a link with level of
847 confinement; dogs were more likely to show worsening behavior if everyone in the household
848 was confined at home, with the effect being strongest in households in which nobody was
849 working from home. This may reflect the level of household tension due to all household
850 members being confined with little to do, but it may simply be the result of increased
851 opportunities for interaction, and therefore misbehavior.

852

853 Excessive or annoying vocalization was the only specific problem behavior that worsened in a
854 sufficiently large number of dogs that there was a large enough group to analyze statistically. In
855 the BLR model, there was a positive association between worsening problems of vocalization
856 and number of 18-64 year-old adults at home, increase in emotional closeness (C/DORS),
857 frequency of getting mad with the pet and general behavioral changes score. There was a
858 negative association with number of walks per day during the confinement; dogs that were
859 walked more often during the confinement were less likely to have worsening problems of
860 vocalization. It appears that a lack of frequency of exercise was a significant factor, indicating
861 that taking dogs for more walks, even if they are shorter than prior to the confinement, could
862 be a useful preventative intervention for excessive vocalization.

863

864 In both the models for increased score for number of worsening behavior problems in dogs and
865 worsening vocalization in dogs, but not the model of poor coping, emotional closeness was a
866 factor. This suggests that an intensification of this aspect of the human-animal bond may place
867 additional stress on dogs that already have behavior problems. An additional factor that could
868 be important in this context is that behavior problems may be secondary to, or influenced by,
869 disease or suboptimal health (Fatjó and Bowen, 2020), particularly given that pets may be
870 lacking medication or veterinary care.

871

872 This brings us to the issue of the effect of the confinement on the quality of life of owners and
873 how they use their pets are a source of support.

874

875 As a crude measure of support, we asked respondents to answer the direct question “How much
876 has your pet helped you during the confinement compared with before?”, on a 7-point Likert
877 scale from much less than before to much more than before. Seventy-four-point three percent
878 of respondents indicated that they had some level of increased support from their pet.

879

880 With respect to the human-animal bond, there were significant increases in C/DORS subscales
881 scores for emotional closeness and interaction with the pet, but a decrease in perceived costs.
882 “Perceived costs” measures the extent to which the presence of the pet interferes with the
883 owner’s freedom of choice to perform other activities. During the confinement the person’s
884 freedom of choice was already restricted, and we would expect the pet to have less effect. These
885 changes in C/DORS offer an insight into the dynamic nature of the human-animal bond, and
886 how it can be affected by changes of circumstance.

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For this study, we needed to have a measure of change of QoL due to the confinement. Although there are single question measures of QoL, such as Cantril's Self-Anchoring Scale, these measure the individual's current situation rather than QoL relative to a previous period. Also, measures like Cantril's Scale have been found to be more influenced by a person's income rather than their emotional wellbeing (Kahneman and Deaton, 2010). Had we used such a measure in the current situation, this could have given a very limited perspective of the effect of the confinement. However, people's perception of quality of life is likely to have been quite distorted by the confinement situation, particularly after a period of several weeks. Even measures like Cantril's scale may not represent the same thing now as they did before the confinement. Given these problems, and the broad range of effects of the confinement, we decided to use our own single question about quality of life change for the individual respondent, supported by four additional measures of the negative effect of the confinement on the household (economic, emotional, health and lifestyle impact). We believe that this provides a good indication of the meaning of quality of life for people within the context of such a major change of circumstances.

When we looked at the correlation between the main question on QoL, and the four additional questions, the strongest associations were with the negative impact on lifestyle and emotional impact, followed by negative health impact, and finally negative economic impact. It is perhaps surprising that economic impact was so poorly correlated with self-reported QoL, but this supports our decision to try to characterize QoL; within this study, and at this moment in time, QoL is largely a measure of the effect the confinement has had on an individual's lifestyle and emotional wellbeing. It is possible that as the confinement continues, the economic impact will increase and the perceived character of QoL will change. This requires further study.

Most respondents (61.8%) indicated that the confinement had negatively affected their QoL. However, 11.4% of people reported an improvement in their QoL, which is quite surprising in the current situation. We did not explore the specific reasons why some people might have an improved QoL, but our measure of QoL is largely influenced by lifestyle and emotional factors; so, perhaps these people lived in locations where the risk of disease was low, or they had fewer family members and dependents to be concerned about, or perhaps they were able to do more of the things they usually enjoyed because they had more time available to them.

In the BLR model that compared factors between people who reported a negative change in QoL and those reporting no change or an improvement in QoL, there was a positive association between owner QoL group and the amount of outdoor space available at home, and with the pet's QoL. Negative lifestyle, emotional and health impacts on the household were all negatively associated with owner quality of life. Of these, the strongest association was with impact on lifestyle. However, as mentioned previously, this may reflect perception of what makes up quality of life in the current circumstances. The degree to which the person gained support from the pet during the confinement was negatively associated with quality of life, which we interpret as meaning that the more severely affected the person's quality of life, the more they gained support from the pet. In studies of the effect of social support on the negative effect of anxiety disorders on quality of life and perceived stress, a similar inverse association was found between support and wellbeing. The implication was that, as in our study, distress

933 activates different coping strategies, including increased seeking of emotional support
934 (Panayiotou and Karekla, 2013).

935

936 Dog owners were 53.2% more likely to be in the same/better QoL change group. This could be
937 explained by the fact that in Spain, one of the only permitted reasons for someone to leave the
938 home was to walk a dog. Anecdotally, this has led to cases of people borrowing dogs from
939 neighbors and family members, so that they had an excuse to go outside. Dog ownership, as
940 opposed to cat ownership, would seem to have a specific advantage in the type of confinement
941 implemented in Spain, that could explain the association between species of pet and owner
942 QoL.

943

944 Many specific variables that might be expected to be associated with the owner's quality of life
945 were not; these included age group, sex, the numbers of different ages of people at home, the
946 level of confinement, and the duration of confinement.

947

948 In the BLR model that examined factors relating to the support the person got from the pet,
949 there was a positive association between getting more support from the pet and the respondent
950 being female, increased emotional closeness (C/DORS) and interaction (C/DORS) with the pet,
951 improvement in the pet's quality of life and improvement in the relationship with the pet.
952 There was a negative association between getting more support from the pet and improved
953 owner quality of life and increased perceived costs. Of these, there was a very strong association
954 with increased emotional closeness (C/DORS). This subscale of C/DORS includes items such as
955 "My pet gives me a reason to get up in the morning", "My pet helps me get through tough
956 times", "My pet is there whenever I need to be comforted", "How often do you tell your pet
957 things you do not tell anyone else?", and "How often do you kiss your pet". The interaction
958 subscale includes "how often do you talk to your pet", "how often do you cuddle/hug your pet",
959 and "How often do you pet your pet". Taken together, the emotional closeness and interaction
960 subscales include many aspects of contact that form part of social support. Social support is a
961 broad construct embracing the positive benefits on health and quality of life derived from
962 interpersonal transactions and provisions derived from social relationships (McNicholas and
963 Collis, 2006). One key feature of a close relationship that is picked up in the C/DORS items is
964 the role of the confidant, someone with whom to share things that are not shared with anyone
965 else. In humans and other gregarious species, the tactile element of social interactions plays a
966 fundamental role in buffering physiological and psychological stress (Pawling et al., 2017).

967

968 It is likely that many people experience loneliness during the confinement. Loneliness can be
969 divided into two main dimensions: social and emotional. Social loneliness is related to an
970 impoverished or negligible social network, whereas emotional loneliness is linked to the
971 absence of access to close relationships. Both dimensions are important, but it is the latter that is
972 more strongly correlated with adverse health and QoL outcomes, and which may be relevant to
973 the situation of confinement when social and physical contact is limited. Loneliness is not a
974 trivial matter; the quantity and quality of social relationships can be considered, by itself, to be
975 a risk factor for mortality (Holt-Lunstad et al., 2010). Our results suggest that during the current
976 outbreak, the relationship people have with their dogs and cats is helping to compensate for the
977 dramatic reduction in their social and physical interactions with people. This is supported by a

978 study on social support (Sarason et al., 1983), which found that pets fulfill many social support
979 functions.

980

981 **Conclusions**

982 Our study found that pet owners gained substantial support from their pets, and that support
983 was increased when the owner's quality of life was more impaired. Support was also associated
984 with increased emotional closeness and interaction with the pet. We also found interesting
985 associations between behavioral problems, general behavioral changes and aspects of the
986 confinement, but some indication that the increased emotional needs of owners could
987 negatively affect pets that had existing behavioral problems. The findings of the study point to
988 ways in which we may be able to minimize the effects of the confinement period.

989

990 However, this study represents a general snapshot of the effects of a particular kind of official
991 confinement in one country. It points to the need for more detailed investigations of behavioral
992 change in dogs and cats during the confinement, and international comparisons.

993

994 **Acknowledgments:**

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998 (FAADA), Single Track Ltd, and the veterinary clinics who helped us to promote the survey.

999

1000 **Ethics statement**

1001 Permission to perform this study was obtained from the Social Sciences Research Ethical
1002 Review Board (SSRERB) at the Royal Veterinary College (URN SR2020-0171).

1003

1004 Survey participants were fully informed about the purpose and background of the study.
1005 Although the survey was anonymous, informed consent was required to participate, and
1006 participants were able to abandon the survey at any point. Participants were also provided with
1007 a link to official information about issues relating to the official confinement, which they could
1008 consult should any questions or concerns arise out of the study.

1009

1010 **Conflicts of interest**

1011 The authors have no conflicts of interest to declare.

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Ethics statement

Permission to perform this study was obtained from the Social Sciences Research Ethical Review Board (SSRERB) at the Royal Veterinary College (URN SR2020-0171).

Survey participants were fully informed about the purpose and background of the study. Although the survey was anonymous, informed consent was required to participate, and participants were able to abandon the survey at any point. Participants were also provided with a link to official information about issues relating to the official confinement, which they could consult should any questions or concerns arise out of the study.

- During COVID-19 confinement in Spain 61.8% of respondents said that their quality of life had deteriorated.
- Poorer self-reported personal quality of life was associated with the lifestyle and emotional impacts of the confinement on the household.
- People whose quality of life had been more severely affected reported that their pet provided proportionately more help for them during confinement.
- The emotional bond between people and their pets strengthened during the confinement.
- Thirty-seven percent of dogs showed signs of difficulty coping with the confinement, but cats were less affected.
- Dogs with pre-existing behavior problems were more likely to have difficulty coping with the confinement.

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