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Citation for published version:

Menor-Campos, D, Hawkins, R & Williams, J 2019, 'Attitudes towards animals among Spanish primary school children', *Anthrozoös*, vol. 32, no. 6, pp. 797-812. <https://doi.org/10.1080/08927936.2019.1673055>

Digital Object Identifier (DOI):

[10.1080/08927936.2019.1673055](https://doi.org/10.1080/08927936.2019.1673055)

Link:

[Link to publication record in Edinburgh Research Explorer](#)

Document Version:

Peer reviewed version

Published In:

Anthrozoös

Publisher Rights Statement:

This is an Accepted Manuscript of an article published by Taylor & Francis in *Anthrozoös* on 07 Nov 2019, available online: <https://www.tandfonline.com/doi/ref/10.1080/08927936.2019.1673055>.

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Attitudes toward animals among Spanish primary school children

Conflict of Interest Statement

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

ABSTRACT

Adult attitudes toward animals have received extensive research attention. By contrast, despite the importance of child-animal interactions for children's development and animal welfare, children's attitudes toward animals have not been fully explored. The aim of this study was to examine Spanish children's attitudes toward animals. A twelve-item scale named the 'Brief Attitudes Towards Animals scale for Children (BATAC)' was designed and completed by 416 Spanish primary school children aged between 6 and 13 years. Analyses revealed that the attitude scale had very good internal consistency (Cronbach's $\alpha = 0.75$; Revelle's $\omega = 0.75$; Sijtsma's $g_{lb} = 0.84$) and three factors, referred to here as 'compassion', 'friendship' and 'opinion on ownership', explained 56.47% of the variance. The sub-scales were used in subsequent analyses alongside the total score. Demographic variables such as age, school year group, ownership of a companion animal, and children's beliefs about animal mind were shown to be associated with children's attitudes toward animals. Being older, being in a higher school year, having a dog or a small mammal at home, and scoring animals higher on sentience capabilities were associated with higher pro-animal attitudes. Other pet types (i.e. cats, birds, reptiles or fish) and children's gender were not associated with attitudes to animals. This study is the first to explore attitudes toward animals among Spanish primary school children, and it highlights attitudinal differences regarding animal species and child demographic variables.

Keywords: attitudes toward animals; beliefs in animal mind; children; companion animals; human-

animal bond; Spanish children

34

36 **INTRODUCTION**

38 'Attitude' is a term used to describe a person's evaluation of different aspects of their lives (Baron,
Byrne & Branscombe, 2006). In the field of animal welfare, attitudes toward animals have been
40 revealed to influence our treatment of animals, in terms of both compassion and humane behaviour,
and more negative behaviours toward animals, such as cruelty (Bertenshaw & Rowlinson, 2009;
42 Hazel, Signal & Taylor, 2011; Knight & Herzog, 2009).

Adults attitudes toward animals have been the subject of numerous research studies, many focusing
44 on the relationships between attitudes and demographic and social factors. For instance, we know
that women usually report more prosocial attitudes toward animals than men (Magnani, Ferri,
46 Dalmau, & Messori, 2017; Paul & Podberscek, 2000; Taylor & Signal, 2005) as do younger people
when compared with older people (Clark, Stewart, Panzone, Kyriazakis & Frewer, 2016; Maria,
48 2006; Ostović, Mikuš, Pavičić, Matković, & Mesić, 2017). Living circumstances, such as having
grown up in urban areas (Kendall, Lobao & Sharp, 2006; Serpell, 2005) and ownership of
50 companion animals (Miura, Bradshaw, & Tanida, 2002; Paul, 2000; Paul & Serpell, 1993; Prokop &
Tunncliffe, 2010; Rothgerber & Mican, 2014) have consistently been reported as having a positive
52 association with adults' attitudes toward animals.

Very few studies have investigated children's attitudes toward animals and what factors might be
54 associated with them, especially in the Spanish population. Kidd and Kidd (1985) found that most
of the 3 to 13-year-old participants in their study displayed positive attitudes toward pet animals,
56 with 99% of children reporting that they wanted a pet. Nevertheless, children's relationships with
animals might change throughout childhood and adolescence. Evidence suggests that children's
58 interest in pets and in biology decreases with age (Borgi & Cirulli, 2015; Prokop, Prokop &
Tunncliffe, 2007), as does emotional concern for and attachments to animals (Muldoon, Williams,

60 Lawrence & Currie 2018; Williams, Muldoon & Lawrence, 2010).

A challenge in this area of research is the availability of age-appropriate child measures of attitudes
62 toward animals. Existing questionnaires aim to measure different facets of child-animal
relationships, for example, The Lexington Attachment to Pets Scale (Johnson, Garrity & Stallones,
64 1992) was designed to measure attachment to pets, while the Children's Treatment of Animals
Questionnaire (CTAQ, Thompson & Gullone, 2003) was designed to measure children's behaviour
66 toward animals. However, none of these instruments have been tested and validated for use with
children growing up in Spain, who are the focus of this paper.

68 *Pet Ownership and attitudes to animals*

Having pets in the home is consistently reported to be associated with more positive perceptions of
70 and more positive behaviours toward animals among both adults (Paul, 2000; Paul & Serpell, 1993;
Rothgerber & Mican, 2014) and children (Lakestani, Donaldson, Verga & Waran, 2011; Miura,
72 Bradshaw, & Tanida, 2002). Research has shown that children who grow up in households with
companion animals, displayed more positive attitudes toward dogs (Lakestani et al., 2011), reported
74 greater emotional connections to living animals, expressed more empathy toward animals, and
perceived more similarities between human and non-human animal emotions (Hawkins & Williams,
76 2016; Rothgerber & Mican, 2014). Furthermore, pet ownership in childhood has been shown to
have a long-term positive impact on attitudes toward animals throughout life (e.g. Hazel, Signal &
78 Taylor, 2011; Serpell, 2004).

However, within the general pattern of positive impacts of pets, there are variations depending on
80 the species (Muldoon et al., 2018; Muldoon, Williams & Currie, 2019). Even though humans seem
to have more intense relationships with animals which are phylogenetically closer to themselves
82 (Batt, 2009; Gebhard, 2013; Serpell, 2004), children would rather choose animals with which they

can interact and cuddle (Gebhard, 2013), establishing stronger emotional bonds with dogs or cats
84 compared with birds or turtles (Hirschenhauser, Meichel, Schmalzer, & Beetz, 2017; Muldoon et
al., 2018).

86 ***Beliefs in animal minds and attitudes to animals***

‘Beliefs in animal minds’ (BAM) is the term used to describe the attribution of mental capacities to
88 animals such as intellect, the ability to reason, and feelings of emotion (Hills, 1995; Knight, Vrji,
Cherryman, & Nankoosing, 2004). Such beliefs have been associated with positive attitudes and
90 behaviours toward animals, such as caring and humane behaviour, concern for animals’ wellbeing,
empathy, and compassion toward animals (Ellingsen, Zanella, Bjerkås, & Indrebø, 2010; Herzog &
92 Galvin, 1997; Hills, 1995; Knight et al., 2004). Hawkins & Williams (2016) found that UK
children's BAM scores were related to emotional attachment and positive attitudes toward animals.
94 The belief that animals are conscious and capable of experiencing negative sensations and emotions
is at the core of most people's concerns about animal welfare (Mendl & Paul, 2004), and may form
96 a moral barrier against animal mistreatment.

The Present Study

98 In a previous paper (Author, Author, & Author, In Press), we explored belief in animal mind among
Spanish primary school children, and considered the effects of a child’s age, school year group,
100 gender, and pet ownership on these. The current study aimed to examine Spanish children's attitudes
toward animals, and the potential associations demographic variables such as age, gender, school
102 year, or having a companion animal, might have with them. We also examined the relationship
between children’s beliefs about animal minds and children’s attitudes toward animals within this
104 Spanish sample.

106 On the basis of previous findings, it was predicted that there would be variations in children's

attitudes toward animals related to age and school year (Prediction 1), gender (Prediction 2), and
108 having a companion animal at home (Prediction 3). Additionally, it was predicted that having
greater belief in animal mind would be related to more positive attitudes toward animals (Prediction
110 4).

112 MATERIAL AND METHODS

114 *Participants*

116 A total of 416 questionnaires were collected from children within one primary school in Cordoba,
Spain, with a response rate of 97.17%. The primary school was selected because of its size (three
118 lines of primary, meaning three groups in each school year), type of centre (state centre) and
location (Cordoba, Spain).

120 The age of the children surveyed ranged from six to thirteen years ($M = 9.18$; $SD = 1.73$). Table 1
displays demographic information from the respondents, alongside with means, and median of
122 BATAAC total score, calculated as a sum of all item scores. Fifty-two children did not report their
gender, nor if they had a pet at home, therefore their answers were excluded in subsequent analyses
124 involving some of these variables.

– Table 1 around here –

126 *Ethical statement*

This study followed Spanish ethical guidelines (Universidad de Córdoba, 2015) and the head
128 teacher provided informed consent for children to participate 'in loco parentis'. Children were
invited to participate and could withdraw from the study at any time if they did not wish to
130 complete data collection.

Questionnaire Design

132 A questionnaire comprising two sections (part one and part two) was used in this study. Part one
comprised demographic questions (age, gender, school year and pet ownership) alongside the
134 Child-BAM: Children's Beliefs about Animal Minds scale (Hawkins & Williams, 2016) and part
two comprised a new scale for children's attitudes toward animals, the 'Brief Attitudes Toward
136 Animals scale for Children' (BATAC).

Measures

Children's Attitudes toward Animals (BATAC)

The 'Brief Attitudes Toward Animals scale for Children' (BATAC) was used (See Table 2). This
140 measure comprised twelve items adapted from previously published scales (Hawkins & Williams,
2016; Johnson, Garrity & Stallones, 1992; Marsa-Sambola et al., 2016; Thompson & Gullone,
142 2003; Templer, Salter, Baldwin, Dickey, & Veleber, 1981) which covered topics such as attachment,
compassion, treatment of animals, and relationship with companion animals. Items were selected
144 following the criteria of appropriateness for 6 to 13 year-old children, and not causing any ethical
concern or psychological distress among children.

146 Children were asked to rate their agreement with each statement, from 1 ('fully disagree') to 5 ('fully
agree'), with the aid of an emoticon rating system of five faces displaying emotions, from very sad,
148 neutral, to very happy. A total score was calculated for each child by summing all item scores (range
12-60). The attitude scale was coded, and higher scores represented more pro-animal attitudes.

Children's Beliefs about Animal Minds

An adapted version of the Children's Beliefs about Animal Minds scale (Child-BAM; Hawkins &
152 Williams, 2016) was designed to examine children's beliefs regarding the capacity of eight animal
species (human being, cow, dog, sparrow, frog, otter, chimpanzee, and goldfish) to be intelligent, to

154 feel pain, fear, happiness, and sadness. The statements were translated into Spanish following the
back-translation procedure (Brislin, 1970). Higher scores represent higher perception of animals'
156 capabilities, including higher levels of cognition (intelligence) and sentience (aggregate value of
pain, fear, happiness and sadness scores). Subcategories of 'sentience' and 'cognition' were
158 analysed in detail, as well as total BAM scores across categories.

In Author, Author and Author (In Press), we analysed belief in animal mind of Spanish primary
160 school children and whether they were associated with a child's age, school year group, gender, and
pet ownership. In this paper, we analysed the relationship between Spanish children's belief in
162 animal mind and their attitudes toward animals.

The Child-BAM scale is reliable within our Spanish population (Author et al., in Press): Cronbach's
164 $\alpha = 0.903$; Revelle's $\omega = 0.93$; Sijtsma's $g_{lb} = 0.85$.

Procedure

166 The head teacher of the school was personally contacted by the first author, who provided
information on the study (questionnaire and supplementary material), inviting the school to take
168 part. Once consent was obtained from the head teacher and faculty of the primary school,
questionnaires were distributed among teachers with an information sheet which explained the aim
170 of the survey, and how to carry it out with their pupils. Teachers were asked not to influence the
children's answers, but to offer support if a child did not understand a question.

172 The survey was carried out during class time. Each child completed the questionnaire individually
at their classroom desk and could ask for help from a teacher if they had difficulty in reading or
174 understanding any of the questions. The questionnaire used appropriate terminology for the age
group, and no personal details were collected beyond their gender, age, and pet ownership.

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Statistical analysis

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Since the majority of variables failed to fulfil the criteria of equal variance and normal data

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distribution (Kolmogorov-Smirnov normality test $p < 0.05$), non-parametric statistical tests were

applied. Therefore, Independent sample Kruskal-Wallis test, Related-samples Friedman's Two-Way

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analysis of variance or Mann-Whitney U test, were performed to analyse differences between

groups of those variables that appeared as predictors of children attitudes toward animals, and post-

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hoc pairwise comparisons were performed to confirm significant differences when necessary.

Spearman's correlation coefficient or Spearman's rho were conducted to identify the linear

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correlation between personal variables of respondents, beliefs in animal mind and attitudes toward

animals. To examine the predictive value of participant variables and beliefs about animal minds on

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scores for attitudes toward animals, Categorical Regression analyses were conducted, as

recommended by Starkweather (2017). Successive regression analyses were carried out after

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excluding those predictors that were revealed as unimportant in previous analyses.

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RESULTS

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Children's Attitudes toward Animals

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The mean value of the Brief Attitudes toward Animals scale for Children (BATAAC) was 51.18 out

of a maximum possible value of 60 ($SD = 7.58$; Median = 53.23). Means, SD and median values

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from each item are shown in Table 2. Item n.1 "Playing with a pet is fun" was scored the highest,

while item n.10 "A pet is a lot of work" was scored the lowest, demonstrating children's positive

204

attitudes toward animals.

206 – Table 2 around here –

208 *Principal Component Analysis*

210 Following Hutcheson and Sofroniou (1999) criteria, our scale showed a good sampling adequacy
212 (Kaiser-Meyer-Olkin KMO = 0.778), while Bartlett's test of sphericity concluded that factor
214 analysis was appropriate ($p < 0.001$). Initial analysis using principal component analysis (PCA)
extracted three components from the attitude variables, explaining 56.47% of the variance. Table 2
shows the eigenvalues of the items in the varimax rotated matrix. Factor 1 was labelled
'compassion' and included question n. 7, 8, 9 and 12; factor 2 was labelled 'friendship' and
included question n. 1, 4, 6, and 11; and factor 3 was labelled 'opinion on ownership' and included
question n. 2, 3, 5 and 10 (Table 2). These three subscales were used in subsequent statistical
analyses.

220 *Examining the reliability of the BATAC*

In order to test the reliability of the scale, several consistency analyses were performed following
222 Peters (2014): Cronbach's alpha (Cronbach, 1951), omega (Revelle & Zinbarg, 2009), and the
greatest lower bound to reliability index (glb; Sijtsma, 2009) using 'R' statistical software package
224 (R Development Core Team, 2014). The BATAC scale showed very good concordance (Cronbach's
 $\alpha = 0.75$; Revelle's omega = 0.75; Sijtsma's glb = 0.84). Only one item (n. 10 'A pet is a lot of
226 work') seemed to slightly reduce its reliability (Table 2).

228 Spearman's correlation analysis showed that the three factors were correlated (Table 3).
Nonetheless, Related-samples Friedman's Two-Way analysis of variance showed that they were
230 scored differently ($p < 0.001$; pairwise comparisons Adj. $p = 0.001$). Factor 2 'Friendship' achieved

the highest scores ($M = 4.672$; $SD = 0.575$; Median = 5), followed by Factor 1 'Compassion' ($M =$
232 4.33; $SD = 1.067$; Median = 5) while Factor 3 'Opinion on Ownership' achieved the lowest ($M =$
234 3.782; $SD = 1.006$; Median = 4). Regarding their reliability, only Factor 1 showed greater
consistency than the whole scale (Table 3).

236 – Table 3 around here –

238 ***Demographic Variables, Attitudes toward Animals, Beliefs about animal minds and.***

240 Categorical Regression analysis established that the independent variables school year, having a
dog, having a small mammal, and Child-BAM scores, significantly predicted children's attitudes
242 toward animals ($F_{391,6} = 11.228$; $p < 0.001$), explaining 13.6% of the variance. The independent
variables age, gender, perception of animals' intelligence, having a cat, a reptile, a bird or a fish,
244 were not significant predictors of children's attitudes ($p > 0.05$). Table 4 shows categorical regression
analysis by sub-scales (factors).

246 *Age and Gender differences in attitudes to animals*

Being older and being in a higher school year were related to higher scores on BATAAC,
248 'compassion' (Factor 1) and 'opinion on ownership' (Factor 3), and therefore, higher concern for
animals. By contrast, gender was not related to BATAAC or any of its factors. Independent sample
250 Kruskal-Wallis test showed that there was a significant variation among school year groups
($p < 0.001$). Children in first (age $M \pm SD = 6.35 \pm 0.48$; Median = 6) and second year (age $M \pm SD =$
252 7.38 ± 0.49 ; Median = 7) of primary school displayed significantly poorer attitudes toward animals
than those in third (age $M \pm SD = 8.37 \pm 0.51$; Median = 8), fourth (age $M \pm SD = 9.48 \pm 0.6$; Median
254 = 9), fifth (age $M \pm SD = 10.33 \pm 0.51$; Median = 10) and sixth years (age $M \pm SD = 11.58 \pm 0.64$;

Median = 12) (Figure 1). Pairwise comparisons established that the differences were due to first vs
256 third, fourth, fifth and sixth year (*Adj. p*<0.001), and to second vs third (*Adj. p* = 0.015), fifth (*Adj. p*
= 0.005) and sixth year (*Adj. p* = 0.015). First year scores and second year scores were similar (*Adj.*
258 *p* = 1.000), as would second and fourth (*Adj. p*>0.05) (for Means, *SD* and median values of BATAAC
total scores, see Table 1).

260 *Pets and attitudes to animals*

Children who owned a dog displayed more positive attitudes toward animals (*M* = 52.02; *SD* =
262 7.42; Median = 53.73) than those who did not (*M* = 50.55; *SD* = 7.66; Median = 53; Mann-Whitney
U test *p* = 0.039), as did children who owned a small mammal (*M* = 53.87; *SD* = 6.09; Median =
264 55.5) compared with those who did not (*M* = 50.86; *SD* = 7.68; Median = 53; Mann-Whitney U test
p = 0.01).

266 *Beliefs about animal minds (Child-BAM) and attitudes to animals*

There were significant associations between scores for beliefs about animal minds (Child-BAM)
268 and attitudes toward animals (BATAAC). However, there were differences in this association
depending on the type of mental capabilities. Scoring animals higher on sentience capabilities
270 (aggregate of pain, fear, happiness and sadness) was significantly related to scoring higher on total
attitudes (BATAAC), as well as the sub-measures 'compassion' (Factor 1) and 'friendship' (Factor 2)
272 (see Table 4). However, intelligence capabilities of animals was not related to attitude scores, for
either total scores (BATAAC) or any sub-measures (factors).

274 Looking at the individual animal types, scoring dogs, humans, sparrows, frogs, otters and
chimpanzees higher on all mental capabilities (total BAM scores) was related to higher total
276 attitudes toward animals (BATAAC) scores (see Table 4). Beliefs in mental abilities on all surveyed
animal species were related to higher levels of 'Compassion' (Factor 1). Scoring dogs' or

278 chimpanzees' mental capabilities higher was also related to more positive attitudes toward 'Owning'
a companion animal (Factor 3). Plus, scoring human, frog, otter and chimpanzees' higher on mental
280 capabilities were related to higher levels of 'Friendship' attitudes (Factor 2).

– Table 4 around here –

282 – Figure 1 around here –

284 **DISCUSSION**

The aim of this study was to examine Spanish children's attitudes toward animals and to examine
286 the potential associations with demographic variables such as age, gender, school year or having a
companion animal on these. We also examined the relationship between children's attitudes toward
288 animals and Child-BAM, for the first time in a Spanish population. Firstly, it is important to note
that Spanish children in this study displayed highly positive attitudes toward animals (a mean of
290 51.18 out of 60), these attitudes differed depending on demographic factors but overall, were
predicted by children's beliefs about animal minds. In a previous paper (Author, Author & Author,
292 In Press), we found widespread beliefs about animal minds in this Spanish child sample, and now in
this paper, their relation to pro-animal attitudes have been highlighted. These findings are similar to
294 those found in children in Scotland, UK (Hawkins & Williams, 2016; Hawkins et al., 2017). Both
findings are promising for the welfare of their companion animals, and other animals children may
296 interact with, given the association between Child-BAM and acceptance of animal cruelty (Hawkins
& Williams, 2016). This study further highlights the importance of targeting BAM within education
298 programmes to promote children's positive attitudes toward animals (Hawkins & Williams, 2016)

Some established human-animal interaction questionnaires have been developed to decipher
300 complex child-animal relationships, but none with a comprehensive perspective on attitudes to
animals that is brief enough to be used with younger children in classroom settings. The Lexington

302 Attachment to Pets Scale (Johnson, Garrity & Stallones, 1992) was neither designed for children
nor validated for its use among them and although validated for measuring attachment to dogs and
304 cats, there is no information regarding other types of pet. The Children's Treatment of Animals
Questionnaire (CTAQ, Thompson & Gullone, 2003), was designed for children but has so far only
306 been validated for use among 8 to 10 years-old children, and only to test their behaviour, not
feelings or attitudes toward animals. Marsa-Sambola et al. (2016) published a scale to examine
308 children's attachment to pets. However, none of these instruments, nor other existing measures,
have been completed by children growing up in Spain, who are the focus of this paper. This study
310 utilised a new short measure of children's attitudes toward animals, the 'Brief Attitude Toward
Animals Scale for Children' and its validation for use with children Spain has been demonstrated in
312 the present study. Although the BATAAC scale showed good reliability as a whole, it is important to
note that the scale appeared to have three principal components, referred here to as 'Friendship',
314 'Compassion' and 'Opinion on Ownership'. This finding is important since some demographic and
other personal variables related to some of these components but not to all. This tool is therefore
316 promising, but further work is required to validate its further use using the three sub-scales.
Additionally, the use of its sub-scales might provide further important information regarding
318 children's attitudes toward animals and potential cultural differences. The results presented in this
paper reveal that Spanish children's attitudes toward animals are influenced by a range of
320 demographic variables, in line with findings from UK populations.

Age differences for attitudes to animals

322 This study revealed that attitudes toward animals differ depending on children's age. In this study,
age and school year influenced children's attitudes scores, with older children and those attending a
324 higher school year, displaying more pro-animal attitudes compared to their younger schoolmates.
This is in line with previous findings that older children have been reported to score BAM

326 differently than younger children (Knight et al., 2004; Hawkins & Williams, 2016). However, age
differences for BAM seem to be inconsistent across studies with some finding the opposite result to
328 the present study, although not all are focused on children (Byrd, Widmar & Fulton, 2017; Driscoll,
1992; Furnham & Pinder, 1990; Kellert & Berry, 1981; Maria, 2006) . Moreover, some studies
330 found no age difference for BAM (Köhler, 2001; Kılıç & Bozkurt, 2013). Children appear to lose
interest in biology (Prokop, Prokop & Tunnicliffe, 2007) and pets (Borgi & Cirulli, 2015) as they
332 grow up. Older children report more negative attitudes toward animals compared with younger
children (Muldoon, Williams, Lawrence, Lakestani & Currie, 2009) and children’s attachment to
334 pets seems to weaken with age (Hirschenhauser et al., 2017; Muldoon et al., 2018). Nevertheless,
there are also findings that contradict these. For instance, Williams, Muldoon and Lawrence (2010)
336 found no differences among 9 to 13-year-old children for attitudes toward animals in a UK
population, however, reductions in pro-animal attitudes may reduce as children develop through
338 adolescence. Our results show more positive attitudes among older Spanish children compared to
the younger children. Age differences in children’s attitudes toward animals are therefore still not
340 fully understood, and there may be other factors, not included in these studies, which might be
affecting their attitudes. Children of different ages can interpret questions in different ways
342 especially when the question is ambiguous. For example, Question n. 10 “A pet is a lot of work”
was considered as a negative attitude when participants rated it high, but it might be argued that pets
344 are indeed a lot of work if you consider the responsibility of having one as their welfare is up to
you, but this may not necessarily reflect a negative attitude toward that pet.

346 ***Gender differences for attitudes to animals***

This study found no gender differences in Spanish children’s attitudes to animals. This is in contrast
348 to research with adults where gender differences are frequently reported. Adult women have
consistently been reported to display more pro-animal attitudes (Apostol, Rebege & Miclea, 2013;

350 Menor-Campos et al., in press; Colombo, Crippa, Calderari, & Prato-Previde, 2017; Knight et al.,
2004; Ozen et al., 2009; Paul & Podberscek, 2000; Sánchez-Muñoz, 2017; Serpell, 2005; Taylor &
352 Signal, 2005). However, the reasons why this gender difference exists remains unclear but some
speculations have been made, for example, some authors suggest that it is due to differences in
354 biological pathways (e.g., Maria, 2006), while others argue that society and cultural norms have an
influence on attitudes and behaviour toward animals (e.g., Peek, Bell, & Dunham, 1996).

356 The lack of gender differences in attitudes toward animals that we have found in our Spanish child
sample is similar to previously reported in UK child research (Hawkins & Williams, 2016). A key
358 concern for research on attitudes to animals is to explore how and when gender differences emerge.
Hastings, Zahn-Waxler, Robinson, Usher and Bridges (2000) found that girls, from the second year
360 of life to adolescence, displayed higher concern for others than boys. More recently, Tardif-Williams
and Bosacki (2015) reported that after a humane education in summer camp, all children reported
362 sharing significantly closer bonds and friendships with their companion animals but interestingly,
these results were more pronounced for girls compared to boys, and among younger children (aged
364 6 to 8 years) compared to older children (aged 9 to 12 years) children. Furthermore, the older boys
scored lower on measures for humane treatment of their companion animals compared to the
366 younger girls. Nevertheless, the potential mechanisms underpinning the development of attitudes
toward animals, including the role of society and social processes and biological/genetic factors
368 requires further research.

Pet Ownership and attitudes to animals

370 The current study shows that having companion animals in Spain is associated with more positive
attitudes to animals, in line with a wide range of studies. Having pets at home has typically been
372 reported to be associated with more positive attitudes toward, and better knowledge of animals in a
range of previous studies (Miura et al., 2002; Paul, 2000; Paul & Serpell, 1993; Prokop &

374 Tunnicliffe, 2010; Rothgerber & Mican, 2014). Children who grow up in households with pets have
been found to hold more favourable attitudes toward animals as adults (e.g. Serpell, 2004).
376 Likewise, adults owning pets hold more positive attitudes toward animals (Hazel, Signal & Taylor,
2011). For instance, Lakestani et al. (2011) found that children with pet dogs displayed more
378 positive attitudes to dogs than children who did not have a pet dog. More recently, Rothgerber &
Mican, (2014) found that children with pets displayed greater connections to living animals,
380 expressing more empathy toward animals and perceiving greater human-animal similarity for both
primary and secondary emotions. These findings may be explained by the strong bond that is
382 usually established between dogs or cats and their owners (Mariti, Ricci, Zilocchi, & Gazzano,
2013), or because taking care so closely of an animal such as cats or dogs might change people's
384 perceptions toward animal issues (Mariti et al., 2012; Mariti et al., 2017).

The results presented in this paper suggest that having a dog or a small mammal at home is related
386 to higher pro-animal attitudes. This finding is interesting because it provides insights into Spanish
children's pet preferences and may be explained by children's preference for animal species that can
388 be touched and cuddled and those which can facilitate physical activities such as play, supporting
anthropomorphic play activities (Gebhard, 2013).

390 *Attitudes to animals and Beliefs about Animal Minds*

This study revealed that children's attitudes toward animals were predicted by children's BAM
392 scores. Beliefs about animal minds have been associated with caring and humane behaviour,
concern for animals' wellbeing, empathy, compassion and attitudes toward animals, (Hills, 1995;
394 Herzog & Galvin, 1997; Knight et al., 2004; Ellingsen et al., 2010). Recently, Hawkins & Williams
(2016) found that Child-BAM was related to children's emotional attachment and positive attitudes
396 toward animals.

398 Aggregating values of children's beliefs about animals' abilities to feel pain, fear, happiness and
sadness allowed us to distinguish a relationship between children's beliefs in sentience capabilities
of animals and children's attitudes toward animals, compared to their beliefs about an animals'
400 cognitive abilities (intelligence). There was no relationship between beliefs in animal intelligence
and children's attitudes toward animals. By contrast, sentience beliefs are highly associated with
402 children's attitudes toward animals. This finding has implications for animal welfare education
programmes, which should aim to reinforce messages relating to both emotional and cognitive
404 abilities of animals, but particularly emotional capabilities, which in turn could positively influence
children's attitudes toward animals.

406 Beliefs in the minds of cows or fish were less likely to be related to children's attitudes toward
animals compared to belief in the minds of humans, dogs, chimpanzees, sparrows, otters or frogs,
408 which seemed to be highly influential. Interestingly, these species achieved the lowest scores on
Child-BAM scale (Author et al., In Press), and it is likely that children had lower contact with these
410 species, potentially explaining these results.

Limitations and future approaches

412 Sampling children from just one primary school might have contributed to a biased data set, and it
was not possible to examine the influence of a wider range of personal attributes which could
414 impact children's attitudes toward animals. Schools may differ for example, on what animal topics
they already teach, some teachers may be more interested in animals than others, there may be
416 differences between rural and urban schools, and other factors such as school size could also have
an impact on results and so should be included in future research. Cultural, education, living
418 conditions and personal background have been associated with different attitudes to animals in
previous studies. Even parents' attitudes are crucial for children's attitude development. This may
420 explain the amount of variance unexplained, which must encourage further research on issues such

as family influence on attitude development.

422 Secondly, the Brief Attitude Toward Animals Scale for Children (BATAAC) needs to be validated in
other samples. The term 'animal' seems to be widely generic, while 'pet' appeared in seven out of
424 twelve statements, so the scale might be measuring attitudes toward companion animals rather than
animals as a whole.

426 The high average BATAAC scores have to be taken cautiously, as they can be the result of a ceiling
effect due to a social desirability bias (see Randall & Fernandes, 1991 for further explanation). Are
428 children answering the way they think they should or the way they really feel about animals? It
would be helpful for future research to relate children's attitudes toward animals to direct
430 observations of child-animal interactions. Triangulating reports from different sources including the
children, teachers and parents in future research may also be useful, although parents tend to
432 highlight their children's kindness and might be influenced by social desirability bias as well.

Another limitation is that only measuring whether a child has an animal within the home does not
434 mean that particular child have any role in their daily care, or are attached to that animal. Future
research should explore children's relations with their companion animals in more depth , including
436 indicators of children's engagement with their pets and attachment to that pet, which may impact
upon their attitudes toward animals.

438 **Conclusions**

Spanish primary school children in the current study reported highly positive attitudes toward
440 animals, similar to other countries. The new brief animal attitude scale used (BATAAC) seems
promising and analysis has revealed three main components, explaining more than a half of its
442 variance. Components have been referred here to as 'Compassion', 'Friendship' and 'Opinion on
Ownership', and are influenced by various demographic variables including age, school year, having

444 a dog or a small mammal at home. Children's belief in animal mind was related to their attitudes
toward animals, but only for sentience abilities, not cognitive capabilities, and not in relation to all
446 animals. This study highlights important implications for animal welfare education, but further
research is required on the development of children's attitudes toward animals throughout childhood
448 and adolescence, and how such attitudes may impact upon both positive and negative behaviours
toward animals.

450 NOTES

452 1. We use the term 'animal' throughout this article to mean all non-human animals.

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TABLES

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Table 1. Summary of respondents' variables alongside with means, SD and medians from BATAAC total scores.

Variable	Number	%	Mean	SD	Median
Gender					
Female (F)	179	43.03	50.78	7.74	53.00
Male (M)	185	44.47	52.01	6.94	54.00
Non reported	52	12.5	-	-	-
School Year Group					
1	46 (14F/11M)	11.06	44.71	8.07	44.00
2	42 (20F/20M)	10.10	46.19	10.25	48.00
3	101 (45F/52M)	24.28	52.33	6.71	54.00
4	81 (30F/27M)	19.47	51.71	7.38	53.45
5	70 (35F/33M)	16.83	53.20	5.70	55.00
6	76 (33F/42M)	18.27	52.77	5.86	55.00
Age					
6	30	7.2	44.24	8.57	43.27
7	42	10.1	47.71	8.98	48.00
8	79	19.0	50.42	8.41	53.00
9	80	19.2	51.36	7.34	53.00
10	80	19.2	52.55	6.78	55.00
11	60	14.4	52.76	5.31	54.00
12	36	8.7	53.20	6.07	55.50
13	5	1.2	53.25	5.38	55.00
Pet Ownership					
Yes	302	72.60	51.69	7.50	54.00
No	62	14.90	49.82	7.67	52.00
Non reported	52	12.5	-	-	-
Type of Animals at home					
Dogs	183	43.99	52.02	7.42	53.73
Birds	75	18.03	51.15	7.92	54.00
Cats	53	12.74	51.27	7.76	54.00
Small mammals	42	10.10	53.87	6.09	55.50
Turtles and other reptiles	41	9.86	52.46	7.26	55.82
Fish	32	7.69	49.75	7.60	52.50

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Table 2. Mean, *SD*, and median values; Principal Component Analysis - Eigenvalues of a varimax rotated matrix - values higher than .5 are in bold; and Reliability analysis - Cronbach's alpha, Revelle's omega and Sijtsma's glb reliability coefficients excluding each item - for each item of BATAAC. [Original statement in Spanish]. * item was reverse scored.

Statements [original in Spanish]	Mean	SD	Median	Principal Component Analysis			Reliability analysis		
				Factor 1 'Compassion'	Factor 2 'Friendship'	Factor 3 'Opinion on ownership'	alpha	omega	glb
1. <i>Playing with a pet is fun</i> [Jugar con una mascota es divertido]	4.73	0.71	5.00	-0.044	0.601	0.108	0.755	0.742	0.848
2. <i>Touching an animal scares, fears or upsets me*</i> [Me molesta, me da miedo o asco ver o tocar un animal]	4.10	1.39	5.00	0.160	0.069	0.775	0.736	0.739	0.838
3. <i>Speaking to a pet is a silly thing*</i> [Hablarle a una mascota es una tontería]	3.84	1.47	5.00	0.072	0.215	0.647	0.748	0.750	0.864
4. <i>A pet can make its owner happy</i> [Una mascota puede hacer feliz a su dueño]	4.66	0.89	5.00	0.209	0.738	0.017	0.749	0.739	0.843
5. <i>Having an animal at home is a bad idea*</i> [Tener un animal en casa es una mala idea]	4.17	1.35	5.00	0.192	0.238	0.683	0.725	0.729	0.850
6. <i>A pet can be like a friend</i> [Una mascota puede ser como un amigo]	4.70	0.89	5.00	0.168	0.756	-0.081	0.748	0.737	0.827
7. <i>When I see an animal that is hurt, I feel upset</i> [Cuando veo que un animal está herido me siento mal]	4.46	1.17	5.00	0.813	0.188	0.156	0.715	0.710	0.832
8. <i>When I know that an animal is lost, I feel upset</i> [Cuando me entero de que un animal se ha perdido me siento mal]	4.31	1.21	5.00	0.786	0.280	0.084	0.721	0.719	0.844
9. <i>When someone hits or mistreats an animal I feel upset</i> [Me molesta ver que alguien golpea o trata mal a un animal]	4.36	1.35	5.00	0.829	-0.004	0.121	0.726	0.706	0.839
10. <i>A pet is a lot of work*</i> [Las mascotas dan mucho trabajo]	3.04	1.49	3.00	-0.013	-0.155	0.597	0.778	0.778	0.871
11. <i>I love feeding my pet</i> [Me gusta darle de comer y beber a mi mascota]	4.62	0.87	5.00	0.062	0.585	0.227	0.752	0.743	0.847
12. <i>When someone annoys or frightens an animal, I feel upset</i>	4.25	1.40	5.00	0.799	-0.003	0.057	0.737	0.717	0.821

626 Tables

628 Table 3. Spearman's rho correlation and reliability analysis - Cronbach's alpha, Revelle's omega and Sijtsma's glb reliability coefficients- of BATAAC factors.

<i>Factor</i>	<i>Spearman's rho</i>		<i>Reliability study</i>		
			<i>alpha</i>	<i>omega</i>	<i>glb</i>
	Factor 1	Factor 2			
Factor 1 'Compassion'			0.870	0.840	0.870
Factor 2 'Friendship'	0.376**		0.680	0.600	0.680
Factor 3 'Opinion on Ownership'	0.256**	0.272**	0.700	0.650	0.710

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Tables

632 Tables

Table 4. Correlations and Categorical Regression outcomes

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Variable	Statistic	BATAC	'Compassion' Factor 1	'Friendship' Factor 2	'Opinion on ownership' Factor 3
Age	r_a	0.212**	0.126*	0.038	0.197**
Gender	r_b	0.073	0.063	0.039	0.049
School year group	r_a	0.221**	0.131**	0.036	0.203**
Total BAM	r_a	0.186**	0.218**	0.239**	0.035
Cognition	r_a	0.028	0.034	0.090	0.030
Sentience	r_a	0.185**	0.239**	0.158**	0.056
Dog	r_a	0.156**	0.129*	0.081	0.132**
Cow	r_a	0.092	0.137**	0.081	0.013
Child BAM	r_a	0.138**	0.159**	0.158**	0.057
Human	r_a	0.108*	0.130**	0.097	0.059
Sparrow	r_a	0.117*	0.168**	0.122*	0.031
Frog	r_a	0.160**	0.214**	0.180**	0.074
Otter	r_a	0.213**	0.197**	0.163**	0.126*
Chimpanzee	r_a	0.074	0.113*	0.093	0.038
Goldfish	r_a				
Age	B	-	-0.43	-	-
Gender	B	-	0.116	-	-
School year	B	0.304	0.588	0.204	0.282
Dogs	B	0.088	-	0.093	0.125
Birds	B	-	-	-	-
Cats	B	-	-	-	-
Small mammals	B	0.114	0.074	0.137	-
Turtles and other reptiles	B	-	-	-	-
Fish	B	-	-	-	-
Child-BAM	B	0.143	0.187	0.196	-
	$Adj\ r^2$	13.6	12	12.2	8.7
	F	11.228	4.572	13.314	8.583
	p	<0.001	<0.001	<0.001	<0.001
	df	6; 391	12; 315	4; 357	4; 397

a. Pearson correlation b. Spearman's rank correlation coefficient.**. Correlation is significant at the

636 0.01 level (2-tailed) *. Correlation is significant at the 0.05 level (2-tailed).

638 Figures

640 Figure 1. Brief Attitude Toward Animals Scale for Children (BATAAC) scores by school year group,
642 means with a 95%CI. A high score indicates a more positive attitude.

