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Animal Welfare 2012, 21: 65-75
ISSN 0962-7286

Measuring the success of a farm animal welfare education event

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Abstract

Education of children about farm animal welfare could affect welfare standards, through influence on current and future purchasing of animal products, and improve general consideration for animals. Establishing success requires evaluation. Here, a farm animal educational event for 13 to 14 year-old schoolchildren, focusing on chicken biology, welfare and food labelling, was assessed. Alterations in knowledge, attitude and a proxy measure of behaviour towards animals and their welfare, key aspects expected to impact on animal welfare, were investigated using questionnaires. These key aspects were predicted to increase following event attendance and remain higher than in the non-attending control group three months later. Knowledge and positive behaviour towards specific poultry species increased significantly in attendees but, although remaining greater than pre-attendance, tended to diminish over time. Value afforded to animal life was unaffected by the event. Consideration of welfare needs was significantly greater overall in attendees than non-attendees, but appeared to be characteristic of children choosing to attend the event, rather than the event per se*. Importance attributed to animal welfare followed a hierarchy from survival-relevant, eg freedom from hunger and thirst, to less critical needs, eg stimulation. The specific species under consideration had the most significant effect on attitudes; consistent with predictions based on perceptions of the animals' 'complexity', cognitive ability, similarity to humans and use. Further investigation into the aetiology of attitude and potential barriers to attitude change is required to effect attitude change and determine whether attitude alteration could support maintenance of shifts in knowledge and behaviour.*

Keywords: *animal welfare, attitudes, chickens, children, education, evaluation*

Introduction

Education of children is of increasing scientific interest as a mechanism to improve consideration of animals. Children are future policy-makers, and both present and future caretakers and consumers whose decisions will help shape standards of animal welfare. For farmed animals, the consumer's purchases of animal products may substantially impact on welfare standards (Moynagh 2000; Regmi & Gehlhar 2001; FAWC 2006). Though children may not perceive that they possess immediate consumer power, they store knowledge for later use and form their ideas (including prejudices) early in life (Carrington & Tronya 1988; John 1999; Ahava & Palojoki 2004; Benn 2004).

Within the literature relevant to children and animal welfare, a focus on citizenship, defined here as aspects of care and respect for animals rather than the formal curriculum subject, has prevailed to-date. The role of pets and educational interventions for children relating to pets, wild animals, and general attitudes to animals and the environment have been reported (eg Beck *et al* 2001; Hergovich *et al* 2002; Miura *et al* 2002; Kotrschal & Ortbauer 2003; Rud Jr & Beck 2003; Smith *et al* 2005; Nicoll *et al* 2008), possibly reflecting the type of animal contact most experienced by children and their general interests. In contrast, the majority of studies addressing attitudes and beliefs about farm animal welfare have considered adults (Holloway *et al* 1999; Heleski *et al* 2004; European Commission 2005; Frewer *et al* 2005; Glass *et al* 2005; Heleski & Zanella 2006; Bock & Huik 2007; Evans & Miele 2007; Mayfield *et al* 2007; Kauppinen *et al* 2010; Prickett *et al* 2010). To the authors' knowledge, few studies have focused on children's relationships with farm animals or their welfare. DeRosa (1987) refers to an American study in 1986 by Shore, examining the effects of educational experiences (eg a half-hour guided tour of a small farm, a tour plus a hands-on activity with animals or no experience) of 31 children, aged between seven and 12, on their knowledge of, and

https://doi.org/10.7120/096272812799129402 Published online by Cambridge University Press

attitudes toward, farm animals. No difference was found from pre- to post-test, regardless of the educational experience, most likely due to a ceiling effect resulting from a highly positive pre-test attitude in the children, or limited sensitivity of the measures taken. Ellis and Irvine (2010) reported that children used distancing mechanisms to cope with the ethical and emotional dilemma of rearing livestock and then selling them for slaughter; eventually objectifying their animals as the final product. There is little information on the views of children about farm animal welfare, or of the effects of education about farm animal welfare on children's beliefs and knowledge.

To establish the success of education requires evaluation, using clear, measureable outcomes. Improvements in animal welfare by educating those who care for livestock directly are measureable using animal-based indicators (eg Hemsworth 2003). Success is more difficult to assess when there is no direct contact with animals, or when educating on a wide scale where 'student' contact is limited to only one or two animals in a certain context, such as pets, that cannot be directly assessed. In the latter case, the usual goal is improving consideration for animals and their care, such that a societal and individual responsibility to ensure consideration of animal welfare is acknowledged and practices which compromise animal welfare are questioned (citizenship); animal-related purchasing decisions are informed (consumerism); and/or animals are treated appropriately when contact is experienced (husbandry). NB Husbandry is used here to refer to behaviour towards animals with which individuals have direct contact, regardless of ownership or frequency of contact. Where direct effects on animals cannot be measured, assessment of education-mediated alterations in human-based indicators, which are expected to reflect promotion of one or more of these citizenship, consumerism and husbandry outcomes, is required.

In the scientific literature about education related to animals, different indices of efficacy have been used, including shifts in attitude (Fitzgerald 1981; Cameron 1983; Ascione 1992; Nicoll *et al* 2008), empathy and social behaviour (Ascione 1992), self-animal perceptions (Smith *et al* 2005), prosocial behaviour towards other humans and animals (Thompson & Gullone 2003) and relevant aspects of knowledge (eg Holloway *et al* 1999; Beck *et al* 2001; Coleman *et al* 2008). How these measures relate to outcome behaviour is not always explored, but where possible should be addressed; assumption of a positive relationship may be inappropriate, while intent to pursue certain behaviour may not always reflect actual behaviour. For example, Holloway *et al* (1999) found that a consumer's 'willingness-to-pay' depends on both awareness and attitude type; members of the public with higher scores for welfare-orientated attitude to pig farming, performed better in questions about knowledge and demonstrated a greater 'willingness-to-pay', whereas those individuals who scored higher on the production efficiency aspect of attitudes knew less about pigs and pig farming and were less prepared to pay more for animal products. Even so, consumer concern for animal welfare (eg Bennett 1996) is not always reflected in purchases of 'higher' welfare products and few consumers actively search for information about animal welfare when shopping for food (Holloway *et al* 1999; Schroder & McEachern 2004; Mayfield *et al* 2007). Similarly, studies in children have found that increases in knowledge about animals do not always shift attitude (Beck *et al* 2001), nor are increases in pro-animal attitudes or human-directed empathy necessarily reflected in increased positive or reduced negative animal-directed behaviour (Nicoll *et al* 2008; Arbour *et al* 2009). Thus, the relationships between acquired knowledge, attitude shifts and alterations in behaviour as a result of education are not straightforward and may vary across educational contexts, suggesting it is prudent to measure all these features during evaluation.

The current study therefore evaluated the efficacy of a farm animal-based educational event for 13 to 14 year-old schoolchildren, focusing on chickens as a model of farmed animals, using these three key aspects hypothesised to impact on animal welfare. Given that farmed animals may be afforded less consideration than non-farmed animals (Driscoll 1995; Heleski & Zanella 2006), and the possibility that increasing consideration for the chicken as a 'low denominator' animal could increase consideration for other species through generalisation of concepts, knowledge of, attitude and behavioural intention towards a range of species were examined.

Materials and methods

Sixty-seven, children (in school year nine) with a median age of 13 years, from three mixed gender, comprehensive state secondary schools in Hertfordshire, UK, took part in this study. Children were recruited through the Royal Veterinary College's Widening Participation Office; flyers were sent to local schools in the Hertfordshire and Greater London area. All participants attended the event by choice; attendance was not made compulsory by any school. A treatment group ($n_{school\ 1} = 18$; $n_{school\ 2} = 12$; $n_{school\ 3} = 16$; $n_{total} = 46$) attended an educational event on chicken biology, welfare and food labelling at the Royal Veterinary College in October 2009. Over one afternoon, the attendees rotated through activities (within four main stations) in groups of their own school peers: (Station 1) 'What is it like to be a chicken?', including exploration of chickens' needs, vision, cognitive abilities and vocalisations; (2) 'How are chickens kept and what do food labels mean?', including the welfare pros and cons of different productions systems, a demonstration of space allowances for broiler chickens under different assurance schemes and matching of supermarket product labels to source systems; (3) 'The welfare of farmed chickens — a simple fix?', involving consideration of welfare concepts and poultry welfare issues (such as lameness in broilers) and an introduction to the perspectives of different stakeholders in poultry production and the constraints of economics; and (4) 'Meet the Chickens', involving experience of close proximity to free-range hens exhibiting normal behaviour, such as scratching and dust-bathing, in a session, where behaviour, natural history and origins of chickens were discussed.

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A control group from the same schools ($n_{school\ 1} = 14$; $n_{school\ 2} = 21$; $n_{school\ 3} = 2$; $n_{total} = 37$) did not attend the event, but were included to check for questionnaire and/or external effects. Across both groups the children were evenly distributed by gender, living mainly in suburban areas; the majority ate meat (those few avoiding it cited diet rather than animal welfare preferences) and all but four children owned a pet, either currently or previously.

The effect of attending the event was evaluated using a questionnaire. This was completed by both groups three times: one week before (B), immediately after (within one week; IA) and three months after (A3M) the event.

Questionnaire design

Prior to the study, the questionnaire was approved by the College's Ethical Review Committee and piloted with non-study year nine children to check suitability for the subjects' age and understanding. In addition to a demographics section, the questionnaire (available from the first author) comprised factual knowledge questions, two attitude tests, and a measure of behavioural intent.

Knowledge assessment

Knowledge about the chickens' biology and welfare and, to examine for generalisation, the welfare of other species was assessed using 12 multiple-choice and short-answer questions with model answers. For each child, a 'total knowledge score' was calculated as the overall score obtained from all 12 questions (out of 33). We predicted that event attendance would increase total knowledge scores in the treatment group relative to the pre-event baseline.

Attitude assessment

Questions within the attitude section encompassed a range of 'lower' to 'higher' animals to examine if, and how far across species, the children would generalise any alterations in their views. To avoid teaching to the questionnaire, chickens were not included. Instead, another poultry species, the turkey, was incorporated to tease out any specific shift in attitude to a farm animal of similar characteristics to the chicken. Two components of attitude were examined: the relative value of an animal's life and the importance attributed to meeting welfare needs.

Value of animal life

Attitude to animal life, relative to other, inanimate possessions (hereafter referred to as VoL) was assessed using the Fireman test, previously used to evaluate planned interventions and appropriate to the reading ability of the age group (Vockell & Hodal 1980; Fitzgerald 1981; Vockell 1982). Children were asked to consider an imaginary fire in another child's house and, in the knowledge that no human lives were at risk, state four of ten objects (seven inanimate and three animate) which they considered should be saved. Favourable attitudes toward animal life predict prioritisation of saving the animals in this scenario (Vockell 1982). To account for use and species effects, all animals were referred to as pets and the question was asked twice with a different range of species (test A: a frog, a chicken and a cat; test B: a stick insect, a turkey and a monkey). The seven inanimate items were: a Nintendo Wii, a stereo, a family photograph, an iPod, a mobile phone, a colour television and a diary. One point was allocated for each animal saved. We predicted that event attendance would increase the number of animals that children in the treatment group would save relative to the pre-event baseline and that, overall, priority would be given to those species perceived as more complex and of higher cognitive ability and similarity to humans (Burghardt & Herzog 1980; Plous 1993; Driscoll 1995; Knight *et al* 2004; Levine *et al* 2005; Phillips & McCulloch 2005).

Importance of animal welfare considerations

To examine attitudes to animal welfare, a novel test was developed to examine how children afforded consideration of different aspects of welfare to a species. Respondents were asked to rate the importance of six statements about an animal's needs (largely based on the Five Freedoms; FAWC 1979 — but in a language and context relevant to children's understanding) using a visual analogue scale, ranging from not important at all (score 0) to very important (score 10). Minimising the questionnaire's length limited this test to only four species: ratings were requested for a frog, a turkey, a cat and a monkey. The species order was quasi-randomised across questionnaires at every sample point to minimise carry-over effects; 24 permutations were used with each child receiving a different permutation each time they answered the question. The statements were:

- To have hunger and thirst satisfied;
- To be healthy (free from pain/injury/disease);
- To have enough space to behave as they wish;
- To be stimulated (not bored);
- To live in a comfortable environment, eg fresh air, shelter; and
- To be free from fear and distress, eg bullying, predation.

It was assumed that attributing greater importance to the statements was synonymous with greater concern for welfare. We predicted that event attendance would increase the importance attributed to these statements for all species by the treatment group and, overall, that greater importance would be afforded to those species perceived as more complex and of higher cognitive ability and similarity to humans.

Self-reported behavioural intent — charity donation

Given that the subject age group was not representative of current major supermarket consumers, a proxy measure of (citizenship) behaviour, considered likely to be more relevant to children, ie something they could consider themselves doing and not requiring knowledge of product labelling, was used. The self-reported intention to donate to charities method was adapted from previous studies on older subjects (university students: Paul & Serpell 1993; and the Australian general public: Tisdell *et al* 2005) and piloted successfully for the study age group prior to implementation.

Children were asked to indicate how they would distribute a nominal £100 between six different hypothetical charities: two concerned with humans (children and the elderly), one with the environment (rainforests) and three with animal

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welfare (frogs, cats and turkeys). For the same reasons as the attitude section, a range of species was used, excluding chickens. We predicted that event attendance would increase the relative attribution of funds to animal charities by the treatment group and, where money was allocated to animal charities, priority would be given to those species perceived as more complex and of higher cognitive ability and similarity to humans.

Statistical analysis

Forty-one treatment group subjects ($n_{school\ 1}$ = 17; $n_{school\ 2}$ = 11; $n_{school\ 3}$ = 13) and 20 control group subjects ($n_{school\ 1}$ = 8; $n_{school\ 2}$ = 10; $n_{school\ 3}$ = 2) completed the questionnaires at each sample point (B, IA and A3M). Prior to analysis, the following calculations of data were conducted.

For the VoL data, total scores (range 0 to 3 — choosing to save all animals), were calculated for each participant for each sample point.

For the importance of animal welfare consideration data, scores were summed across the statements for each species to give a total overall welfare consideration score for each species per child (range 0–60) at each sample point. The data were transformed using logarithms to obtain a normal distribution with homogenous variance to allow parametric analysis.

The hypothetical money allocated to each charity in the behavioural intent task was converted to a proportion of the total money allocated across charities to account for the fact that some children allocated more or less than the nominal sum of £100.

Data were analysed using SPSS Statistics 17.0 (SPSS Inc), with a two-tailed significance of $P < 0.05$ and, where necessary, *P*-values were corrected for multiple testing using the Bonferroni correction.

Knowledge and welfare consideration scores (total and by statement) were analysed using fully factorial Linear Mixed Models (LMMs), with school (1–3), gender and group (treatment or control) as between-subjects factors, and sample point (B, IA and A3M) and for welfare consideration scores, species (frog, turkey, cat, monkey), as within-subjects factors. The models were reduced to their simplest form and, where appropriate, marginal means and paired *t*-tests were calculated to analyse differences between means. The remaining data did not conform to assumptions of parametric testing and were analysed non-parametrically. In initial analysis, no difference between schools in total VoL scores or money allocated to each charity was evident from Kruskal-Wallis tests performed at each sample point, so both data sets were pooled across schools for subsequent analysis.

For the total VoL scores, Friedman tests were used to analyse differences between sample points within each group and Kruskal-Wallis tests were used at each sample point to examine group-by-gender effects. Friedman tests were also used to examine differences between allocation of money to charities for each group by sample-point combination and differences between sample points for each charity by group combination. Where appropriate, these were followed by Wilcoxon tests to identify where significant differences lay. Finally, Kruskal-Wallis tests were used to examine group-by-gender effects on money allocation for each charity at each sample point. Significant differences between medians were identified using *post hoc* Mann-Whitney *U*-tests where appropriate.

Results

Knowledge

There was no difference in baseline knowledge between the groups. There was significant effect on total knowledge score of both sample point (LMMs: $F_{2,110} = 6.90$, $P = 0.002$) and group ($F_{1,162} = 12.89$, $P < 0.001$), with a significant interaction ($F_{2,110} = 6.13$, $P = 0.003$; Figure 1). While the control group's scores remained the same on all occasions, as predicted the treatment group's scores increased significantly compared to baseline and to the control group at each of the post-event sample points (IA and A3M). The treatment group's knowledge was significantly greater immediately after the event than three months later; further examination of the data revealed that this increase was due to better performance on questions related to chicken biology rather than on chicken welfare or other species. There was a significant main effect of school ($F_{2,162} = 19.22$, $P < 0.001$); the estimated marginal means indicated that school 1 (mean [± SEM]; 13.76 [± 0.52]) scored higher on knowledge ($P < 0.001$) than either school 2 (9.89 [± 0.53]) or 3 (8.64 [± 0.92]) at all sample points.

Attitude

Value of Animal Life

Overall, pooled across all sample points and subjects, in VoL test A, 8% of children chose not to save any animals, 26% chose to save one animal, 21% chose two and 45% saved all three animals. In VoL test B, 4% of children chose not to save any animals, 27% saved one animal, 28% saved two animals and 41% saved all three animals.

There were no significant differences in total VoL score across sample points within or between groups, nor were there effects of group or gender. Overall, totalled across all sample points and subjects, the frequency with which animals were saved followed predictions based on animal complexity, perceived cognitive ability and similarity to humans (Test A: cat 156, chicken 117, frog 94; Test B: monkey 166, turkey 128, stick insect 78). The inanimate item saved most frequently was the non-replaceable family photograph (Test A 120; Test B 118).

Importance of welfare statements for species

There were no effects of sample point or gender on total welfare consideration scores, but there were main effects of school (LMMs: $F_{2,558} = 26.89$, $P < 0.001$), group ($F_{1,558} = 11.34$, $P = 0.001$) and species ($F_{3,382} = 18.78$, $P < 0.001$). School 2 allocated higher total welfare consideration scores than either of the other schools (mean [± SEM], school 1: 44.85 [± 0.59]; school 2: 50.72 [± 0.60]; school 3: 45.11 [± 1.05]). Overall, total welfare consideration scores were lower in the control group (control, C: 45.38 [± 0.79]; treatment, T:

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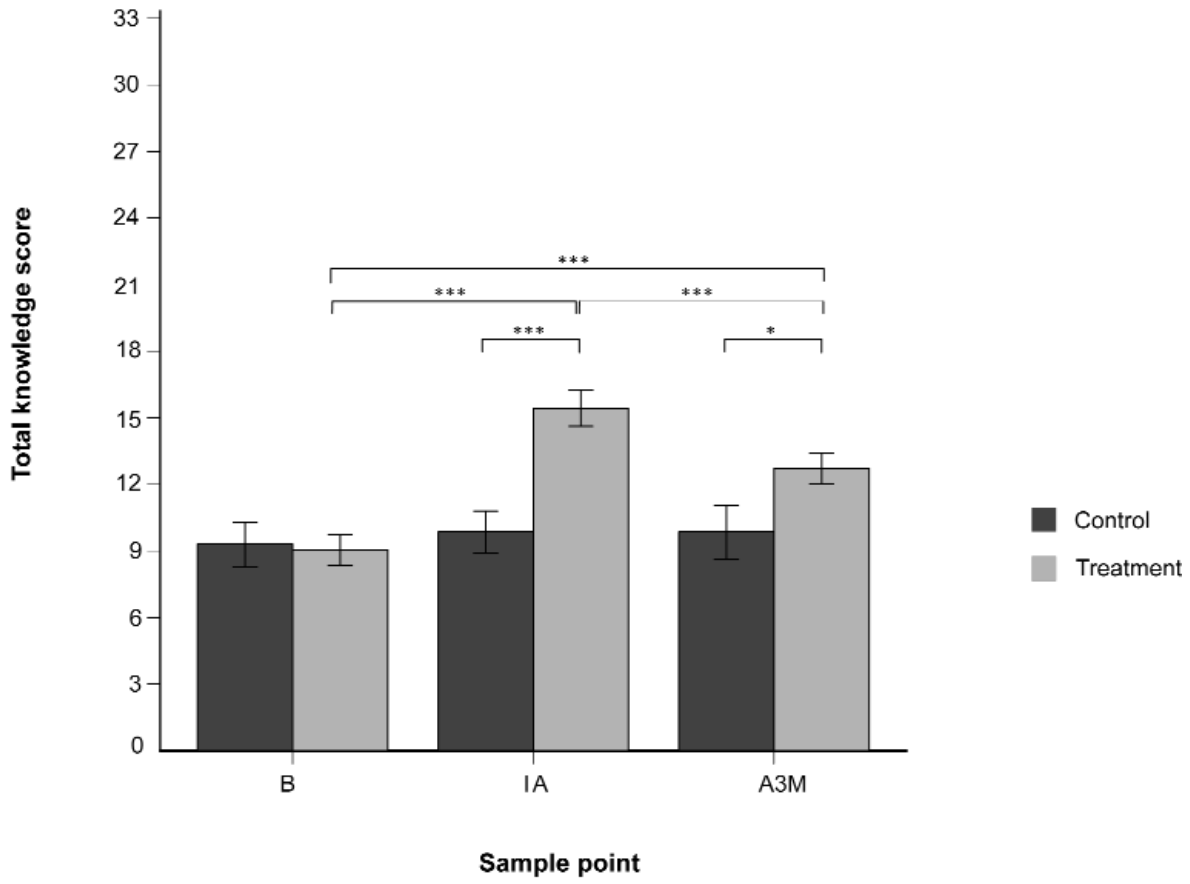
Figure 1



Mean (± SEM) knowledge scores (maximum 33) for control (n = 20) and treatment (n = 41) groups at three sample points: (B) one week before; (IA) immediately after and (A3M) three months after an educational event. * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

48.40 [± 0.44]) than the treatment group. Examining each statement separately, overall, the control group scored the importance of freedom from hunger and thirst (C: 9.62 [± 0.02], T: 9.67 [± 0.01]; $F_{1,537} = 4.09$, $P = 0.044$), space to behave (C: 9.55 [± 0.02], T: 9.61 [± 0.01]; $F_{1,683} = 4.95$, $P = 0.026$) and freedom from fear and distress (C: 9.54 [± 0.02], T: 9.64 [± 0.01]; $F_{1,661} = 15.92$, $P < 0.001$) significantly lower for all species than the treatment group. However, there were no differences in the total or statement welfare consideration scores when comparing groups at each sample point individually.

Total welfare consideration scores indicated that the frog's welfare was significantly less important to children than the other species, the turkey's welfare was significantly less important than that of the cat and monkey, but there was no difference between the latter (Figure 2). Overall, mean statement scores were relatively high (> 9.0) regardless of species and the highest importance was mostly attributed to freedom from hunger and thirst (Table 1). Species effects were seen on the importance attributed to all statements. Space to behave freely, stimulation and a comfortable environment were considered significantly less important for the turkey and frog than for the cat or monkey (Table 1), and significantly less importance was attributed to satisfaction of hunger and thirst for the frog than other species.

A significant interaction ($F_{3,318} = 2.78$, $P = 0.041$) between group and species for the health consideration statement was characterised by greatest and similar importance scores being attributed to the cat by both groups (mean [± SEM] C: 9.76 [± 0.03]; T: 9.75 [± 0.02]), but within the treatment group, similar scores were also attributed to the monkey and turkey, whereas the control group scored much lower for all remaining species (monkey C: 9.64 [± 0.04], T: 9.74 [± 0.02]; turkey C: 9.56 [± 0.04], T: 9.70 [± 0.02]; frog C: 9.49 [± 0.05]; T: 9.60 [± 0.03]).

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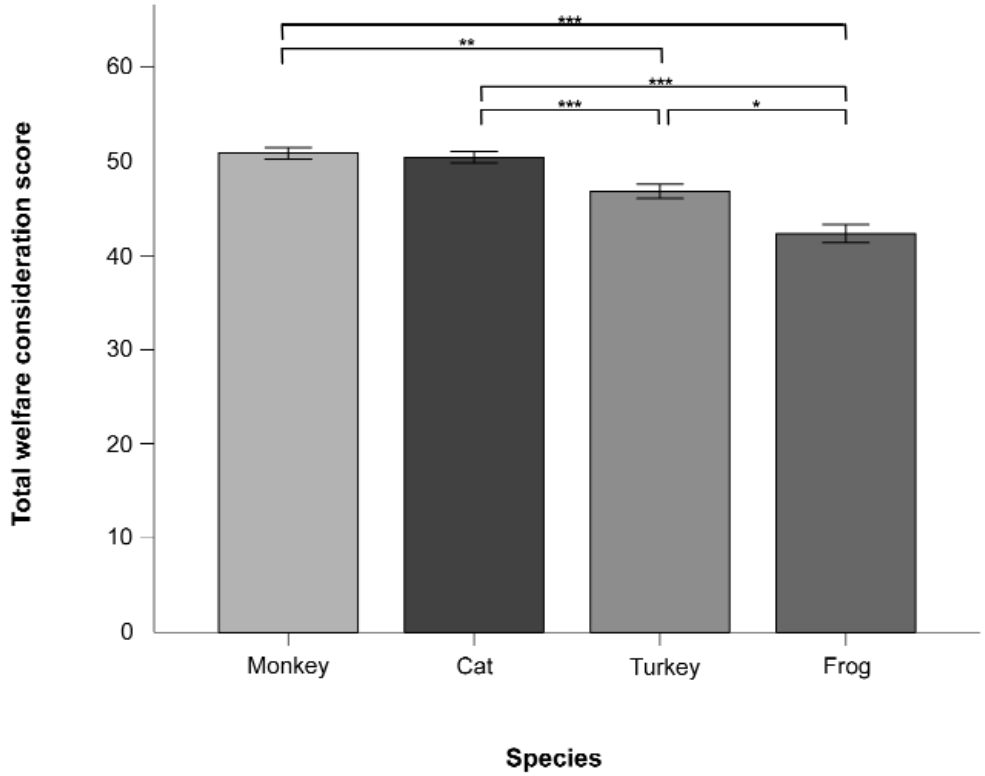
Figure 2



Mean (± SEM) total welfare consideration scores (minimum = 0, maximum = 60) pooled across all children (n = 61) for each species. * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

Table 1 Estimated marginal mean (± SEM) overall welfare consideration scores (max = 10) allocated by children (n = 61) to each species for each welfare-related statement (group and sample points pooled).

Welfare consideration statement	Monkey	Cat	Turkey	Frog
To have hunger and thirst satisfied	9.70 (± 0.02)^{ab}	9.73 (± 0.02)^{a}	9.64 (± 0.03)^{b}	9.52 (± 0.03)^{c}
To be healthy (no pain/injury/disease)	9.69 (± 0.02)^{ab}	9.76 (± 0.02)^{b}	9.63 (± 0.02)^{ac}	9.54 (± 0.03)^{c}
To have space to behave as they wish	9.64 (± 0.02)^{a}	9.66 (± 0.02)^{a}	9.53 (± 0.03)^{b}	9.48 (± 0.03)^{b}
To be stimulated (not bored)	9.61 (± 0.02)^{a}	9.55 (± 0.02)^{a}	9.44 (± 0.02)^{b}	9.39 (± 0.02)^{b}
To live in a comfortable environment, eg fresh air, shelter	9.69 (± 0.02)^{a}	9.67 (± 0.02)^{a}	9.59 (± 0.02)^{b}	9.52 (± 0.02)^{b}
To be free from fear and distress, eg bullying, predation	9.64 (± 0.02)^{ab}	9.67 (± 0.02)^{b}	9.58 (± 0.03)^{abc}	9.49 (± 0.03)^{c}

Within rows, different superscripts indicate significant differences between species ($P < 0.05$).

Behavioural intent

The overall median (IQR; min to max) proportions of nominal money donated by children to hypothetical charities were; children 0.20 (0.18–0.30; 0–0.70), rainforests 0.20 (0.10–0.30; 0–1.00), the elderly 0.17 (0.10–0.20; 0–0.40), cats 0.15 (0.10–0.20; 0–0.50), turkeys 0.10 (0.05–0.15; 0–0.60), and frogs 0.10 (0.05–0.13; 0–0.50). For both groups, there were significant differences between charities in the proportions of money donated at each sample point (Table 2, within-row comparisons); the turkey and the frog charities were always allocated the least proportion.

Although, overall, the control group allocated significantly more to the turkey charity before the intervention than the treatment group (Mann-Whitney: $U = 13.32$, df = 1, $P < 0.001$), their baseline allocation was unexpectedly high and may have been an anomaly associated with first experience of the questionnaire as it significantly decreased at IA (Wilcoxon: $Z = -2.803$, $P = 0.015$; Table 2, within-column comparison). For the treatment group, significant alteration in allocation across sample points was seen only for the children's charity (Friedman: $\chi^2 = 6.44$, $P = 0.04$, df = 2, n = 41), tending to increase from B to A3M (Wilcoxon:

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Table 2 Median (interquartile range) proportion of hypothetical money donated to each charity at each sample point: one week before (B), immediately after (IA), and three months after (A3M) an educational event, by control (n = 20) and treatment (n = 41) groups.

Group and sample point	Charity						χ^2 (df = 5)	*P*-value
	Children	Elderly	Rainforests	Cats	Turkeys	Frogs		
Control								
B	0.20[a]	0.16[ab]	0.20[ab]	0.16[b]	0.15[b]	0.10[ab]	20.39	0.001
	(0.20–0.30)	(0.10–0.20)	(0.11–0.22)	(0.10–0.20)	(0.10–0.20)	(0.05–0.17)		
IA	0.20[a]	0.20[ab]	0.18[ab]	0.15[ab]	0.10[b]	0.05[ab]	30.86	< 0.001
	(0.16–0.29)	(0.10–0.20)	(0.10–0.25)	(0.10–0.20)	(0.05–0.14)	(0.05–0.14)		
A3M	0.20[a]	0.16[ab]	0.20[a]	0.15[ab]	0.10[ab]	0.10[b]	29.75	< 0.001
	(0.18–0.30)	(0.10–0.20)	(0.10–0.29)	(0.10–0.20)	(0.06–0.16)	(0.05–0.14)		
Treatment								
B	0.20[a]	0.10[ac]	0.20[a]	0.10[a]	0.05[b]	0.05[bc]	55.83	< 0.001
	(0.08–0.30)	(0.01–0.20)	(0.07–0.30)	(0.03–0.20)	(0.00–0.13)	(0.00–0.11)		
IA	0.20[a]	0.18[bc]	0.20[ac]	0.14[bc]	0.10[bd]	0.10[d]	68.85	< 0.001
	(0.20–0.30)	(0.10–0.20)	(0.10–0.30)	(0.10–0.20)	(0.09–0.14)	(0.05–0.14)		
A3M	0.20[a]	0.17[b]	0.20[ab]	0.16[bc]	0.10[cd]	0.10[d]	72.67	< 0.001
	(0.19–0.38)	(0.10–0.20)	(0.10–0.28)	(0.10–0.20)	(0.05–0.16)	(0.05–0.10)		

Chi-squared and *P*-values derived from Friedman's tests indicate overall significant effects on money allocation across charities at each sample point within groups. Within rows, different superscripts indicate significant differences ($P < 0.05$) between allocations to charities.

$Z = -2.538$, $P = 0.054$); and the turkeys charity (Friedman: $\chi^2 = 7.35$, $P = 0.025$, df = 41), increasing significantly from B to IA ($Z = -2.729$, $P = 0.018$; Table 2, within-column comparisons), and tending to maintain this increase from B to A3M ($Z = -2.281$, $P = 0.069$). There were no other significant differences within-charities between groups or sample points.

Discussion

The purpose of this study was to examine the effect of a chicken-focused animal welfare educational event on knowledge, attitudes and behavioural intent towards poultry and other species.

As predicted, in contrast with Shore's findings (DeRosa 1987), the event increased the attendees' knowledge about chickens. However, this increase was less related to the chicken's welfare than its biology, did not generalise to other species and had diminished three months later. This finding suggests that attendees had only gained a degree of fragile, inert knowledge (Perkins 1993), as if learned for an examination rather than a deeper, embedded conceptual understanding allowing application outside of the same context. Indeed, it is interesting to note that while participants in this study had yet to sit their GCSE examinations, the schools' general examination performances in the preceding year reflected the pattern of factual knowledge acquisition seen in this study (% children receiving ≥ 1 GCSE grade A* to C in 2009: school 1; 81%, school 2; 52%, School 3; 60%).

Contrary to our predictions and consistent with the findings of a previous study (DeRosa 1987), influence of the event on the childrens' attitude was minimal. Neither our novel dimension of attitude, importance of welfare considerations, nor the VoL test were modified by the intervention. Though the VoL test has been used successfully to detect alteration in attitude in 10–12 year-old children (Fitzgerald 1981), in our study, regardless of their experience of the educational event, slightly older children were not inclined to save all the animals. It is plausible that ownership or experience of specific objects and animals may have influenced their rescue selection via perceived personal relevance, or that children felt the hypothetical situation to be unlikely. However, it is also possible that this measure of the value of an animal's life was insensitive to an educational event where no threat to life was discussed. These explanations require further investigation to ensure appropriate evaluation of the desired outcome. Our novel attitude test indicated that overall consideration of welfare needs was greater in event attendees than non-attendees. However, the lack of interaction with sample point suggests that this finding is likely to be a reflection of the characteristics and interests of the children choosing to attend such an event, rather than experiencing it. Even so, this difference was notably mediated through the greater importance attributed by the treatment group for only some of the statements, ie satisfaction of hunger and thirst, space to behave, freedom from fear and distress and to be healthy, though the latter incorporated species effects too. As might be expected, the relative importance attributed to comfort and stimulation was lower regardless of group; but it should be noted that

https://doi.org/10.7120/096272812799129402 Published online by Cambridge University Press

scores were high overall. Thus, this might reflect perceived responsibility for caretakers to avoid negative welfare as more important than promoting positive welfare.

Though sensitive enough to discriminate species-specific attitudes, as welfare consideration scores allocated by all treatment children were generally high in this study, it is plausible that a ceiling effect constrained sensitivity to within-species attitude alterations (eg DeRosa 1987) and adjustment of the scale is required. Little is known with certainty about the age at which educational interventions in this topic are most effective. While it is possible that children already had fixed attitudes towards animals at this age, how these might relate to welfare consideration requires exploring. Certainly, attitude alteration in far older age groups (eg Hemsworth *et al* 1994, 2002; Coleman *et al* 2000) and in attitudes toward wildlife in a similar age group (eg Dettmann-Easler & Pease 1999) has been accomplished. Here, the relevance of consumerism to the age group was a large consideration, thus younger audiences were not considered appropriate.

Attitude differences towards species in both tests used in this study generally reflected our predictions based on previous literature. Understanding how differences in consideration of species arise can indicate how to address barriers to effecting attitude change, where desirable. When animal rescue did occur in the VoL test, the popular and complex species were saved, while a family photograph, as an irreplaceable object, was more likely to be rescued than a frog or stick insect. Baker *et al* (2005) found that people showed preference for animals in the same order: mammals over birds over reptiles and fish over insects. The consideration of welfare afforded to the cat and monkey, species of higher relative perceived complexity, intelligence, ability to experience emotion or possession of mind and closer in relative similarity to humans (Burghardt & Herzog 1980; Kellert 1980; Plous 1993; Driscoll 1995; Davis & Cheeke 1998; Gunnthorsdottir 2001; Knight *et al* 2004; Phillips & McCulloch 2005; Maurer *et al* 2010), was also greater than for the turkey and the frog. This was particularly true for specific considerations which might be perceived by some as related to less absolute needs than those safeguarding against cruelty and neglect, eg space to behave freely, stimulation and provision of a comfortable environment. Attitudes can also be influenced by an animals' use. It was notable that the cat, a common pet, was given greater precedence even than the monkey for freedom from fear and distress and provision of health. This potentially reflects a perception of responsibility to pets which may not be seen in this age group for other species associated with other societal uses and was possibly mediated through familiarity or personal relevance; in our study nearly all children owned pets. Indeed, Heleski and Zanella (2006) found that American students of animal science and behaviour thought it less important to meet the behavioural needs of agricultural animals than companion animals. The low consideration afforded to the turkey in our study supports this finding, but could reflect the perception of the turkey's intelligence, capacity for boredom or pain, responsiveness, or intrinsic value as a result of psychological justification for societal exploitation of it as a meat animal (Driscoll 1995; Davis & Cheeke 1998; Myers 2002; Knight *et al* 2004; Heleski & Zanella 2006). In addition to low perceived complexity and phylogenetic factors, minimal consideration for the frog relative to other species in this study may also have resulted from its ability to evoke human disgust, which has been associated with fear of unknown animals (Australian marsupials) in 9–13 year-old children (Muris 2008).

Overall, in our behavioural intent task, children appeared less likely to act on behalf of animal than human or environmental concerns. This may also have been due to the greater perceived relevance to their personal lives; environmental concerns are highly topical and prominent in the news and in science education. Amongst the animal charities, as with the attitudinal measures, intention was prioritised by an animal's complexity. Children who participated in the educational event did not show more concern for animals in general but did change their behavioural intent towards turkeys. Although the turkey was included to identify generalised shifts towards an animal of similar characteristics to a chicken rather than an immediate reaction to a chicken *per se*, this did assume that children perceived a species difference. Given the apparent slight shift in knowledge towards chickens and behaviour towards turkeys, without a similar shift in knowledge, behaviour or attitudes to any other species, our findings are likely to reflect the event's focus on chickens and suggest that, in this context, generalisation of concepts does not spontaneously occur.

Although, here, we were unable to tease out the contribution of specific influential factors on differences in attitudes and behavioural intent toward non-human animal species, the fact that species-specific differences exist is important in the context of educating children about animal welfare. The accepted concept of animal welfare (Dawkins 2000) involves the capacity to suffer, which, above a certain phylogenetic threshold, may be considered unrelated to biological complexity. The high consideration scores overall suggest that children did recognise a capacity to suffer in all species, but not necessarily equally. To shift such underlying perceptions which may be acting as barriers to change, education programmes should include clarification that capacity for suffering does not necessarily rest on intelligence or biological complexity and relies instead on possession of a certain threshold neural capacity. This would address a situation where children learn about what welfare is, but would not apply the concept to certain species due to misconceptions about their capacity to suffer.

It was encouraging that the event changed knowledge and behavioural intent, even with only the focus species and only partial maintenance of these effects three months afterwards. Without further sampling, it is not possible to determine if the pattern of decay would continue, or if alterations could potentially remain, even if at a low level. Though relationships between knowledge, attitudes and behaviour may be complicated and posses bi-directional influences (eg Holloway *et al* 1999), the lack of alteration in attitude which we might expect to support shift in

https://doi.org/10.7120/096272812799129402 Published online by Cambridge University Press

knowledge and behavioural intent (Bem 1970; Azjen & Fishbein 1980; Myers 1987; Shrigley 1990; Wallace *et al* 2005) may have contributed to their apparent transience and requires further investigation. Another explanation is that children who are concerned about animal welfare may feel powerless to effect change. In this case they may, over time, have attempted to shield themselves from the subject; so forgetting or blocking what they had learnt, in order to avoid cognitive dissonance (see Festinger 1957). This possibility requires further investigation but suggests that when considering an intervention, care must be taken not to raise concern in children without altering any impotence they may feel or experience regarding their own role in improving animal welfare.

Animal welfare implications

Our findings suggest that illustrating animal welfare concepts with one particular species may not facilitate generalisation to different species with 13–14 year-old children. If a general concern for animal welfare across species is desired, a broad focus of teaching such as ethics or duty of care using multiple exemplar species may be more effective, at least in the first instance.

Here, a distinct separation by species was evident in children allocating importance to factors determining welfare. If features including perceived complexity of species, popularity and animal use are indeed causing variation in attitude or behaviour, to effect change such barriers need challenging within the framework of educational interventions, prior to further information dissemination. Critically, educational interventions should raise a topic's relevance and reduce feelings of impotence which may also be acting as barriers for change or impede maintenance of new behaviours.

It is essential that funds invested to improve animal welfare are effective and this requires evaluation. If education is to successfully effect human behaviour in order to improve animal welfare, desired outcomes should be defined and measureable. Many educational events associated with animal welfare are restricted to one-off, short-term experiences. Our study indicates that under these circumstances, a shift in knowledge may decay and may be entirely unsupportive of an attitudinal shift or indeed actual behaviour; thus an increase in knowledge alone may be insufficient to drive improvement in animal welfare, and evaluation should be sensitive to this.

Conclusion

Our study indicates that acquisition of specific knowledge following a 'one-off' educational event is possible, though it is subject to decline over time. Although not necessarily true for all attitudinal components, those we measured showed no directional shift which might be associated with this knowledge acquisition. Instead, we identified global patterns relating differences in value of life and attributed importance of welfare needs between species to their complexity, use and/or popularity. There was insufficient evidence to support a general relationship between knowledge acquisition and behavioural intention with respect to animal welfare, although a small positive shift in behavioural intent towards poultry suggests focus species may benefit. These findings have implications for education about animal welfare as a method of achieving improvement in animal welfare. Further work should attempt to tease out the specific barriers which act as impediments to changes in, and/or retention of, attitude, knowledge or behaviour resulting from education.

Acknowledgements

We thank the schoolteachers and children involved in this study for their co-operation and time, and Becky Knight of the Royal Veterinary College Widening Participation Office for her assistance in school recruitment. The paper was approved for submission (Manuscript ID number: P/VCS/00086/DVAL17).

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