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1 Running head: PREVENTION THROUGH EDUCATION

2

3 Assessing the Effectiveness of the Animal Welfare Education Programme
4 'Prevention through Education' for Primary School Children

5

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17

18

19 **Assessing the Effectiveness of the Animal Welfare Education Programme ‘Prevention**
20 **through Education’ for Primary School Children**

21

22 **Running title:** PREVENTION THROUGH EDUCATION

23

24 **Abstract**

25

26 Animal welfare education aims to promote positive relationships between children and
27 animals thus improving animal welfare, yet few scientific evaluations of these programmes
28 exist. This study aimed to evaluate the effectiveness of an animal welfare education
29 programme, ‘Prevention through Education’ developed by the Scottish Society for the
30 Prevention of Cruelty to Animals (Scottish SPCA). The programme included four
31 interventions focusing on pets, wild animals, farm animals and general animal rescue, that
32 were analysed individually. Key factors including: knowledge about animals, knowledge
33 about the Scottish SPCA, attachment to pets, attitudes towards animals and beliefs about
34 animal minds were assessed using a self-complete questionnaire administered to a sample of
35 1,217 primary school children, aged 7-8 and 10-11 years, across Scotland. A pre-test, post-
36 test and delayed post-test method was employed and test schools were compared to control
37 schools. Results from the evaluation showed a significant impact of the programme on
38 knowledge about animals and knowledge about the Scottish SPCA for all interventions. The
39 pets and farming intervention both had a significant impact on children’s beliefs about animal
40 minds. The results showed trends towards improvements in a range of other child-animal
41 measures but these failed to reach significance. This study highlights the importance of
42 teaching animal welfare education to primary school children for early prevention of animal

43 cruelty, discusses the need to base this education on theory and research to find effective
44 change, and demonstrates how evidence-based practice can inform future education
45 programmes.

46

47 **Keywords:** Animal welfare, animal cruelty, children, education, evaluation

48

49 **Introduction**

50

51 Animals play a significant role in children's lives across the world; many ranking
52 their pets as one of their most important and intimate relationships (Melson, 2001; Muldoon,
53 Williams & Lawrence, 2014). Fonseca et al (2011) found that children are intrinsically
54 motivated to treat animals well, respect animals and hold beliefs concerning human
55 responsibilities towards animals. Both animals and children can benefit from this close
56 relationship. For children, having pets can be extremely beneficial in terms of social support,
57 reducing anxiety (e.g. Melson & Schwarz, 1994) and becoming more empathetic towards
58 others (Melson, Peet & Sparks, 1992). Attachment to a pet is associated with higher quality
59 of life and other indicators of mental health and wellbeing among children and adolescents
60 (Marsa-Sambola et al., 2016; Muldoon, Williams & Lawrence, under review). Animals can
61 benefit through improved welfare and treatment. Paul and Serpell (1993) found that children
62 who have a greater involvement in caring for their pets are more likely to be concerned about
63 animal welfare and hold more humane attitudes. The relationship between children and
64 animals can be complex with both positive and negative attributes (Melson, 2003; Bryant,
65 1990) and animal neglect and abuse remains a significant problem across the UK and the rest
66 of the world (RSPCA, 2016; Scottish SPCA, 2016; ASPCA, 2016, RSPCA Australia, 2016).

67 Little research specifically addresses the issue of animal cruelty in children,
68 particularly in recent years, with only ten studies being published since 2011 (Hawkins,
69 Hawkins & Williams, In Press; Hawkins & Williams, 2016²). Innovative approaches, such as
70 community interventions that target factors associated with behaviour towards animals (e.g.
71 attitudes and knowledge) are crucial for preventing animal cruelty. Research has rarely
72 investigated animal cruelty in general child populations, instead targeting specific sub-groups
73 (e.g. juvenile offenders), extreme behaviour (e.g. violent crime) or traumatic life events such
74 as child abuse or domestic violence (Ascione 2001; Hawkins et al., In Press). Ideally, animal
75 welfare education programmes should be preventative and universal, targeting all children.
76 Investigating methods for prevention of animal cruelty in the general child population is
77 important because many cases of animal cruelty are of neglect and abandonment, due to a
78 lack of knowledge of appropriate care and specific species welfare needs (Vermeulen &
79 Odendaal, 1993; Scottish SPCA, 2013). Animal cruelty is not always intentional. Young
80 children may lack the cognitive maturity to understand that their behaviours may be
81 detrimental to welfare and may harm an animal through natural exploration or as a result of a
82 lack of knowledge about animal behaviour and appropriate care (Ascione, 2005). Educating
83 children about humane animal treatment could therefore prevent unintentional animal cruelty
84 with benefits for both the safety of children (such as preventing dog bites, Shen et al., 2016)
85 and the welfare of animals.

86 Animal welfare education for children may be one of the most fruitful approaches of
87 improving the welfare of animals. Understanding the mechanisms underlying the child-
88 animal relationship is crucial for the development and evaluation of such programmes. Three
89 broad but interrelated psychological factors play a role in children's relationships with
90 animals: knowledge of welfare needs, empathy towards animals and attitudes towards
91 animals (Muldoon et al., 2009). The specific factors that have been shown to affect children's

92 treatment of animals include: empathy, compassion (Ascione, 1992), knowledge and accurate
93 understanding of specific animal needs (Coleman, Hall & Hay, 2008; Muldoon et al., 2009;
94 Williams, Muldoon & Lawrence, 2016), attitudes (Kellert, 1985), direct experience or
95 proximity to animals (Kahn & Kellert, 2002) and attachment to and feelings of responsibility
96 towards animals (Muldoon, Williams & Lawrence, 2015). Children's beliefs about animals'
97 minds (Child-BAM, Hawkins & Williams, 2016¹), that is holding the belief that non-human
98 animals are sentient, have the ability to think, feel, communicate and are self-aware, may also
99 affect how children interact and treat particular animals (Burghardt, 2009; Hawkins &
100 Williams, 2016¹). Conceptualising animals as insentient and unintelligent may lead to
101 behaviours that are considered unacceptable (Knight et al., 2004). Animal welfare education
102 programmes that target these specific factors, could therefore potentially increase children's
103 humane treatment of animals. Animal welfare education aims to build upon children's
104 interest and experience with animals, with the overall goal of increasing children's ability and
105 willingness to understand another animal's perspective (cognition) and share their emotions
106 and feelings (affect) as well as increasing pro-social behaviour (Faver, 2010).

107 There is limited but growing evidence that classroom interventions can promote
108 empathy and positive attitudes and behaviour towards non-human animals (Muldoon et al.,
109 2009). Previous studies investigating the effectiveness of educational interventions have
110 found: a positive increase in comfort with pets and understanding of pet care (Zasloff, Hart &
111 Weiss, 2003), closer bonds and friendships with pets (Tardif-Williams & Bosacki, 2015) a
112 greater consideration of welfare needs (Jamieson et al., 2012), increased knowledge of
113 animals (O'Hare & Montminy-Danna, 2001) and responsible pet ownership (Mariti et al.,
114 2011; Coleman et al., 2008), increased empathy and treatment of animals (Angantyr et al.,
115 2016; Arbour, Signal & Taylor, 2009), more positive attitudes towards animals (Nicoll et al.,
116 2008; O'Hare & Montminy-Danna, 2001; Fonseca et al., 2011), humane attitudes and human-

117 directed empathy (Ascione & Weber, 1996) and enhanced perception of animals (Mariti et
118 al., 2011) and animal sentience (highlighting the benefits of an in-class approach for positive
119 change; Fonseca et al., 2011).

120 School-based humane education or animal welfare education varies widely on many
121 dimensions. Programmes vary in specific topics addressed, how the programme is delivered
122 and their frequency and duration. Education varies greatly in pedagogical approaches
123 including lesson plans that build academic skills while teaching humane concepts. Many
124 successful education programmes involve interacting with animals (for example, Nicoll et al.,
125 2008), while others do not (for example, Ascione, 1992). Although education programmes
126 vary, most focus on “instilling, reinforcing, and enhancing young people's knowledge,
127 attitudes, and behaviour toward the kind, compassionate, and responsible treatment of human
128 and animal life” (Ascione, 1997, p. 60). The potential of universal animal welfare education
129 programmes as a prevention strategy has been largely ignored and evaluative research is still
130 in its infancy (Faver, 2010). Although a small number of evaluative studies do exist, there
131 remains the need for rigorous, methodologically sound research to evaluate the efficacy of
132 these programmes (Arbour et al., 2009).

133 The aim of this research was to therefore evaluate the effectiveness of an animal
134 welfare education programme for primary school children delivered by the Scottish Society
135 for the Prevention of Cruelty to Animals (Scottish SPCA). The Scottish SPCA has a
136 continued presence in schools reaching over 300,000 children annually across all parts of
137 Scotland. The Scottish SPCA’s ‘Prevention through Education’ programme comprises of four
138 interventions, each individually designed to address primary school children’s knowledge
139 about the welfare needs of animals, as well as encourage empathy and positive attitudes
140 towards animals. The ultimate goal of these interventions is to prevent animal cruelty from an
141 early age. The interventions follow the schools existing pedagogy, tie in with the Curriculum

142 for Excellence in Scotland, are founded on sound educational and psychological principles
143 and have been extensively piloted with schools. The workshops engage children in team-
144 work, role play, discussion and debate. Children are encouraged to voice their views and
145 experiences of animal welfare, to act as positive role models, and to learn about potential
146 career opportunities with animals. The workshops use a variety of materials to engage
147 children with animal welfare issues.

148 This research uses a controlled intervention design employing repeated testing (pre-
149 test, post-test and delayed post-test) and comparing children who participated in a workshop
150 to those who had not yet participated, to discriminate between the impact of the educational
151 workshops and general time effects. The evaluation research was carried out independently of
152 the welfare organisation that designed and implemented the education programme.

153

154 **Research questions**

155 1. How effective is the ‘Scottish SPCA Animal Friendly Citizens’ intervention for
156 knowledge, attitudes, attachment and beliefs about animal minds?

157 2. How effective is the ‘You and Your Pet’ intervention for knowledge, attitudes, attachment
158 and beliefs about animal minds?

159 3. How effective is the ‘Wildlife Welfare’ intervention for knowledge, attitudes, attachment
160 and beliefs about animal minds?

161 4. How effective is the ‘Food and Farm Animal Welfare’ intervention for knowledge,
162 attitudes, attachment and beliefs about animal minds?

163 *Predictions:* There will be a significant pre- to post-test change for: knowledge, Child-BAM,
164 attitudes towards animals, and attachment to pets for each intervention. It was also predicted
165 that these observed changes would be maintained six weeks later.

166

167 **Methods and Materials**

168 Design: A mixed factorial design was used to evaluate each intervention. One variable
169 was phase of testing (time), a repeated measures variable with two conditions: pre-tests (day
170 before workshops) and post-tests (day after workshop). Delayed post-tests (six weeks later
171 following schools summer holiday) analysis was carried out on a sub-sample of the total, based
172 on schools who agreed to participate. The between subject's variable was the intervention
173 condition (intervention versus control). The same control group data was used in each analysis.

174 Participants: The test group comprised a total of 1090 children from 22 primary schools
175 (Male, n = 552, Female, n = 538, Mean age = 9.7 years range 6.4-12.2 years). Children were
176 sampled from two year groups (Primary 4: ages 7-8 years 52.8% of sample and Primary 6: 10-
177 11 years 47.2% of sample). Some schools included composite classes where target year groups
178 were combined with another year group into classes. The overall age range in this study is an
179 important phase of moral development (e.g. Kohlberg, 1958), it is also a time of conceptual
180 change in biology knowledge (e.g. Williams, 2012; Myant & Williams, 2005), when children
181 are likely to be receptive to learning about animal welfare needs. Research also highlights that
182 it is a target age group for many animal welfare organisations' education programmes
183 (Muldoon et al., 2009).

184 Opportunistic sampling was employed whereby schools that had already booked the
185 Scottish SPCA interventions were invited to participate in the research study. The
186 interventions included 'Scottish SPCA Animal Friendly Citizens' (AFC; n = 771), 'Wildlife
187 Welfare' (WW; n = 157), 'You and Your Pet' (YYP; n = 39) or 'Food and Farm Animal
188 Welfare' (FFAW; n = 183). The control group (n = 127) included three primary schools (Male,
189 n = 71, Female, n = 56, Mean age = 9.4 years range 6.4-11.9 years). The control group had no

190 previous engagement with the Scottish SPCA programme. Due to time constraints for the
191 schools, only a small percentage of the schools agreed to participate in delayed post-tests and
192 so a total of 447 children, from seven test schools only, completed all three questionnaires.
193 Children in the control groups completed pre-test and post-test questionnaires only.

194 Ethical Considerations: The ethical guidelines of the British Psychological Society,
195 specifically relating to research with children, were adopted for this research and ethical
196 consent was granted from the University of Edinburgh's Clinical and Health Psychology Ethics
197 Committee. All information was treated confidentially and kept in a secure location at all times;
198 child and school data were anonymised during data preparation by adopting identity numbers.

199 Intervention Materials and Procedure: The pre-tests, intervention workshops and post-
200 tests were conducted over three consecutive school days; the control group followed the same
201 pattern but did not receive an intervention workshop on the second day. A self-complete
202 questionnaire was developed as the evaluation tool and administered to all children by a teacher
203 at each stage of the study during class time.

204 ***'Prevention through Education' Programme Interventions***

205 Each test school chose to participate in one of four one-hour interactive educational
206 interventions which were delivered by a Scottish SPCA staff member within school
207 classrooms. All interventions began with a 15-minute PowerPoint slideshow about the
208 Scottish SPCA and factual information about the focus of the intervention including
209 photographs and video footage. The slideshows were followed by one themed activity relating
210 to the focus of the intervention, a card game, and then ended with a general question and
211 answer session. Common themes of promoting animal welfare knowledge, positive attitudes,
212 empathy towards animals, and knowledge of the Scottish SPCA were integral to all
213 interventions but each had a specific focus. The interventions are updated each year, covering

214 the same content but may be delivered in a different format, taking into account current
215 research outcomes and suggestions to ensure effectiveness. This allows schools to engage with
216 the Scottish SPCA's education programme annually by selecting different workshops each
217 year.

218 '*Scottish SPCA Animal Friendly Citizens*' introduced the Scottish SPCA's work within the
219 community. With the use of videos, this workshop gave pupils an opportunity to role-play as
220 animal rescue officers, think about how they would rescue an animal and what equipment
221 would be required. This intervention emphasised how pupils can be responsible animal
222 welfare citizens, in particular when it comes to hazards to animals caused by litter.

223 '*Wildlife Welfare*' focused on the diversity of Scottish wildlife that the Scottish SPCA rescues
224 and introduced how animals need to compete to survive the seasonal weather and how human
225 activities can cause conflict with wildlife. This intervention included an educational board
226 game. The use of video clips helped pupils gain a better understanding of an animal's journey
227 from arriving at the wildlife rescue centre through to release.

228 '*You and Your Pet*' focused on the Scottish SPCA's work across Scotland, ownership
229 responsibilities and pet care along with health and hygiene around animals. This intervention
230 also involved a maze challenge game.

231 '*Food and Farm Animal Welfare*' intervention highlighted the Scottish SPCA's work with
232 Scotland's farming and food industries. Children were challenged to identify what was fact or
233 fiction in a farming challenge game and also learned about farm animal produce and food
234 packaging labels.

235 *Pre and post-questionnaires*

236 A quantitative self-complete questionnaire served as the evaluation tool for this study.
237 The paper, tick box questionnaire used appropriate terminology for 7-13 year-olds and was UK
238 language compatible. The questionnaire was piloted with three test schools (n = 91, girls = 50,
239 boys = 41, ages 6-9 = 27, ages 10-13 = 64) confirming the questionnaires suitability for the age
240 and understanding of the participants. The questionnaire took approximately 20 minutes to
241 complete. The questionnaire, as well as asking for age, gender and school class, tested for a
242 wide range of variables relating to positive and negative interactions with animals, including:
243 *Knowledge of Animal Welfare Needs*: Knowledge about animals, specifically relating to the
244 content of the workshops, was assessed using one scale that asked children to 'decide whether
245 you think the following statements are true or false' with nine items (e.g. 'you should never
246 give hedgehogs milk'). Each item had three options (1-'true', 2-'not sure' or 3-'false'); a total
247 score was calculated. ($\alpha = .61$).

248 *Knowledge of the Scottish SPCA*: Knowledge of the Scottish SPCA was assessed using one
249 question 'What do you know about the Scottish SPCA?' with 10 items scored on a five-point
250 Likert scale (1-'strongly agree'- 5-'strongly disagree'); a total score was calculated. ($\alpha = .66$).

251 *Attitudes towards Animals*: This measure was adapted from the Pet Attitude Scale (PAS-M;
252 Munsell et al., 2004; Daly & Morton, 2006) and comprised three scales, each with various
253 items scored on a five-point Likert scale (1-'strongly agree'- 5-'strongly disagree'). The first
254 scale related to pet animals and comprised nine items (e.g. 'All pet animals should be cared for
255 by humans'). The second scale related to wild animals and comprised eight items (e.g. 'Wild
256 animals should live free in the wild'). The third scale related to farm animals and comprised
257 12 items (e.g. 'All farm animals should be able to go outdoors'). An overall total score for
258 attitudes towards animals was calculated (minimum 28, maximum 140), as well as subtotals
259 for each type of animal (pet/wild/farm). ($\alpha = .72$).

260 *Attachment to Pets*: The Short Attachment to Pets Scale for Children and Young People,
261 developed and validated by Marsa-Sambola et al. (2015, 2016), was used to measure
262 attachment to pets. One nine-item scale asked children to ‘Please tell us how you feel about
263 your favourite pet animal’. Each item was scored on a five-point Likert scale (‘strongly agree’
264 – ‘strongly disagree’). Total scores were calculated (minimum score 9, maximum score 45). (α
265 = .85).

266 *Children’s Beliefs about Animal Minds (Child-BAM)*: The Child-BAM measure (Hawkins &
267 Williams, 2016¹) comprised five scales each with eight items. Each question (e.g. ‘Do you
268 think the following animals are clever?’) related to a specific emotion
269 (clever/pain/happiness/sadness/fear). These questions were repeated for eight animals
270 (dog/cow/human/robin/frog/badger/chimpanzee/goldfish). Each item was scored on a five-
271 point Likert scale (1-‘strongly agree’- 5-‘strongly disagree’). Overall sentence scores were
272 calculated for each participant by adding the total score across scales ($\alpha = .92$).

273

274 ***Statistical Analysis***

275 1090 test participants and 127 control participants completed questionnaires at two sample
276 points (pre-test and post-test). 447 participants in the test group completed questionnaires at
277 three sample points (pre-test, post-test and delayed post-test). For the purpose of this
278 evaluation, total scores were added for each key variable for each individual at each sample
279 point and data was analysed at the individual level using SPSS Statistics 22 (SPSS Inc.), with
280 a two-tailed significance of $p < 0.05$.

281 Initially the data was checked for outliers using box-plots. Normal distribution of dependant
282 variables was checked using the Kolmogorov–Smirnov test, histograms, and skewness and

283 kurtosis values. This indicated that the data was not normal ($p < .000$). Strongly positively
284 skewed variables were transformed using logarithmic transformation (log 10) and strongly
285 negatively skewed variables were transformed using reflect and logarithmic transformation
286 (log 10). These transformations produced satisfactory skewness and kurtosis values. The
287 assumption of homogeneity of variances was checked using the Levene's test ($p > .05$) and the
288 assumption of sphericity was tested using Mauchly's test of sphericity ($p > .05$). To correct for
289 unequal variances and violation of sphericity, Greenhouse-Geisser correction was used if the
290 estimated epsilon (ϵ) was less than 0.75 and the Huynh-Feldt correction was used if estimated
291 epsilon (ϵ) was greater than 0.75 (Maxwell & Delaney, 2004). Studentized residuals were
292 calculated and residuals $\geq \pm 3$ (standard deviations) were classified as outliers and not
293 included in the analysis. Normality checking based on residuals using Q-Q plots indicated
294 that the data did not violate the assumption of normality.

295 Each intervention (AFC; $n = 771$; YYP; $n = 39$, WW; $n = 157$; FFAW; $n = 183$) was analysed
296 compared to the control group ($n = 127$) in separate analyses. A two-way mixed model
297 ANOVA using time (phase of testing: pre-test, post-test) as the within subject, group (two
298 conditions: test and control) as between subjects, tested main effects and interactions effects.
299 The main focus of the results reported below are the interaction effects which show a
300 difference in performance for intervention groups but not the control.

301 A one-way repeated measures ANOVA for each intervention group was used to determine
302 differences in scores between pre-test, post-test and delayed post-test for each intervention.
303 This was to give an indication of whether improvements were maintained six weeks after the
304 education programme (following the school summer holiday).

305

306 **Results**

307

308 **1. How effective was the ‘Scottish SPCA Animal Friendly Citizens’ intervention for**
309 **knowledge, attitudes, attachment and beliefs about animal minds?**

310

311 The AFC intervention significantly increased knowledge about animals and knowledge about
312 the Scottish SPCA. There was a statistically significant interaction between the intervention
313 condition and time on knowledge about animals, ($F(1,794) = 29.4, p = .000, \eta^2 = .004$) and
314 knowledge about the Scottish SPCA ($F(1,710) = 23, p = .000, \eta^2 = .031$). There was a
315 statistically significant interaction between the intervention condition and time on and
316 attitudes towards pets ($F(1,749) = 5.22, p = .023, \eta^2 = .007$) but the group difference was
317 found at pre-test and not post-test (Table 1 and 2).

318 Although there were trends towards improvements in a range of other measures including
319 attitudes, attachment and Child-BAM following AFC (see Table 1) these failed to reach
320 significance: Child-BAM, ($F(1,721) = 2.84, p = .093, \eta^2 = .004$), attachment to pets,
321 ($F(1,746) = .48, p = .49, \eta^2 = .001$), attitudes towards animals, ($F(1,631) = .215, p = .643,$
322 $\eta^2 = .000$), wild animals, ($F(1,711) = .0, p = .994, \eta^2 = .000$), farm animals ($F(1,693) = .24, p$
323 $= .63, \eta^2 = .000$).

324 **Long-term effects:** Significant pre-test-delayed post-test changes were found for knowledge
325 about animals and knowledge about the Scottish SPCA, Table 4). All other variables were
326 non-significant ($p > .05$).

327

328 **2. How effective was the ‘You and Your Pet’ intervention for knowledge, attitudes,**
329 **attachment and beliefs about animal minds?**

330

331 The YYP intervention significantly increased knowledge about animals, knowledge about the
332 Scottish SPCA and Child-BAM. There was a statistically significant interaction between the
333 intervention condition and time on knowledge about animals ($F(1,149) = 23.61, p = .000, \eta^2 =$
334 $.14$), knowledge about the Scottish SPCA, ($F(1,141) = 15.96, p = .000, \eta^2 = .102$) and Child-
335 BAM ($F(1,143) = 8.54, p = .004, \eta^2 = .06$). The intervention significantly increased children's
336 attachment to pets; there was a statistically significant interaction between the intervention
337 condition and time on attachment to pets, ($F(1,145) = 1.01, p = .016, \eta^2 = .04$), however the
338 significance was lost following simple main effects analysis (see Tables 1 and 2).

339 Although there were trends towards improvements in attitudes following YYP (see Table 1)
340 these failed to reach significance: attitudes towards animals ($F(1,136) = 1.2, p = .28, \eta^2 =$
341 $.009$), attitudes towards pets, ($F(1,144) = .72, p = .398, \eta^2 = .005$), wild animals ($F(1,143) =$
342 $1.51, p = .222, \eta^2 = .01$) and farm animals, ($F(1,148) = 1.27, p = .26, \eta^2 = .008$). Main effects
343 are presented in Table 3.

344 **Long-term effects:** Significant pre-post-delayed post-test changes were found for knowledge
345 about the Scottish SPCA and Child-BAM (Table 4). All other variables were non-significant
346 ($p > .05$).

347

348 **3. How effective was the 'Wildlife Welfare' intervention for knowledge, attitudes,**
349 **attachment and beliefs about animal minds?**

350

351 The WW intervention significantly increased knowledge about animals and knowledge about
352 the Scottish SPCA. There was a statistically significant interaction between the intervention

353 and time on knowledge about animals ($F(1,261) = 32.1, p = .000, \eta^2 = .11$) and knowledge
354 about Scottish SPCA ($F(1,240) = 25.8, p = .000, \eta^2 = .097$) (see Tables 1 and 2).

355 Although there were trends towards improvements in a range of other measures including
356 Child-BAM, attachment and attitudes following WW (see Table 1) these failed to reach
357 significance: Child-BAM, ($F(1,233) = 2.21, p = .14, \eta^2 = .009$), attachment to pets,
358 ($F(1,252) = 0, p = .99, \eta^2 = .000$), attitudes towards animals, ($F(1,200) = .35, p = .56, \eta^2 =$
359 $.002$), attitudes towards pets, ($F(1,227) = 3.03, p = .083, \eta^2 = .013$), wild animals ($F(1,224) =$
360 $.54, p = .463, \eta^2 = .002$) and farm animals ($F(1,222) = .062, p = .803, \eta^2 = .000$). Main effects
361 are presented in Table 3.

362 **Long-term effects:** Significant pre-post-delayed post-test changes were found for knowledge
363 about animals and knowledge about the Scottish SPCA (Table 4). All other variables were
364 non-significant ($p > .05$).

365

366 **4. How effective was the ‘Food and Farm Animal Welfare’ intervention for each** 367 **variable?**

368 The FFAW intervention significantly increased knowledge about animals, knowledge about
369 the Scottish SPCA and Child-BAM. There was a statistically significant interaction between
370 the intervention condition and time on knowledge about animals ($F(1,280) = 16.02, p = .000,$
371 $\eta^2 = .054$), knowledge about the Scottish SPCA, ($F(1,268) = 55.9, p = .000, \eta^2 = .17$) and
372 Child-BAM, ($F(1,259) = 21.7, p = .000, \eta^2 = .08$). There was a statistically significant
373 interaction between the intervention and time on attitudes towards pets, ($F(1,271) = 3.92, p =$
374 $.049, \eta^2 = .014$). However, the significance was lost following simple main effects analysis
375 (see Tables 1 and 2).

376 Although there were trends towards improvements in a range of other measures including
377 attachment and attitudes following FFAW (see Table 1) these failed to reach significance:
378 attachment to pets, ($F(1,246) = 2.91, p = .089, \eta^2 = .012$), attitudes towards animals,
379 ($F(1,244) = 3.59, p = .059, \eta^2 = .015$), attitudes towards wild ($F(1,265) = 3.16, p = .076, \eta^2 =$
380 $.012$) and farm animals ($F(1,266) = 2.88, p = .091, \eta^2 = .011$). Main effects are presented in
381 Table 3.

382 **Long-term effects:** Significant pre-post-delayed post-test changes were found for knowledge
383 about animals, knowledge about the Scottish SPCA and Child-BAM (Table 4). All other
384 variables were non-significant ($p > .05$).

385

386 **Discussion**

387 The purpose of this study was to independently evaluate the ‘Prevention through
388 Education’ programme developed by the Scottish SPCA. The animal welfare education
389 programme had, overall, positive outcomes. However, significant changes were only found
390 for knowledge about animals and knowledge about the Scottish SPCA for all of the
391 interventions and also in Child-BAM for the YYP and FFAW interventions. It is encouraging
392 that the hypotheses are supported for key variables and that the results are consistent with
393 previous findings (e.g. Arbour et al., 2009), though further work is required to examine how
394 we can significantly impact other child-animal variables. First, we will consider changes in
395 knowledge and attitudes, and then attachment and beliefs about animal minds, before turning
396 our attention to strengths and weaknesses of the study and future directions for research.

397 Knowledge

398 The largest impact from all of the interventions was on knowledge about animals’
399 needs and knowledge about the Scottish SPCA. The finding that education programmes have
400 the largest impact on knowledge is supported by previous studies, such as Lakestani, Aguirre
401 and Orihuela (2015) who found increased knowledge about farm animals following a farm
402 intervention for 8-10 year-olds in Mexico, and Mariti et al, (2011) who found an increase in
403 knowledge and education of the animal world following a classroom intervention with
404 children aged 9-11 years in Italy. Accurate knowledge about animals and their appropriate
405 needs can lead to positive animal welfare (Vermeulen & Odendaal, 1993). Thus, increasing
406 knowledge through education, as demonstrated here, could have positive implications for
407 children’s treatment of animals. Knowledge about the Scottish SPCA also significantly
408 increased following all interventions. Animal welfare organisations rely on public awareness
409 for their charitable and rescue work, raising awareness of the charity among children engages
410 children with the charity from a young age. The Scottish SPCA report: “Since 2010, reports
411 of children being involved in cruelty to animals have decreased 16% and calls to our helpline
412 from adults alerted by children to animals in danger have increased 545%” (Scottish SPCA
413 Annual Review 2013, p.19).

414 Attitudes

415 There were no significant differences in attitudes following the interventions, despite
416 some indication of trends towards positive attitude change. Previous research has shown,
417 however, that attitudes towards animals can be significantly improved through education
418 (Fitzgerald, 1981; Malcarne, 1983). Methodological differences in studies may help to
419 explain these inconsistencies in research findings. A strength of the current study is that we
420 used a control group, whereas not all evaluation studies that have found significant changes
421 in attitudes included a control group (e.g. O’Hare & Montminy-Danna, 2001; Mariti et al.,
422 2011). In our study it is notable that children who did not participate in the education

423 programme displayed a negative change in attitudes over time towards pet animals. Each
424 intervention involved a single workshop lasting only one hour, therefore the trend towards
425 improvements in children's attitudes towards animals bodes well for positive behaviour given
426 that attitudes can correlate with behaviour (e.g. Kraus, 1995). However, further research is
427 required to investigate how we can make a significant and long-term impact on children's
428 attitudes towards animals through school-based education.

429 The lack of a significant change in attitudes towards animals may, in part, be
430 explained in terms of ceiling effects given that both the test and control children had highly
431 positive attitudes towards pets (60.3% scoring above the mean) at baseline. This left little
432 scope for improvement and is consistent with previous research that evidences children
433 demonstrate a great interest in pets and positive attitudes towards pets (Melson, 2003).
434 Another explanation of our insignificant result may be that the research team were evaluating
435 an existing programme that was not based on theoretical attitude or behaviour change models.
436 Theory helps us to form the basis of interventions but there may not be 'one size fits all' for
437 animal welfare education. Nevertheless, each theory and model of behaviour change, as well
438 as those relating to attitudes, has validity and may provide useful recommendations to design
439 animal welfare interventions (see Kwasnicka et al., 2016; De Leeuw et al., 2015). It is
440 important to note that increasing knowledge is beneficial, however, information and
441 exhortation are the least effective methods for changing behaviour (Bandura, 1977;
442 Campbell, 1963) and 'being told what to do' is also not effective (Branson et al., 2012).
443 Psychological behaviour change models highlight the importance of perceived benefits of a
444 behaviour and perceived barriers to a behaviour, which animal welfare programmes should
445 aim to target. There are many benefits of helping animals both intrinsic and extrinsic that
446 children can be made aware of, as well as potential barriers which may be preventing children
447 from behaving appropriately toward animals, such as lack of knowledge about welfare needs

448 and appropriate care, that can be taught through these interventions (Muldoon et al., 2015).
449 By basing animal welfare interventions on theory and research, we may see more effective
450 change in attitudes and behaviour.

451 Attachment

452 Children scored higher on attachment to pets following each intervention but the
453 change was not significantly different from the control group. There are implications in
454 promoting positive attachment for animal welfare given that low attachment predicts higher
455 acceptance of animal cruelty and neglect (Hawkins & Williams, in preparation) and high
456 attachment tends to correlate with animal welfare (Melson, 2001). Further research is needed
457 to investigate how we can successfully promote attachment to animals. Similarly, with
458 attitudes, both the test and the control children scored high on attachment to pets at baseline
459 (63% scoring above the mean) which may explain our insignificant findings. Consistent with
460 previous research (e.g. Melson, 1990), our study shows that children demonstrate high
461 attachment to their pets. Promoting attachment should be an aim of animal welfare
462 interventions (Muldoon et al., 2009) and future research should investigate the best methods
463 of targeting children's attachment to animals. Ideally, a logic model for animal welfare
464 interventions should be built that integrates theory and research on childhood attachment and
465 attachment-based interventions.

466 Beliefs about animal minds

467 Children's beliefs about animal minds increased following all interventions but only
468 significantly for the YYP and FFAW interventions. This result is consistent with previous
469 research that class-room based interventions can increase perceptions of animal sentience
470 (Fonseca et al., 2011). However, in our case, only the pets and farm animal interventions
471 were effective at doing so. The significant improvements seen in Child-BAM found for YYP

472 and the FFAW interventions is extremely positive in terms of animal welfare given that
473 beliefs about animal minds is associated with: caring and humane behaviour, concern for
474 animal's well-being, empathy, compassion and attitudes towards animals, attachment to pets
475 and lower acceptance of intentional and unintentional animal cruelty and animal neglect
476 (Herzog & Galvin, 1997; Hills, 1995; Knight et al., 2004; Ellingsen et al., 2010; Hawkins &
477 Williams, 2016¹).

478 A possible explanation as to why the FFAW intervention was effective at increasing
479 Child-BAM is that it included material about animal sentience, such as a video about a cow
480 limping and a farmer being given advice from a Scottish SPCA inspector; this video
481 highlighted that cows feel pain, which could explain the increase in Child-BAM scores in this
482 intervention. Similarly, the YYP intervention encourages the children take an animal's
483 perspective. For example, in the board game they are asked "You see children chucking
484 stones at an injured dog. Should you help the dog?". This leads them to consider that an
485 animal might feel pain and that it is wrong to hurt an animal. The YYP workshop also
486 focused on familiar animals that children form emotional attachments with, it was a highly
487 interactive session and the workshop used emotional stimuli with examples of animal neglect
488 including a rabbit and cat that had been abandoned in a box, and a puppy with broken legs.
489 Animal sentience was not a focus in the AFC or WW workshops, highlighting the importance
490 of including material on animal sentience in animal welfare education programmes.

491 As demonstrated by the current findings and from previous studies, animal welfare
492 education can have positive impacts but improvements may be subject to decline over time
493 (e.g. Jamieson et al., 2012). Improvements in the current study were maintained for at least
494 six weeks but only for animal needs knowledge and knowledge about the Scottish SPCA.
495 Follow-up instruction or frequent, repeated education sessions may be more beneficial than a

496 one-off intervention workshop for long-term positive impact (Malcarne, 1983; Coleman et
497 al., 2008; Williams et al., in preparation).

498

499 **Limitations and Future Research**

500 As a quasi-experimental study evaluating an existing intervention running in schools
501 throughout Scotland, there were some limitations in terms of the control the research team
502 had over sample selection and school recruitment. This meant different interventions had
503 different sample sizes and the control group was formed of schools who did not engage at all
504 with the Scottish SPCA, and thus were difficult to recruit to a research study involving the
505 Scottish SPCA education programme. These limitations would be remedied with a more
506 rigorous experimental design, however, this would be at the expense of evaluating real work
507 interventions as they are carried out in normal practice.

508 This study only examined children in Scotland and should therefore be generalised to
509 other cultural contexts with caution. Cultural (e.g. Risley-Curtiss, Holley & Wolf, 2006) and
510 demographic factors (e.g. Hensley, Tallichet & Dutkiewicz, 2011) may influence the
511 relationship between children and animals and so it is important that future research and
512 animal welfare education programmes are tailored to various multicultural, social and
513 economic backgrounds (Ascione, 1997; Faver, 2010).

514 This study did not examine moderation factors such as age, gender, demographics, pet
515 ownership, family affluence, or personality measures (Mathews & Herzog, 1997). These
516 variables each have an impact on human-animal interactions and might influence how
517 receptive children are to animal welfare education interventions. Further research is required
518 to examine the effectiveness of animal welfare education interventions for different target
519 groups of children, who may pose different levels of risk to animals.

520

521 **Animal Welfare Education Implications**

522 There are a range of educational implications of these findings. Firstly, animal welfare
523 education can be designed to fit into the classroom and have a beneficial impact on
524 knowledge and other variables related to the humane treatment of animals. This programme
525 demonstrates how animal welfare education can be built into a range of curriculum areas
526 (science, citizenship and even literacy and maths). A survey of almost 800 teachers across
527 England and Wales was conducted by the RSPCA (2014) found that 83% felt that animal
528 welfare should be part of the national curriculum and 93% stated that they would teach
529 animal welfare in the classroom if time permitted. The Scottish SPCA's 'Prevention through
530 Education' is linked to Scottish education systems Curriculum for Excellence, and adopts
531 pedagogical approaches appropriate for primary school children which has helped its
532 acceptance in schools across Scotland.

533 Secondly, while single workshop interventions lasting one hour have a clear impact
534 on knowledge, longer term interventions are likely to be required for attitude change and
535 positive behavioural change (Malcarne, 1983; Coleman et al., 2008; Williams et al., in
536 preparation); the implications are that schools should participate in animal welfare workshops
537 on a regular basis. Thirdly, this study is one of the first to scientifically evaluate the
538 effectiveness of an animal welfare education programme for primary school aged children,
539 despite recognition of the importance of education by a wide range of animal welfare
540 organisations. An online survey of 22 animal welfare organisations and humane societies
541 revealed that although organisations create education programmes, they do not evaluate their
542 effectiveness (Muldoon et al., 2009). Scientific evaluations, such as this one, are invaluable
543 tools for demonstrating the positive impact of such programmes, finding out what is working

544 or not working, and reviewing and enhancing programmes. Finally, this research has led to
545 the creation of useful age-appropriate assessment tools including new measures, such as the
546 Child-BAM measure. This evaluation tool, and specific measures, will be available to other
547 research teams and welfare organisations to promote the evaluation of animal welfare
548 education programmes.

549

550 **Conclusions**

551 This study provides evidence of the effectiveness of the Scottish SPCA's 'Prevention
552 through Education' programme in successfully improving knowledge of animal welfare
553 needs, knowledge about the Scottish SPCA and children's beliefs about animal minds. While
554 there were positive trends towards attitude change and stronger attachment following the
555 interventions, further research is required to reveal how these can be promoted effectively
556 through school based education. By basing animal welfare education on theory and research
557 (such as attitude and behaviour change models as well as child development and attachment
558 models), we can start to build theoretically-driven logic models for our interventions, which
559 may lead to more successful outcomes and effective changes in child-animal interactions.
560 There is currently a lack of evidence-based methods that positively influence the factors
561 underlying the child-animal relationship, which are crucial for designing and implementing
562 successful education programmes. Through the evaluation of animal welfare education
563 programmes, significant and sustained improvements can be made that will positively
564 influence the treatment of animals, preventing both unmotivated and motivated animal
565 cruelty.

566

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571

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716

717

718 **Table 1.** Descriptive Statistics.

Intervention	Pre-test		Post-test	
	M	SD	M	SD
Knowledge about animals (high score = high knowledge)				
AFC	3.5	1.9	4.9	2
YYP	4	1.8	6	1.8
WW	3.4	1.6	4.9	2
FFAW	3.6	1.5	4.5	1.8
Control	3.2	1.7	3.3	2
Knowledge about the Scottish SPCA (low score = high knowledge)				
AFC	1.19	.1	1.1	.1
YYP	1.2	.1	1.1	.1
WW	1.23	.1	1.1	.1
FFAW	1.23	.1	1.1	.1
Control	1.26	.1	1.24	.1
Children's beliefs about animal minds (low score = high BAM)				
AFC	1.8	1.8	1.75	.1
YYP	1.8	1.8	1.72	.1
WW	1.8	1.8	1.77	.1
FFAW	1.8	1.8	1.73	.1
Control	1.8	1.8	1.78	.1
Attitudes towards animals (low score = positive attitudes)				
AFC	1.69	.08	1.68	.1
YYP	1.69	.07	1.67	.07
WW	1.7	.07	1.69	.08
FFAW	1.69	.07	1.67	.07
Control	1.7	.08	1.69	.09
Attitudes towards pet animals (low score = positive attitudes)				
AFC	1.16	.08	1.15	.08
YYP	1.16	.09	1.15	.08
WW	1.17	.08	1.17	.08
FFAW	1.16	.08	1.15	.07
Control	1.13	.08	1.16	.1
Attitudes towards wild animals (low score = positive attitudes)				
AFC	1.16	.13	1.14	.13
YYP	1.16	.12	1.13	.11
WW	1.18	.13	1.15	.13
FFAW	1.15	.13	1.12	.13
Control	1.18	.13	1.16	.15
Attitudes towards farm animals (low score = positive attitudes)				
AFC	20	3.8	19.9	3.8
YYP	19.8	3.5	18.9	3.3
WW	20	4	20	4.3
FFAW	20	3.8	19	3
Control	21	4.6	20.8	4.9
Attachment to animals (low score = high attachment)				
AFC	1.14	.14	1.12	.14
YYP	1.19	.15	1.11	.17
WW	1.14	.15	1.13	.15
FFAW	1.14	.14	1.1	.13
Control	1.15	.16	1.13	.15

719 *Note.* Bold indicates a significant result at the $p < .05$ level. AFC=Animal Friendly Citizens,
 720 YYP= You and Your Pet, WW= Wildlife Welfare, FFAW= Food and Farm Animal Welfare.

721

722 **Table 2.** Results from simple effects analysis for each intervention.

Test x Control at Pre-test				Test x Control at Post-test			
<i>df</i>	<i>F</i>	<i>p</i>	η^2	<i>df</i>	<i>F</i>	<i>p</i>	η^2
'Scottish SPCA Animal Friendly Citizens' intervention							
Knowledge about animals							
1,831	3.2	.074	.004	1,824	65.7	.000	.074
Knowledge about Scottish SPCA							
1,757	32.3	.000	.041	1,806	111.4	.000	.121
Attitudes towards pets							
1,768	3.93	.048	.005	1,791	.99	.321	.001
'You and Your Pets' intervention							
Knowledge about animals							
1,162	6.28	.013	.04	1,162	55.7	.000	.26
Knowledge about Scottish SPCA							
1,147	4.1	.045	.03	1,145	35	.000	.194
Child-BAM							
1,147	.04	.85	.000	1,149	4.5	.036	.03
Attachment to pets							
1,146	2.05	.16	.014	1,152	.2	.654	.001
'Wildlife Welfare' intervention							
Knowledge about animals							
1,268	.39	.533	.001	1,261	35	.000	.12
Knowledge about Scottish SPCA							
1,259	1.48	.225	.006	1,246	32.8	.000	.12
'Food and Farm' intervention							
Knowledge about animals							
1,307	5.24	.023	.017	1,303	26.2	.000	.08
Knowledge about Scottish SPCA							
1,295	3.4	.066	.011	1,299	13.12	.000	.042
Child-BAM							
1,288	.16	.692	.001	1,299	13.29	.000	.043
Attitudes towards pets							
1,274	1.27	.26	.005	1,282	2.59	.11	.009

723 *Note.* Bold indicates a significant result at the $p < .05$ level.

724

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Table 3. Results from main effects analysis for each intervention following insignificant interactions.

Main effect of time				Main effect of group			
<i>df</i>	<i>F</i>	<i>p</i>	η^2	<i>df</i>	<i>F</i>	<i>p</i>	η^2
'Scottish SPCA Animal Friendly Citizens' intervention							
Child-BAM							
1,721	11.61	.001	.016	1,721	3.79	.052	.005
Attachment to pets							
1,767	11.26	.001	.014	1,767	.53	.47	.001
Attitudes towards animals							
1,631	1.5	.218	.002	1,631	3.75	.053	.006
Attitudes towards wild animals							
1,711	.5	.484	.001	1,711	4.49	.034	.006
Attitudes towards farm animals							
1,693	5.95	.015	.009	1,693	5.54	.019	.008
Compassion towards animals							
1,735	.343	.558	.000	1,735	2.94	.087	.004
Humane behaviour towards animals							
1,715	8.77	.003	.012	1,715	.53	.469	.001
'You and Your Pets' intervention							
Attitudes towards animals							
1,136	.053	.82	.000	1,136	.94	.334	.007
Attitudes towards pets							
1,144	.286	.59	.002	1,144	.07	.795	.000
Attitudes towards wild animals							
1,143	.03	.87	.000	1,143	.864	.354	.006
Attitudes towards farm animals							
1,148	.06	.81	.000	1,148	3.54	.062	.023
Compassion towards animals							
1,145	1.23	.27	.008	1,145	.35	.56	.002
Humane behaviour towards animals							
1,140	.06	.81	.000	1,140	1	.317	.007
'Wildlife Welfare' intervention							
Child-BAM							
1,233	1.2	.274	.005	1,233	.006	.94	.000
Attachment to animals							
1,252	.06	.804	.000	1,252	.119	.73	.000
Attitudes towards animals							
1,200	.38	.54	.002	1,200	.000	.984	.000
Attitudes towards pets							
1,227	.18	.67	.001	1,227	4.98	.027	.021
Attitudes towards wild animals							
1,224	.03	.87	.000	1,224	.557	.456	.002
Attitudes towards farm animals							
1,222	.01	.93	.000	1,222	.396	.53	.002
Compassion towards animals							
1,227	.51	.48	.002	1,227	2.49	.116	.011
Humane behaviour towards animals							
1,248	.07	.799	.000	1,248	.289	.591	.001
'Food and Farm' intervention							
Attachment to animals							
1,246	.233	.63	.001	1,246	5.02	.026	.02
Attitudes towards animals							
1,244	5.33	.022	.021	1,244	7.62	.006	.03
Attitudes towards wild animals							
1,265	2.48	.117	.009	1,265	8.11	.005	.03
Attitudes towards farm animals							

1,266	2.41	.122	.009	1,266	9.25	.003	.03
Compassion towards animals							
1,271	2.46	.118	.009	1,271	.095	.76	.000
Humane behaviour towards animals							
1,246	.042	.837	.000	1,246	1.36	.245	.005

728 *Note.* Bold indicates a significant result at the $p < .05$ level.

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731 **Table 4.** Results from one-way repeated measures ANOVA using test group data only for the
 732 interventions.

<i>df</i>	Main effect		Pre and post-test		Post and delayed	Pre and delayed
	<i>F</i>	<i>p</i>	η^2	<i>p</i>	<i>p</i>	<i>p</i>
'Scottish SPCA Animal Friendly Citizens' intervention						
			Knowledge about animals			
1,9,622	4.32	.015	.014	.000	1	.000
			Knowledge about Scottish SPCA			
2,532	21.8	.000	.076	.000	.052	.000
'You and Your Pets' intervention						
			Knowledge about Scottish SPCA			
2,14	4.63	.029	.4	.001	.045	.027
			Child-BAM			
2,542	3.58	.029	.013	.000	.002	.000
'Wildlife Welfare' intervention						
			Knowledge about animals			
2,190	3.92	.021	.04	.000	1	.000
			Knowledge about Scottish SPCA			
2,160	5.42	.005	.063	.000	.854	.000
'Food and Farming' intervention						
			Knowledge about animals			
2,158	6.96	.001	.081	.000	.002	.012
			Knowledge about Scottish SPCA			
2,140	26.23	.000	.273	.000	.000	.000
			Child-BAM			
2,142	3.38	.037	.045	.000	.002	.000

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