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Attitudes to animal use of named species for different purposes: effects of speciesism, individualising morality, likeability and demographic factors

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Attitudes to animals and their use are becoming increasingly important for the success of conservation and environmental initiatives. Beliefs about animals, their perceived emotional appeal, as well as individuals' moral capacities are all likely drivers of attitudes to animal use. In the present study, 320 participants completed an online survey containing the animal purpose questionnaire (APQ), the likeability and the speciesism scales, along with subscales of the moral foundations questionnaire and some demographic items. The results suggest that participants were least agreeable towards the use of pet species, but more neutral towards the use of profit and pest species. Individuals with a stronger liking for animals, greater individualising moral values and fewer speciesist attitudes were more likely to challenge animal use. In addition, individuals who identified as young female and non-meat-eating displayed heightened concern about animal use. Individualising morality and speciesism, along with personal factors such as eating orientation were significant predictors of attitudes to animal use as measured by the APQ. Speciesism was the strongest individual predictor of APQ totals, accounting for the highest proportion of the variance in the hierarchical regression. Overall the findings suggest that human versus non-human animal and pet versus non-pet are the key speciesism prejudices at work. Moreover, a general measure of human respect for the rights of other humans also predicted respect for the rights of animals. Thus the findings also suggest some similarity in the psychological mechanisms underpinning human–human and human–animal relations.

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Introduction

Animal use is a controversial societal debate, our attitudes to which likely predict the success of conservation and welfare campaigns (Batt, 2009), possibly even the risk of human-directed aggression (Taylor and Signal, 2004). However, there can be marked discrepancy between our expression of love and concern for animals and our behaviour towards them (Loughnan et al., 2010). For example, often the abuse of domesticated species such as dogs is challenged, yet several meat products are consumed with little thought. This phenomenon has been labelled 'speciesism', defined as the 'assignment of different moral worth based on species membership' (Caviola et al., 2019). Speciesism has been compared to other forms of discrimination, such as racism and sexism, given that animals are treated differently based on simple biological differences between each other and humans (Lafollette and Shanks, 1996). Previous research has identified multiple factors which influence our attitudes to animal use, including the type of species and purpose of use (Bradley et al., 2020; Higgs et al., 2020), species likeability (perceptions of species' attractiveness, 'cuteness' and familiarity; Tisdell et al., 2005; Sevillano and Fiske, 2016; Possidónio et al., 2019, 2021), and participant characteristics such as gender (Caviola et al., 2019; Possidónio et al., 2019, 2021; Bradley et al., 2020; Higgs et al., 2020) and age (Driscoll, 1992; Ormandy and Schuppli, 2014; Clemence and Leaman, 2016). Non-meat eaters attribute higher mental capacities to animals (Knight et al., 2009; Higgs et al., 2020), suggesting they show reduced tendency to dementalize certain species (Knight et al., 2004; Bilewicz et al., 2011; Morris et al., 2012; Hawkins and Williams, 2016; Higgs et al., 2020).

Species and purpose of use. Knight and Barnett (2008) identified three key themes which influence attitudes to animal use, including 'type of animal', 'purpose of animal use' and 'knowledge of animal use'. Like Caviola et al. (2019), they found participants' attitudes to be dependent on the species of animal and their prescribed mental capacity, but also their familiarity with the species and perceived attractiveness. In addition, participants were more accepting towards animal use when it was beneficial to humans and there were no alternatives. For example, using animals for medical research was deemed most acceptable, whereas use for personal decoration was often disapproved of. Further to this, participants expressed that increased knowledge of animal use would probably be accompanied by increased concern for animal welfare. These findings suggest attitudes to animal use are subject to the influence of type of species as well as purpose and knowledge of use. The animal purpose questionnaire (APQ; Bradley et al., 2020; Higgs et al., 2020), devised to systematically compare attitudes by species and purpose, is a key focus of the present study.

To produce a standardised measure of speciesist attitudes, Caviola et al. (2019) developed the speciesism scale, which includes several statements concerning the moral treatment of animals. This scale measures prejudicial judgements of species value which can be unrelated to cognitive capacity and sentience. In total 27 questions, including more specific items referring to particular species and more abstract items about animals in general, were derived from existing scales including the animal attitudes scale (AAS; Herzog et al., 1991). These items were screened and adapted to explicitly capture theoretically defined speciesism (defined as attributing moral status to an individual solely on the basis of their species) without conflating aspects of moral reasoning and participants' beliefs about the potential benefit of the animal use. This new measure has been comprehensively validated and speciesist attitudes have been linked with socio-ideological constructs such as social dominance orientation, political conservation and system justification as well as prosocial behaviour towards animals (Caviola et al., 2019).

Species' likeability. Evidently some animals are more popular than others, and whilst a species' cultural role, e.g. companion or food source, may play a key role in this, we should not ignore the obvious influence of a species' emotional appeal. For example, despite being the same species, we may be less accepting towards the use of a lamb compared to an adult sheep due to their 'cute' nature. Possidónio et al. (2019) provided the animal images database of evaluations, including cuteness, valence, capacity to think, capacity to feel and the elicited human feelings of care and protection, in relation to acceptability to kill for human consumption across 120 animals. Similarly, Sevillano and Fiske (2016) found that judgements of warmth (as reflected in animals' aggressive or friendly tendencies) and competence (as reflected in animals' cognitive and physical abilities) predicted a variety of emotional and behavioural tendencies towards animals (including fondness, awe, pity and compassion). Companion animals were rated most positively and elicited more feelings of moral concern compared to predators, farmed animals and pests (Sevillano and Fiske, 2016; Leite et al., 2019). Phylogenetic position also makes a difference: mammals are often perceived more favourably in terms of importance, usefulness, threat and lovableness (Wiley Driscoll, 1995).

Tisdell et al. (2005) measured species' emotional appeal using a likeability scale, which captures a species' attractiveness, familiarity and similarity to humans. Participants' feelings towards several wildlife species explained 67% of variation in their views on the survival of the species. It follows that we should be less accepting towards the use of other species that we consider 'likeable'. Likeability can also explain our bias for domesticated companion species which we often perceive as cute, loyal and possessing their own personality (Archer, 1997). However, the influence of species' likeability is yet to be studied using a variety of species, thus, we cannot determine if this relationship is consistent across species with differing cultural roles. Moreover, the emotional conditions under which judgements are formed may also be key. In an online emotional priming study, Caviola and Capraro (2020) demonstrated that the emotionality induced by a variety of experimental interventions increased discrimination between animal species based on likeability rather than judgements on moral status (though paradoxically the tendency to prioritise humans over other animals was reduced when participants were primed to think emotionally rather than deliberatively).

Morality and speciesism. As a moral judgement, attitudes to animal use are not limited to the influence of personal characteristics such as gender and age, they are grounded in an individual's moral virtues and regulations. Haidt and Joseph (2004; further developed by Haidt and Graham, 2007) proposed that five psychological foundations are used to construct an individual's moral identity. The first two foundations have been labelled 'individualising' (Haidt and Graham, 2007), as they concern our respect for the rights of others. These include the care/harm foundation, which relates to empathic abilities, and the fairness/reciprocity foundation for values of justice and equality. The remaining foundations have been characterised as 'binding' as they focus on strengthening groups and organising society into hierarchies and roles (e.g. loyalty/betrayal and authority/subversion) and have less relevance to attitudes to animal use than care/harm and fairness/reciprocity.

The moral foundations questionnaire (MFQ; Graham et al., 2009, 2011) has been used to link individualising morality to a variety of viewpoints, such as environmental opinions and practise (Milfont et al., 2019), attitudes towards the poor (Low and Wui, 2016) and a liberal political standpoint (Haidt and Graham, 2007). Thus the MFQ provides a general measure of human morality which may predict attitudes to animal use, to the extent that there is similarity in the psychological mechanisms underpinning human–human and human–animal relations (Sevillano and Fiske, 2016; Leite et al., 2019). For example, Goddard et al. (2019) used subscales of the MFQ to understand how individualising morality influences attitudes to livestock production and consumption. Data collected from over three thousand Canadians revealed that individuals with higher individualising morality scores were more likely to buy environmentally sustainable dairy products and meat from sources with reduced antibiotic use, and more likely to vote in favour of stricter livestock welfare standards and disease protocols.

Objectives of the current study. The findings of Goddard et al. (2019) strongly suggest that individualising morality relates to attitudes to animal use, but the MFQ (Graham et al., 2009, 2011) has yet to be used in conjunction with the speciesism (Caviola et al. 2019) or APQ scales (Bradley et al., 2020; Higgs et al., 2020). Similarly, relationships between APQ, speciesism and likeability (Tisdell et al., 2005) ratings have yet to examined. The earlier study of positive evaluations (as measured by the animal images database) in relation to purpose of use did not extend beyond the 'acceptability to kill for human consumption' (and the moderating effect of pet ownership) assessed by Possidónio et al. (2019, 2021), and the categories related to purpose of use (Sevillano and Fiske, 2016; Leite et al., 2019).

To address this gap, the present study combined measures of speciesism, attitudes to animal use across several species and purposes, animal likeability, individualising morality and demographic/lifestyle variables. The APQ compared the use of 12 species traditionally falling into the categories pet/companion, pest and profit species (Taylor and Signal, 2009; Bradley et al., 2020). The purposes examined included medical research and food production, plus population control (culling), sport and fashion/ornamentation, which were not previously specified (Bradley et al., 2020; Higgs et al., 2020). Additionally, participants completed the 12-item individualising morality subscales of the MFQ (Graham et al., 2009, 2011), the speciesism scale (Caviola et al., 2019), rated each species on the likeability scale (Tisdell et al., 2005) and also completed several demographic and lifestyle questions. Based on previous findings, APQ attitudes were expected to differ across species and purpose and individuals who identified as female, non-meat-eating or younger in age, were expected to score higher on the speciesism scale and lower on the APQ (Clemence and Leaman, 2016; Caviola et al., 2019; Bradley et al., 2020; Higgs et al., 2020; Possidónio et al., 2019, 2021).

The key predictions of interest were that higher levels of individualising morality, likeability and weaker speciesism should be inversely related to APQ ratings: individuals with a greater focus on others' rights, a stronger liking for animals and fewer speciesist attitudes were predicted to be less agreeable towards animal use across the range of species and purposes of use included in the APQ, consistent with greater concern for animal welfare. We also examined some patterns of differences (by species and purpose) and associations (with questionnaire results and demographics) which were not explicit novel predictions (Kerr, 1998). This was done in part to see if earlier findings with the APQ (Bradley et al., 2020; Higgs et al., 2020) were replicated in the present study. However, we were also interested to explore the full dataset and comment on relationships between speciesism and individualising morality, for example.

Table 1 Demographic and personal lifestyle information of respondents.

Demographic	Variable	*N* (%)
Age (years)		
	18–25	226 (70.63)
	26–50	73 (22.83)
	51+	18 (5.94)
Eating orientation		
	Omnivore	206 (64.38)
	Flexitarian	33 (10.31)
	Pescatarian	18 (5.63)
	Vegetarian	31 (9.69)
	Vegan	22 (6.88)
Education level		
	GCSE	4 (1.25)
	A-Level	104 (32.5)
	Bachelor's	147 (45.94)
	Master's	45 (14.06)
	Doctorate	9 (2.81)
Pet ownership		
	Ever owned	290 (90.63)
	Currently own	206 (64.38)
Trained scientist		59 (18.44)
Experience working with animals		73 (22.81)

N = number of participants (percentage of total sample), excluding participants who responded using 'No', 'Other' or 'Prefer not to say', or who did not complete the demographic item. The skew in age is shown in three broad bands for simplicity (all analyses used age by completed year as a continuous variable).

Methods

Ethics approval was gained from the University of Nottingham UK School of Psychology Ethics Committee (Ref: 994R and Ref: S1021). Whilst participants were asked to envisage the killing of a variety of species, they were assured that the questions were hypothetical, for the purposes of the study.

Participants and procedure. The target sample size was 300 participants, to increase representation across the populations reached and to ensure the power of the anticipated regression analysis. Sampling was constrained by time but rule of thumb was applied to judge the adequacy of the sample size (Wilson Van Voorhis and Morgan, 2007; Lakens, 2022). A total of 402 individuals responded to the survey, however, 82 were excluded for failing to complete the first questionnaire (APQ), leaving a final sample size of 320 participants.

The majority of participants ($N = 199$) were recruited via convenience sampling, by distributing the survey link on social media, including personal pages and specific survey sharing groups, as well as Reddit forums such as vegan debate threads. The remaining participants were recruited through the online survey sharing tool survey circle ($N = 100$), and the University of Nottingham UK School of Psychology research participation scheme (Sona Systems software, $N = 21$).

The sample was predominantly female ($N = 249$, 77.81%); 10 participants (3.13%) selected 'Other', 'Prefer not to say' or did not select an answer, so their data were excluded from further gender analysis. Participants had an average age of 26.18 (range 18–64 years, SD = 9.7); 70.63% ($N = 226$) were aged 18–25. Other demographic details are summarised in Table 1.

Participants began by reading an information sheet before giving informed consent. They were made aware that the survey should take around 10–25 min and involved reporting their attitudes to animal use and the personal significance of a series of moral statements, along with a few personal details (linked only to a nickname identifier of their choosing). They were reassured that they would remain anonymous and that the regulations of the UK Data Protection Act (2018) would be strictly followed; their voluntary participation and withdrawal rights were highlighted. Prior to completion all participants were required to check a box confirming that they had understood the information, were over the age of 18 and consented to participate in the study. After completing the series of short questionnaires, participants were presented with a debriefing screen explaining the study in more detail and the purpose of the research. Contact details were provided should participants wish to withdraw their data (based on their nickname identifier and day of completion), along with details for support groups and further reading links.

Measures. The survey data was collected through Qualtrics online survey software (between 04/12/20 and 12/02/21). Each participant was presented with the questionnaires in the below order, each as a single continuous page.

Animal purpose questionnaire. For each species, agreement was rated for five purposes: medical research; sport; food production; culling/population control and fashion/ornamentation. Examples were provided in the questionnaire instructions ('an animal model of dementia' for medical research, 'hunting or horse racing' for sport, 'wearing a fur coat or displaying a stag head on the wall' for fashion/ornamentation). Food production was defined as 'any form of commercial or domestic consumption of animal meat'. Culling was defined as 'the selective killing of individual animals to control the size or characteristics of a population, e.g. killing male chicks as they cannot produce eggs or euthanising homeless dogs in shelters'.

The 12 species selected ranged in phylogeny and could be categorised as typically pet/companion, pest or profit: cat, dog, horse, rabbit (pet/companion); pigeon, rat, spider, wasp (pest); chicken, cow, deer and shrimp (profit) for UK-based populations. Participants rated their agreement on a 5-point Likert scale coded from 1 (strongly disagree) to 5 (strongly agree). Lower scores represent less agreement towards animal use, consistent with a more pro-welfare attitude. Whilst the order of purpose presentation remained constant between questions and participants (medical research, sport, food production, culling, fashion/ornamentation), the order of species presentation was randomised. The internal consistency of the APQ across the 60 items (5 purposes × 12 species) was excellent ($\alpha = 0.973$).

Likeability scale. Participants were asked to rate their feelings towards the 12 species on a five-point Likert scale ranging from 'Like strongly' (2) to 'Strongly dislike' (−2), the choice of 'Uncertain of feelings' (0) was also available. Following exploration of species differences, scores were averaged across species, higher scores indicating an overall stronger liking for animals. The order of species presentation was randomised. The internal consistency across the 12 items of this scale was good ($\alpha = 0.743$).

Moral Foundations Questionnaire: individualising sub-scales. Twelve questions were used to assess the individualising moral foundations: care/harm and fairness/reciprocity. For six questions participants were asked to rate the relevance of each statement when deciding if something is right or wrong. Three statements assessed the fairness/reciprocity foundation of morality, e.g. 'Whether or not someone acted unfairly', and three statements assessed the care foundation, e.g. 'Whether or not someone suffered emotionally'. Each item was rated on a 6-point Likert scale ranging from 'Not at all relevant' to 'Extremely relevant'. For the remaining six questions, participants were asked to rate their level of agreement or disagreement (on a 6-point Likert scale ranging from 'Strongly agree' to 'Strongly disagree') with three statements pertaining to each of the individualising morality foundations. Three statements assessed the fairness/reciprocity foundation, e.g. 'Justice is the most important requirement for society', and three statements assessed the care foundation, e.g. 'One of the worst things a person could do is hurt a defenceless animal'.

Each response was scored from 0 to 5, with 'Not at all relevant' and 'Strongly disagree' receiving a score of 0, whereas 'Extremely relevant' and 'Strongly agree' received a score of 5. Total scores for each foundation ranged from 0 to 30, with higher scores suggesting individuals place greater importance on these moral foundations when making decisions. A greater overall score across the two foundations suggests that individuals are more likely to consider the rights of others when making decisions. Each participant was presented with the relevance-rated statements prior to the agreement-rated statements, however, the order of question presentation within each category of statement was randomised between participants. Across the 12 items, the internal consistency of this scale was good ($\alpha = 0.781$).

Speciesism scale. Participants were asked to rate their agreement/disagreement with six statements concerning the moral treatment of animals, for example, 'It is morally acceptable to keep animals in circuses for human entertainment' and 'Humans have the right to use animals however they want'. Statements were rated on a seven-point Likert scale from 'Strongly disagree', which received a score of 6, to 'Strongly agree', which received a score of 0. One item, 'Chimpanzees should have basic legal rights such as a right to life or a prohibition of torture', was reverse scored. Overall, higher scores indicated weaker speciesist attitudes, suggesting greater concern for animal welfare. The order of statement presentation was randomised for each participant. The internal consistency across the six items of this scale was good ($\alpha = 0.779$).

Demographics. In the final section, participants were requested to provide some basic personal information including gender, age and education level, along with their eating orientation (e.g. omnivore, pescatarian, vegetarian), and to indicate any work experience with animals, pet ownership and scientific training undertaken. The variables were numerically coded for the purposes of regression analysis, the responses 'female', 'meat-eating', 'GCSE' and 'no' were coded as 1. The number 2 was used to represent 'yes', male, 'non-meat-eating' and 'A-level' education; further education levels were coded 3 (bachelors), 4 (masters) and 5 (doctorate).

Design and analysis. Responses were recorded using the Qualtrics online survey software and all statistical analyses were conducted using IBM SPSS Statistics version 26.

Two one-way repeated measures ANOVAs were conducted to assess the influence of species (12 levels: cat, dog, horse, rabbit, chicken, cow, deer, shrimp, pigeon, rat, spider, wasp) and species category (3 levels: pet, profit, pest) on likeability ratings. A two-way repeated measures ANOVA was conducted for APQ attitudes (dependent variable: rating 1–5), where the independent variables included species and purpose (5 levels: medical research, sport, food production, culling, fashion/ornamentation). A second one-way repeated measures ANOVA was conducted to determine the influence of species category on APQ attitudes. All

simple main effects comparisons and paired-samples *t*-tests were Bonferroni-corrected and the adjusted *p* values are reported in the text.

Pearson's correlations were conducted to investigate the relationship between APQ attitudes, likeability ratings, speciesism, individualising morality scores and age. Independent-samples *t*-tests were used to determine the influence of gender (male or female) and eating orientation (meat-eater or non-meat-eater) on each scale. Finally, a multiple hierarchical linear regression (five step) was used in order to test for improvement in the ability to predict the criterion variable (total APQ scores) as variables were added. The most basic demographic variables and eating orientation were added in step 1, followed by additional personal lifestyle details in step 2, subsequent steps were used to assess the predictive power of the three key measures of interest: speciesism, individualising morality and likeability ratings. Regression models of this kind increase the risk of type 1 error (Mundry and Nunn, 2009). We therefore also compared the results obtained when the predictors were added simultaneously.

Both the regression and correlational analyses were conducted using APQ totals because (given the intersectionality of purpose by species) the fine grained analysis would have required up to 60 models (to assess the prediction of attitudes to the use of each of the 12 species for each of the 5 purposes). The dataset has been provided for more focused analyses if these would be useful to predict behaviours towards specific animals for more specific purposes (Batt, 2009). The raw dataset is available from the University of Nottingham research data repository https://doi.org/10.17639/nott.7184.

Results

Whilst the data were significantly skewed for some items, by applying the central limit theorem, we can assume the data appropriate for parametric testing due to the size of the sample (Elliott and Woodward, 2006). All corrected degrees of freedom are reported to the nearest integer.

Factorial analysis of likeability ratings. One participant failed to complete the likeability questionnaire; thus, 319 responses were analysed. Mauchly's Test of Sphericity indicated that the assumption of sphericity had been violated for Species, $\chi^2(65) = 533.61$, and Species Category, $\chi^2(2) = 53.12$. Since the epsilon was >0.75, Huynh–Feldt corrected values are reported ($\varepsilon = 0.78$ for species and 0.87 for species category).

The influence of species. A one-way (12 level) repeated measures ANOVA revealed that Species had a significant effect on likeability ratings, $F\ (9,\ 2721) = 344.11$, $\eta_p^2 = 0.52$, $p < 0.001$. As expected, there was a significant difference in likeability ratings between a number of species, for example, ratings for dog, chicken, shrimp, pigeon and rat differed significantly from those given to all other species. As shown in Fig. 1A, dogs were more liked than every other species, chickens were liked more than shrimps and pest species, but not as much as dogs and other mammal species; pigeons were liked more than rats and other pest species, but less than shrimps, chickens and mammal species; rats were liked better than spiders and wasps, but less than pigeons and the other listed species. However, there was no significant difference in likeability ratings between several species from different categories, including cat–deer, deer–horse, horse–cow and rabbit–deer (Fig. 1A).

The influence of species category. A second one-way (3 level) repeated measures ANOVA revealed that Species Category had a significant influence on likeability ratings $F\ (2,\ 554) = 1054.8$, $\eta_p^2 = 0.77$, $p < 0.001$. Paired-samples *t*-tests revealed a difference between likeability ratings for each species category. Participants had a strong liking for pets, a moderate liking for profit species and a dislike for pest species (Fig. 2A).

Factorial analysis of APQ attitudes

The influence of species. All participants completed the APQ, thus, 320 responses were analysed. Mauchly's Test of Sphericity indicated the assumption of sphericity had been violated for Species, $\chi^2(65) = 949.14$, Purpose, $\chi^2(9) = 274.14$, and Species × Purpose, $\chi^2(989) = 4815.45$, therefore Greenhouse–Geisser corrected values are reported ($\varepsilon = 0.56$ for the main effects of Species, 0.71 for the main effects of Purpose and 0.43 for Species × Purpose interaction).

A two-way (12 × 5) repeated measures ANOVA was conducted for APQ responses. This showed main effects of Species, $F\ (6,\ 1954) = 109.93$, $\eta_p^2 = 0.26$, $p < 0.001$, and Purpose, $F\ (3,\ 898) = 251.8$, $\eta_p^2 = 0.44$, $p < 0.001$, as well as a Species × Purpose interaction, $F\ (19,\ 5988) = 100.39$, $\eta_p^2 = 0.24$, $p < 0.001$. The mean agreement towards the use of each species is shown in Fig. 1B in the same sequence as the likeability ratings (though in the case of the APQ scores lower ratings reflect higher concern for each of the species). As expected, the Bonferroni corrected post-hoc tests revealed there was no difference between attitudes towards several species, e.g. dog–cat, cow–chicken and spider–wasp. However, there was also no difference between attitudes towards several species from different categories. Attitudes towards cows did not differ from those towards each of the pest species (pigeon, rat, spider, wasp), rabbit did not differ from deer or rat, chicken did not differ from spider or wasp and deer did not differ from horse. All other differences were significant.

The mean (SEM) agreement towards animal use across the five purposes were as follows: medical research = 2.97(0.064), sport = 1.84(0.047), food production = 2.4(0.05), culling = 2.35 (0.056), and fashion/ornamentation = 1.48(0.038). Bonferroni corrected post-hoc tests revealed that agreement towards animal use differed significantly between all five purposes with one exception. There was no statistical difference between support for food production and culling. Participants were most accepting of the use of cow, chicken and shrimp for food, but most accepting of the use of pest species for medical research. In the case of culling, participants were more accepting, but not agreeable, towards killing of typical pest species, (rat, spider and wasp). Furthermore, participants were more accepting towards the use of horses for sport over any other species. Participants disagreed with the use of all listed species for fashion/ornamentation (Fig. 3). Simple main effects analysis for the Species × Purpose interaction confirmed that participants differentiated the purposes of use for each of the species, with the exceptions that there was no statistical difference in the level of disagreement with the use of dogs for sport and culling, cats for sport and food production, deer for medical research and food production, horses for food production and culling, cows for sport and fashion/ornamentation, pigeons, rats and spiders for sport and food production.

The influence of species category. A second analysis was conducted to compare the effect of species category, i.e. pet, pest and profit, on APQ attitudes. Mauchly's Test of Sphericity was significant, $\chi^2(2) = 114.04$, suggesting the assumption of sphericity had been violated. Since the epsilon was >0.75, Huynh–Feldt corrected values are reported ($\varepsilon = 0.77$).

The results of a one-way repeated measures ANOVA indicated a main effect of Species Category, $F\ (2, 492) = 143.91$, $\eta_p^2 = 0.31$,

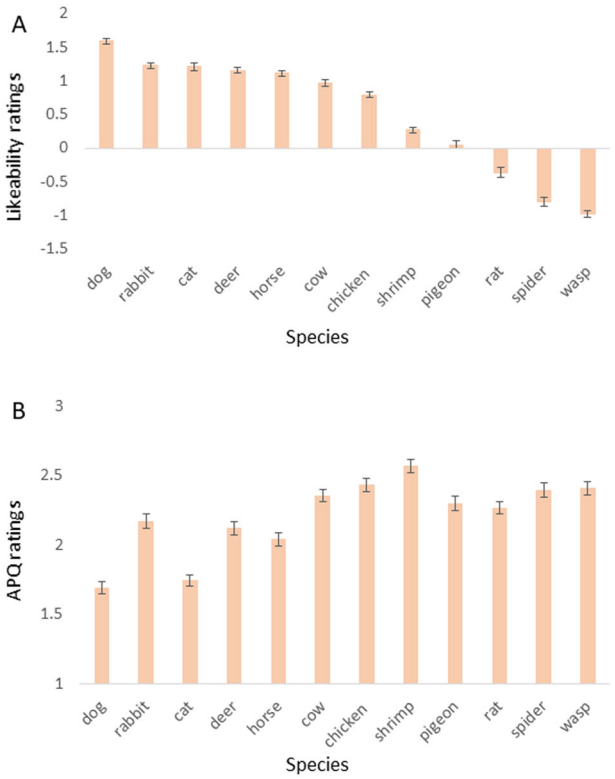

Fig. 1 Average ratings by species. Error bars show two standard errors of the mean. **A** Likeability ratings for each species, where 2 indicates a strong liking for the species, −2 indicates a strong disliking and 0 suggests participants are neutral/uncertain of their feelings. **B** APQ scores where 3 indicates a neutral attitude and scores below 3 reflect varying levels of disagreement with the use of the listed animal species.

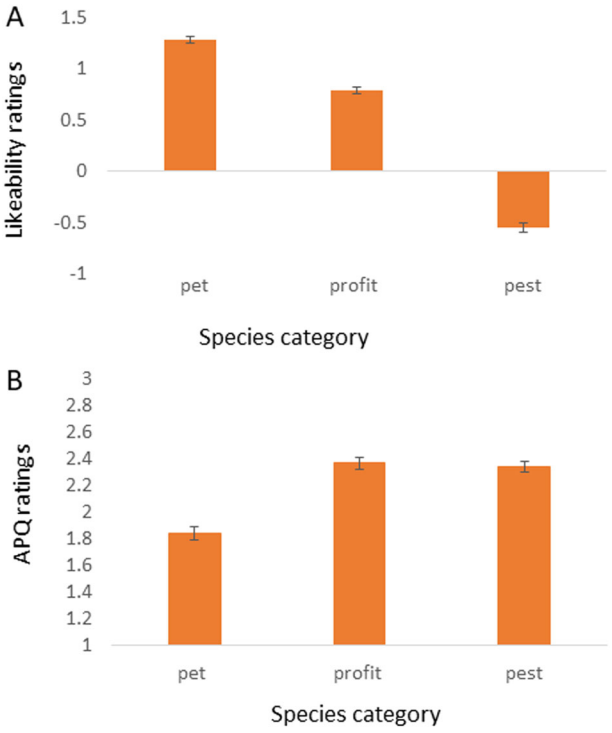

Fig. 2 Average ratings by species category: pet (cat, dog, horse, rabbit), profit (chicken, cow, deer, shrimp) and pest (pigeon, rat, spider, wasp). Error bars show two standard errors of the mean. **A** Likeability ratings where 2 indicates a strong liking for the species category, −2 indicates a strong disliking and 0 suggests participants are neutral/uncertain of their feelings. **B** APQ scores where 3 indicates a neutral attitude and scores below 3 reflect varying levels of disagreement with the use of the animals by species category.

$p < 0.001$. There was more disagreement with the use of pet than profit ($p < 0.001$) or pest species ($p < 0.001$), with no difference between APQ attitudes for species categorised as profit and pest, $p = 0.78$. In other words, participants agreed least with the use of species categorised as pets, but attitudes towards the use of species categorised at profit and pest were more neutral (Fig. 2B).

Correlations between APQ attitudes, likeability, speciesism and individualising morality. Total scores were used for each measure and results were interpreted with reference to Cohen's (1992) recommendations for determining effect size. The results of the Pearson's correlations (summarised in Fig. 4) showed a large negative association between APQ scores and speciesism ($r = -0.638$, $N = 319$, $p < 0.001$). There was a small negative association between likeability and APQ scores ($r = -0.195$, $N = 319$, $p < 0.001$), as well as a small association between likeability and speciesism ($r = 0.238$, $N = 318$, $p < 0.001$). Furthermore, there was a moderate negative association between individualising morality and APQ scores ($r = -0.408$, $N = 318$, $p < 0.001$), as well as a moderate positive correlation between speciesism and individualising morality ($r = 0.468$, $N = 318$, $p < 0.001$).

The directions of the correlations are as expected because higher agreement with animal use as measured by a higher APQ score suggests relatively less animal welfare concern, and higher speciesism scores reflect weaker speciesist attitudes, which are likely to be indicative of generally greater concern for animal welfare. As predicted, APQ attitude ratings were negatively correlated with likeability, individualising morality and weaker speciesism. Individuals with a stronger overall liking for animals in general (some of the pest species were disliked), higher individualising morality and fewer speciesist attitudes showed more concern for animal welfare.

***T*-tests examining the influence of gender and eating orientation**. Independent samples *t*-tests were conducted to determine the influence of gender and eating orientation on APQ attitudes, likeability ratings, speciesism and individualising morality scores. The data of participants who responded to personal questions using 'Other' or 'Prefer Not to Say' were not included in the following analysis. Where Levene's test indicated the assumption of homogeneity of variance had been violated, corrected values are reported.

Gender. Males ($M = 30.33$, SEM = 1.12) scored significantly higher on the APQ compared to females ($M = 25.61$, SEM = 0.54), t (308) = 3.87, $p < 0.001$, and significantly lower on the individualising morality sub-scales of the MFQ (male: $M = 42.38$, SEM = 1.04; female: $M = 46.92$, SEM = 0.44), t (308) = 4.4, $p < 0.001$, for the MFQ total, minimum t (308) = 2.30, $p = 0.003$, for the harm foundation sub-scale. Furthermore, females ($M = 27.09$, SEM = 0.44) scored higher on the speciesism scale (reflecting weaker speciesism) compared to males ($M = 22.8$, SEM = 0.93), t (308) = 4.33, $p < 0.001$. There was no significant difference between likeability scores by gender, t (308) = 0.641, $p = 0.522$.

Eating orientation. Individuals who identified as omnivore, flexitarian or pescatarian were classified as 'meat-eating', whereas

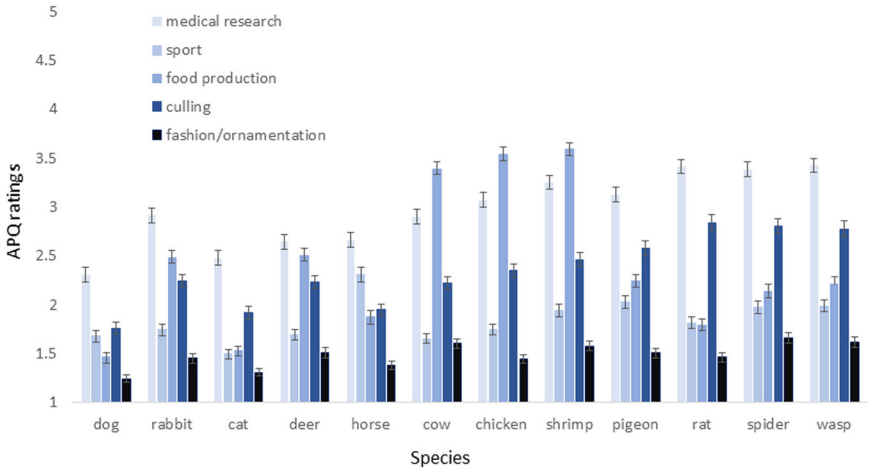

Fig. 3 The distribution of average APQ scores across species and purpose. Error bars show two standard errors of the mean. Scores of 3 indicate a neutral attitude, scores above 3 reflect some level of agreement and scores below 3 reflect varying levels of disagreement with the use of the listed animal species by purpose.

individuals who identified as vegetarian or vegan were classified as 'non-meat-eating'. Meat-eaters ($M = 28.19$, SEM = 0.5) scored higher on the APQ compared to non-meat-eaters ($M = 18.13$, SEM = 0.88), t (89) = 9.93, $p < 0.001$, and lower on the speciesism scale reflecting stronger speciesist tendencies (meat-eaters: $M = 25.19$, SEM = 0.43; non-meat-eaters: $M = 31.36$, SEM = 0.75), t (90) = 7.11, $p < 0.001$. Non-meat-eaters ($M = 9.72$, SEM = 0.73) reported a higher liking for animals compared to meat-eaters ($M = 5.46$, SEM = 0.34), t (308) = 5.17, $p < 0.001$. Whilst non-meat-eaters ($M = 48.6$, SEM = 1.12) scored significantly higher on the MFQ sub-scales compared to meat-eaters ($M = 45.75$, SEM = 0.43), t (308) = 2.64, $p = 0.009$, this difference remained significant for the care foundation sub-scale, t (308) = 3.619, $p < 0.001$, but not the harm foundation sub-scale (in isolation), t (308) = 1.083, $p = 0.280$.

Correlational analysis assessing the influence of age. The results of a Pearson correlation indicated that there was a weak positive correlation between age and APQ attitudes ($r = 0.144$, $N = 317$, $p = 0.01$), and a weak negative correlation between age and speciesism scores ($r = -0.157$, $N = 317$, $p = 0.005$). Because of the way the scale is scored (see 3.2.4. above), the negative correlation indicates relatively higher speciesism with age. Thus the correlational analyses suggested that older participants tended to show overall higher agreement with animal use in conjunction with relatively higher speciesism. There was no significant relationship between age, likeability ratings or morality scores.

Regression analysis of likeability, speciesism, individualising morality and demographic variables as predictors of APQ attitudes. A multiple hierarchical linear regression was conducted to assess the predictive value of multiple variables on total APQ scores. These included likeability ratings, speciesism and individualising morality scores, age, gender, eating orientation, education level, pet ownership (as measured by the inclusive 'ever owned pet' question), experience working with animals and any scientific training. There was no evidence of heteroscedasticity and collinearity statistics indicated that the assumption of multicollinearity was met (all tolerances >0.2 and all VIFs < 10). Overall, 296 participants completed all scales and demographic questions, thus, our sample size exceeded the recommended '$104 + m$' number of participants with respect to the number of predictors ($m = 10$; Wilson Van Voorhis and Morgan, 2007). Moreover, sensitivity power analyses conducted in G*Power confirmed that we were powered to detect small effects in the linear multiple regression (R^2 increase), for $N = 296$ (completing all scales and demographic questions) and 10 predictors (Cohen, 1988; Faul et al., 2007): $f^2 = 0.057$ at 80% power; $f^2 = 0.072$ at 90% power; and $f^2 = 0.113$ at 99% power.

For individualising morality, speciesism, likeability and APQ attitudes, total scores were used. Variables were entered into the model in five steps. Gender, eating orientation and age were entered at Step 1, this model accounted for 22.33% of variability in APQ attitudes ($R^2_{\text{Adjusted}} = 21.53\%$). The remaining demographic/lifestyle variables, including pet ownership, experience working with animals, scientific training and education level, were entered at Step 2 and accounted for an additional 2.55% of variance ($R^2_{\text{Adjusted}} = 1.53\%$). Speciesism, individualising morality scores and likeability ratings were entered separately in Steps 3–5. Speciesism accounted for an additional 28.73% of variance ($R^2_{\text{Adjusted}} = 29.26\%$) and individualising morality an additional 2.61% ($R^2_{\text{Adjusted}} = 2.52\%$) of variance in APQ attitudes. Whilst likeability ratings did not account for any additional variance in Step 5, the final model was significant F (10, 285) = 36.62 and accounted for 56.23% of variance in APQ attitudes ($R^2_{\text{Adjusted}} = 54.7\%$).

Beta values (displayed in Table 2) indicate that in Step 1, gender had a significant positive relationship with APQ attitudes, whereas eating orientation had a significant negative relationship. Age was not a significant predictor of APQ attitudes and scientific training was the only significant predictor entered in Step 2 ($p = 0.043$). In Steps 3 and 4, speciesism and individualising morality scores were significantly negatively related to APQ attitudes. However, although it was overall significant in the correlations, likeability was not a significant predictor in the hierarchical linear regression model.

The single step regression analysis (Table 3) confirmed the key findings of the hierarchical regression in that speciesism and individualising morality were significant predictors of APQ scores. The effects of gender and scientific training were no longer significant, whereas working with animals was a significant predictor. These shifts in the profile of results are consistent with the possibility that the effects of these variables may be indirectly mediated, by secondary effects on other variables with which they correlate.

Discussion

The main objective was to assess the influence of individualising morality, speciesist tendencies and likeability on attitudes to

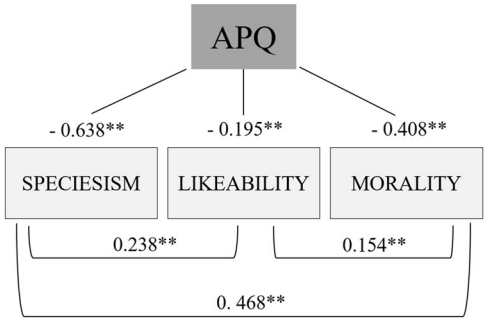

Fig. 4 A summary of the relationship between APQ attitudes, speciesism, likeability and individualising morality scores. **Indicates a significant correlation at $p < 0.001$.

Table 2 R^2 and unstandardised beta coefficients for hierarchical linear regression of demographic variables, likeability ratings, speciesism and individualising morality scores on APQ-total score.

Variable	ΔR^2	ß
Step 1	0.223	
Gender		4.15**
Age		0.073
Eating orientation		−9.44**
Step 2	0.026	
Pet ownership		−2.18
Work with animals		1.69
Scientific training		2.48*
Education level		0.45
Step 3	0.287	
Speciesism		−0.72**
Step 4	0.026	
Individualising morality		−0.22**
Step 5	0	
Likeability ratings		−0.022

*Significant at 0.05 level.
**Significant at 0.01 level.

Table 3 Unstandardised beta coefficients for single step linear regression of demographic variables, likeability ratings, speciesism and individualising morality scores on APQ-total score.

Variable	ß
Gender	1.056
Age	0.023
Eating orientation	−5.391**
Pet ownership	−1.752
Work with animals	2.528**
Scientific training	0.689
Education level	0.130
Speciesism	−0.624**
Individualising morality	−0.221**
Likeability ratings	−0.021

**Significant at 0.01 level.

animal use as measured by the APQ. As a pure measure of prejudice, speciesism in the sense of prioritising one animal over another would be expected to be highly correlated with likeability (at least when participants are thinking emotionally; Caviola and Capraro, 2020); in which case it is perhaps unsurprising that likeability added little predictive power in the present study. The framing of the APQ might be expected to promote emotional decision making (since participants were asked to rate agreement with the use or treatment of animals 'which directly or indirectly results in the killing of the animal'). The basis for our participants' decision making was not examined as such but earlier reported findings are in line with emotional decision making, prioritising dogs over pigs (Bradley et al., 2020) and chimpanzees (Higgs et al., 2020), as are the findings of the present study (dogs were liked the most and participants showed the least approval of their use).

The relatively low association between APQ and likeability ratings is perhaps also unsurprising as the APQ total measure used in the regression model averages across species of varying likeability. The inclusion of diverse named species can be seen as a positive in the sense that this in principle improves the generality of the findings. However, for some statistical purposes the inclusion of diverse species is likely to add noise when scale totals are used for regression analyses, particularly in the case of likeability given the inclusion of pest species (some of the species selected were actively disliked). Nonetheless, hierarchical regression analyses showed that attitudes to animal use as measured by APQ totals were predicted by a combination of more general scales which relate to pro-welfare attitudes and participant demographics. The fact that speciesism nonetheless emerged as a strong predictor suggests that human versus non-human animal is a key speciesism prejudice at work. The likeability scale in use distinguished species but not purpose, the speciesism scale distinguished species but not systematically. The MFQ subscales were broad measures of individualising morality, not specifically related to use of different animal species or for different purposes.

After the demographic factors, speciesism was the strongest predictor accounting for the highest proportion of the variance in rated attitudes across the range of species and purposes measured using the APQ. An important factor to consider may be a species' cultural role (Kupsala et al., 2016; Possidónio et al., 2019, 2021). Tisdell et al. (2005) included only wildlife species, whereas the present study used species likely to be characterised as pet/companion, pest and profit; in this way, the current study captured the additional influence of a species' cultural role on likeability ratings. For example, despite participants significantly favouring profit species over pest species (as measured by likeability), attitudes towards their use did not differ. This may be explained using the concept of 'dementalization' (Loughnan et al., 2010), a form of cognitive dissonance whereby food species are intellectually downgraded to morally resolve the conflict between the reluctance to hurt beings with mental awareness and culinary preferences for meat (Bastian et al., 2012). Thus, a species' cultural role may introduce additional cognitive processes and override the influence of their likeable traits on attitudes towards their use. However, because of these additional factors, which apply to some species but not others, the decision to use an overall likeability rating for regression analysis does not reflect this diversity. If regression analyses were conducted by species categories, likeability might be expected to better predict attitudes towards pet/companion and pest, rather than profit, species (Possidónio et al., 2021).

Unsurprisingly, individuals with fewer speciesist attitudes were less agreeable to animal use, suggesting they abstain from prejudice by recognising the moral worth and potential suffering of all species. As predicted, individuals with greater individualising moral values were less likely to agree with animal use and held fewer speciesist attitudes, with a possibly greater influence of the care foundation in relation to meat eating (but not gender differences). Greater focus on the fairness and harm foundations of

morality may result in different species being viewed more equally and heightened concern for their welfare and rights. The present findings expand on those of Goddard et al. (2019), by suggesting individualising morality is predictive of attitudes towards a range of species, beyond those traditionally used as a food source, and across a variety of purposes.

Relationship to previous findings. Overall, participants favoured mammal species (Wiley Driscoll, 1995; Tisdell et al., 2005), which was reflected in attitudes towards their use (with the exception of cows, discussed below). Consistent with previous findings (Bradley et al., 2020; Higgs et al., 2020), participants disagreed with the use of pet species such as dogs and cats, possibly due to perceptions of heightened intelligence and increased capacity for suffering, as well as the effects of pet attachment (Possidónio et al., 2021). In contrast, attitudes towards the use of pest and profit categories of species were more neutral and not significantly different from each other (though with some individual exceptions at the species level). Animal use for medical research was most widely accepted, potentially due to the perception of limited alternatives (Knight et al., 2009), whereas participants disagreed most with animal use for fashion/ornamentation. Given the timing of the data collection, the Covid pandemic might be expected to impact the perceived acceptability of medical testing. However earlier studies with the APQ also found overall higher levels of agreement with the use of animals in medical research (and basic science) pre-pandemic (Bradley et al., 2020; Higgs et al., 2020).

As expected (Higgs et al., 2020; Bradley et al., 2020; Possidónio et al., 2019, 2021), individuals who identified as female and were less agreeable towards animal use. Females have consistently demonstrated greater concern for animal welfare (Caviola et al. 2019; Bradley et al., 2000; Higgs et al., 2020). Herzog et al. (1991) suggest this is the result of traditional gender roles which have shaped different moral and ethical perceptions towards animals. With focus on caregiving and sensitivity to children, a female perspective can be characterised as moralistic and humanistic. In contrast, a male perspective can be characterised as utilitarian and 'doministic', related to lower sensitivity to the ethical treatment of other species. Similarly, in the present study, females scored significantly higher on individualising morality. This is consistent with the cross-cultural finding that women score higher on the care, harm and purity moral foundations compared to men, which is particularly true in Western cultures where traditional gender roles are internalised (Atari et al., 2020). And, as expected, females showed less speciesism than males (Caviola et al., 2019).

Also in line with previous findings (Possidónio et al., 2019, 2021; Bradley et al., 2020; Higgs et al., 2020), individuals who identified as non-meat-eating were less agreeable towards animal use. As expected non-meat-eaters also reported lower speciesism, a higher liking for animals compared to meat-eaters and scored higher on the MFQ (and care foundation sub-scale) compared to meat-eaters. With respect to eating-orientation, one explanation for these findings may be that non-meat-eaters have overcome the tendency to 'dementalize' species based on their cultural role, i.e. they have resolved cognitive dissonance to equally appreciate and respect species (Bilewicz et al., 2011). Perhaps surprisingly, and although the study participants liked them well enough, overall attitudes towards the use of cows did not differ from attitudes to the use of pest animals. This finding suggests that the generally more positive attitudes towards mammals (Wiley Driscoll, 1995) does not hold for mammalian species viewed as food produce (Possidónio et al., 2019). However, this finding should not be expected to hold in all populations (because viewing species as a food preference will be culturally determined, see above). In general, the designation of species to categories such as pet, profit and pest shows cross-cultural variation, for example kangaroos might also in principle be categorised as food/profit animals in Australia (Leite et al., 2018).

As shown in Table 1, the sample sizes in the more fine grained categories of dietary preference were relatively small hence the decision to simplify the analyses with just the two categories (meat eating versus non-meat-eating) as per earlier reported studies using the APQ (Bradley et al., 2020; Higgs et al., 2020). Effects of diet were not the main focus of the present study. However, with a larger data set, it would be interesting to create a third group by dividing the meat-eaters into omnivores versus flexitarians and pescatarians, to see if participants in these more differentiated groupings would report different attitudes towards animal use and different levels of speciesism and moral foundations.

The correlational analyses suggested that older participants tended to show overall higher agreement with animal use in conjunction with relatively higher speciesism. However, contrary to previous studies (Driscoll, 1992; Ormandy and Schuppli, 2014; Clemence and Leaman, 2016), age was not a significant predictor of APQ scores. This may be the result of our relatively young sample which predominantly consisted of individuals aged 18–25 years. Finally, as might be expected, individuals with scientific training were more accepting towards animal use, which may relate to differing perceptions around animal sentience, necessity of use and recognition of beneficial outcomes (Knight et al., 2009).

Limitations of the present study. As in previous studies (Bradley et al., 2020; Higgs et al., 2020), our participant profile consisted predominantly of young female adults, who had owned a pet, identified as omnivore and were highly educated. We acknowledge that the sampling methods in use limit the generalisability of our findings to wider populations. Moreover, the APQ items selected for the present study were by no means a full test of attitudes to animal use across species and purpose. In the current study, attitudes towards the use of twelve species across five purposes were investigated. Whilst species ranged in phylogeny, their species membership may be associated also with other pre-existing perceptions and attitude towards species in that category (Caviola et al., 2019). Moreover, the species selected were familiar and fairly common, and may not reflect attitudes to unusual or exotic species. It is also important to recognise that membership of the designated pet-profit-pest category was more ambiguous for some species than others: some species are less representative of their designated category or even have the potential to belong to more than one of these categories. For example, rats may be perceived as both pet and pest, and deer are not as widely eaten as cows, chickens or shrimps. Such ambiguities inevitably reduce the internal validity of analyses by species category.

Although the sample was not very diverse, the moral foundations measured by the MFQ are assumed to be universal. However, cultural norms and social learning will shape differing cultural expressions of morality (Graham et al., 2011). With this in mind, future research should investigate if cultural orientation mediates the relationship between attitudes to animal use and individualising morality. Cultural differences in attitudes to animal use have been investigated previously, however, morality is yet to be a focus of such research. For example, in a study across eleven countries, Phillips et al. (2012) found that individuals from European countries, such as Great Britain, Serbia and Macedonia, reported significantly greater concern for animal welfare compared to individuals from Asian countries,

such as Iran, South Korea and China. However, with a greater focus on individualising moral traits, compared to collectivist societies, individualistic societies may prioritise animal rights and suffering when making decisions concerning animal use. This may be reflected in fewer speciesist attitudes and less agreement towards use.

Whilst the APQ (Bradley et al., 2020) is a valid and useful tool for gaining systematic data on attitudes towards the selected species, for cross-cultural replications of the current study, a less specific measure e.g. the AAS (Herzog et al., 2015), may be more appropriate. The delineation of variation in attitudes by species and purpose afforded by the APQ offers an advance on more generic scales but inevitably introduces variability. Despite this variability, the APQ shows good convergent validity with the better established AAS (10 item short form; Bradley et al., 2020; Higgs et al., 2020). It is important to recognise that across nations and cultures, familiarity and interactions with species will vary, consequently, measuring attitudes towards the same twelve species across different cultures will not produce a valid representation of attitudes to animal use. Surveys referring to 'animals' (in general) might provide a fairer comparison cross-culturally and/or the APQ might need adapting to select different species of interest in different cultural settings. The AAS-10 poses questions about 'animals' in general and names specific species in 5/10 items. All items bar two include reference to specific purposes of use but purpose is not examined systematically by the AAS, it provides a general measure of pro-welfare attitudes. Thus combining use of the MFQ (Graham et al., 2009, 2011), speciesism (Caviola et al., 2019) and AAS (Herzog et al., 1991, 2015), might be a better approach to explore the relationship between individualising morality and attitudes to animal use cross-culturally. The APQ total similarly provides a general measure of pro-welfare attitudes, measured overall, across a variety of species and purpose, but findings will inevitably depend on the selection of species and purposes of use.

Conclusions and implications. The current study successfully bridges a gap in the literature by establishing the influence of speciesist attitudes, individualising morality, and likeability on attitudes to animal use as measured by the APQ. Individualising morality and speciesism, along with personal characteristics such as eating orientation, were significant predictors of attitudes to animal use as measured by the APQ. Whilst participants reported positive feelings towards both, agreement with the use of profit species was higher than that of pet/companion species, consistent with the presence of cognitive dissonance in relation to meat consumption (Bastian et al., 2012; Bilewicz et al., 2011). Individuals with stronger individualising moral values and fewer speciesist attitudes displayed less agreement towards their use. The same was found for individuals who identified as female and non-meat-eating. Associations with the selected 'individualising' MFQ subscales suggest that (building on the work of Goddard et al., 2019) a general measure of human morality predicts attitudes to the use of a variety of animal species across a variety of purposes (beyond food production). Thus, a general measure of human respect for the rights of other humans also predicts respect for the rights of animals. This finding suggests some similarity in the psychological mechanisms underpinning human–human and human–animal relations (Sevillano and Fiske, 2016; Leite et al., 2019). However, the MFQ was not as good a predictor of attitudes to animal use across the range of species and purposes included in the APQ as the standardised measure of speciesist attitudes provided by Caviola et al. (2019). Although an exploratory finding, the moderate correlation between speciesism and MFQ scores adds weight to the validity of the speciesism construct (Caviola et al., 2019).

Data availability

The raw dataset is available from the University of Nottingham research data repository https://rdmc.nottingham.ac.uk/handle/internal/9502, attributed to the authors and article title in the collection 'public research data', https://doi.org/10.17639/nott.7184.

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Competing interests
The authors declare no competing interests.

Ethical approval
Ethics approval was obtained from the University of Nottingham UK School of Psychology Ethics Committee (Ref: 994R and Ref: S1021). The research was performed in accordance with the University of Nottingham UK School of Psychology Ethics Committee guidelines and regulations and in accordance with the Declaration of Helsinki.

Informed consent
All participants gave informed consent.

Additional information
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