Farmyard Animal or Best Friend? Exploring Predictors of Dog vs. Pig Pet Speciesism

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Abstract

Despite dogs' and pigs' shared similarities, previous research indicates people favour dogs over pigs (known as 'pet speciesism'). Whilst pet speciesism has been empirically supported, little is known about its predictors. This gap in the literature is problematic as urgent requirements to decrease meat consumption emphasise the pressing need to develop interventions to reduce pet speciesism and thus reduce meat consumption. However, to develop these interventions, we must first identify why people view pigs (vs. dogs) negatively. To begin addressing this gap, the current study utilised the Stereotype Content Model to uniquely explore pet speciesism's predictors. We recruited participants via social media, posters, flyers and SONA, resulting in a total of 232 participants (all 18+; M_{age}=28.57, SD_{age}=10.74; 61.2% meat consumers; 78.4% female; 45.3% British). Behavioural and subjective self-relevance, familiarity, similarity and pet status of an animal, alongside overall empathy towards animals, differentially predicted dogs' and pigs' perceived warmth and competence and may usefully explain pet speciesism. These predictors should be investigated causally in experiments. Both the current study and later experiments could explain why people exhibit prejudice in favour of dogs and against pigs, with unique theoretical implications for pet speciesism literature and practical implications for meat consumption, policies and public perceptions of pigs.

Keywords: *pet speciesism, dog, pig, warmth, competence*

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Introduction

Dogs and pigs share multiple similarities: They are both omnivorous quadruped mammals with similar behaviours and appearances compared to other species, alongside similar levels of intelligence, emotionality, and sociability (Lea & Osthaus, 2018; Marino & Colvin, 2015). As dogs and pigs share many characteristics, people should hypothetically view them in psychologically similar (positive) ways. For instance, people empathise more with mammals than non-mammals (e.g., birds; Prguda & Neumann, 2014; Westbury & Neumann, 2008) and prefer animals which share biological and behavioural characteristics with humans ('bio-behavioural similarity'; Batt, 2009).

Yet despite these shared characteristics, people within 'Western' cultures[1] typically view dogs positively and pigs negatively (Caviola & Capraro, 2020; Gradidge et al., in press), a phenomenon called 'pet speciesism': Prejudice against typical non-pet animals (e.g., pigs) and in favour of typical pet animals (e.g., dogs; Caviola & Capraro, 2020). Pet speciesism is a form of speciesism: Prejudice against some species, and in favour of others, based on taxonomic classification alone (Singer, 1995). Whilst pet speciesism differs from anthropocentric speciesism (prejudice against all animals and in favour of humans), research has predominantly investigated anthropocentric instead of pet speciesism (Gradidge & Zawisza, 2021). Thus, research on pet speciesism is sorely needed to explore how and why people view certain species (e.g., dogs) favourably and others (e.g., pigs) unfavourably.

Current research indicates pig vs. dog pet speciesism (hereon pet speciesism) occurs across various psychological dimensions, including affective components (empathy; Gradidge et al., in press; liking; Caviola & Capraro, 2020), behavioural intentions (willingness to help; Gradidge et al., in press), perceptions of animal victims (victim derogation; Gradidge et al., in press), perceptions of perpetrators of crimes against animal victims (second-hand forgiveness; Gradidge et al., in press) and mind attribution (emotional attribution; Bilewicz et al., 2011). Specifically, people empathise more with and are more

[1]This paper refers to psychological phenomena within 'Western' cultures throughout unless otherwise specified.

willing to help a dog (vs. pig) kidnapping victim, whilst expressing more victim derogation and greater second-hand forgiveness (forgiving the perpetrator) for pig (vs. dog) victims (Gradidge et al., in press). People also like dogs more than pigs (Caviola & Capraro, 2020) and attribute dogs with greater emotional capabilities (Bilewicz et al., 2011).

Pet speciesism is also evident within the real world. Within the UK, 33% of households have a dog (Bedford, 2021), whereas pigs cannot be legally categorised as pets (DEFRA, 2010). Furthermore, thousands of pigs within the UK are slaughtered for meat each month (e.g., 964,000 in July 2020; DEFRA, 2020), whilst dog meat consumption is illegal. Thus, concern for some animals (e.g., dogs) and not others (e.g., pigs) has moral implications for policy (e.g., the animals people are legally allowed to consume vs. not), meat consumption and, ultimately, animal welfare and the environment. For instance, people tend to deny the mental capabilities (e.g., capacity to suffer, intelligence, capacity for emotion) and moral status of 'food' animals (e.g., Bratanova et al., 2011; Loughnan et al., 2010), and this denial of mind and lack of moral status in turn justifies people consuming them (Gradidge et al., 2021). As meat consumption necessarily involves animal slaughter, this finding indicates that our lack of moral concern for 'food' (vs. non-'food') animals has real-world negative consequences for animal welfare, and thus that speciesism is morally unethical. Bolstering this moral argument against speciesism, meat consumption also has negative environmental consequences: For example, if most people adopted predominantly plant-based diets by 2050, greenhouse gas emissions could reduce by 52% (Springmann et al., 2018). Thus, if people exhibited less speciesism and instead cared equally and positively for all animals, dire negative environmental consequences from meat consumption could be avoided.

Concern for some animals over others also has wider effects beyond meat consumption: For example, when pigs are victims of crime, people are more likely to derogate them (ignore their positive qualities) or forgive their perpetrators, and less likely to help them or empathise with them, than dog victims (Gradidge et al., in press). Thus, people may be less responsive to certain animal victims over others because of underlying pet speciesism, which may have real-world negative implications for certain species when they are victims. These consequences emphasise the urgent need to develop interventions to reduce pet

speciesism. However, to develop these interventions, we must first identify *why* people view pigs (vs. dogs) negatively.

One reason as to why people view pigs (vs. dogs) negatively is that, despite multiple similarities, both species also have key *dis*similarities. For example, research indicates that dogs and humans have co-evolved for approximately 32,000 years (Wang et al., 2013). Dogs have also evolved unique physiological and behavioural characteristics (e.g., an inner eyebrow muscle; Kaminski et al., 2019) absent in other species such as pigs. These characteristics enable dogs to be intrinsically appealing to humans due to their humanised facial expressions (Kaminski et al., 2017), responsiveness (Pérez Fraga et al., 2021) and cuteness which resembles human infants (paedomorphism; Archer & Monton, 2011; Kaminski et al., 2019).

Yet, despite these intrinsic differences between dogs and pigs, dogs are not universally liked across cultures and history: For example, both Islam and Judaism typically have ambivalent views of dogs including viewing dogs as dirty and impure (Berglund, 2014; Berkowitz, 2019), and dogs are killed for meat, physically beaten and frequently not treated like pets in some cultures (Gray & Young, 2011). The idea of dogs as pets (that is, solely companions that are not kept for functional purposes) is also a relatively recent phenomenon in history (Herzog, 2014). Perceptions of dogs can be ambivalent even within modern 'pet-loving' countries: An estimated 3% of people from the UK are very afraid of dogs whilst another 11% are a little afraid of dogs (YouGov, 2014). In addition, pigs are not universally disliked, as demonstrated by the trend of so-called 'miniature pigs' being kept as pets. Combined with the fact that social psychological research consistently finds that people view humans (e.g., sexism; Glick et al., 2000) and even non-humans (e.g., robots; Deligianis et al., 2017) in prejudiced ways, these differing perceptions of dogs and pigs suggest a wider explanation than intrinsic evolutionary factors alone. That is, this prior research suggests a role for extrinsic factors (characteristics imposed onto animals by humans) in pet speciesism *in combination with* intrinsic factors (characteristics inherent to the animal; Serpell, 2004). Whilst previous research has explored intrinsic factors (as seen from the research above), research lags behind on extrinsic factors explaining pet speciesism.

Psychological theories such as the Stereotype Content Model (Fiske, 1998; Fiske et al., 1999), which measures stereotypes and prejudice against and towards groups, provide a possible framework to explore pet speciesism and these extrinsic factors. The Stereotype Content Model suggests peoples' perceptions of others consist of two psychological dimensions: Warmth and competence (Fiske, 1998; Fiske et al., 1999). Warmth refers to whether another being (such as an animal) is viewed as having positive or negative intent. In animals, warmth may be reflected in an inclination towards friendliness or aggression (Sevillano & Fiske, 2016). Competence refers to whether this being (e.g., an animal) is viewed as capable of enacting this intent. In animals, competence may be reflected in an animals' capacity to engage in friendly (e.g., wagging tail; initiating play) or aggressive (e.g., biting) behaviour (Sevillano & Fiske, 2016). Species are categorised as warm and competent ('companions', e.g., dogs), warm but not competent ('prey', e.g., pigs), competent but not warm ('predators', e.g., lions) or neither warm nor competent ('pests', e.g., rats; Sevillano & Fiske, 2016). People are also more willing to actively help, and less to actively harm, 'warm' species, and more willing to passively help, and less to passively harm, 'competent' species (Sevillano & Fiske, 2016), known as the behaviours from intergroup affect and stereotypes map (Cuddy et al., 2007). These findings therefore emphasise how enhancing 'warmth' and 'competence' perceptions of animals can improve behavioural intentions towards them.

As the Stereotype Content Model applies to animals, it represents a robust psychological framework to explore pet speciesism, whereby greater perceived warmth and/or competence of dogs (vs. pigs) indicates pet speciesism. The current study also utilises the Stereotype Content Model to explore extrinsic predictors of pet speciesism, thus beginning exploration of extrinsic factors which cause pet speciesism. Speciesism and general social psychological literature provide possible extrinsic factors which we discuss below.

Familiarity

Social psychological literature (e.g., Pettigrew & Tropp, 2006) has extensively explored how interpersonal and intergroup familiarity with others affects perceptions of them, whereby familiarity in this context refers to quantity or perceived quality of contact with others (Auger & Amiot, 2016). Interpersonally, people typically prefer others who are deemed familiar to oneself (Reis et al., 2011). For instance, people view

familiar (vs. unfamiliar) human faces as more likeable (Harmon-Jones & Allen, 2001). At the intergroup level, familiarity can also have positive effects. For instance, direct contact with human outgroups (Pettigrew & Tropp, 2006) or mere exposure to faces of outgroup members (Flores et al., 2018) can reduce prejudice. These findings arise from two theories: intergroup contact theory (Pettigrew, 1998) and mere exposure effect (Zajonc, 1968). Intergroup contact theory suggests (positive) contact has beneficial effects as it reduces negative, and enhances positive, affect (Tausch & Hewstone, 2010). Specifically, outgroup contact reduces anxiety by enabling people to realise the outgroup is not threatening (Pettigrew & Tropp, 2008), and increases outgroup-directed empathy and perspective-taking through intergroup friendship (Pettigrew & Tropp, 2008).

Conversely, the mere exposure effect suggests multiple exposures to a stimulus increases liking for the stimulus. Specifically, viewing a stimulus multiple times improves one's ability to recognise the stimulus (Bornstein & D'agostino, 1992, 1994) which is interpreted as a positive experience and incorrectly attributed to the stimulus as liking (Bornstein & D'agostino, 1992, 1994).

Corroborating these theories, anthrozoological research (the study of human-animal interaction) indicates familiarity also has positive effects on perceptions of animals. For example, imagining interacting with a dog or cow increases inclusiveness of animals into the self and more positive behavioural intentions towards animals (Auger & Amiot, 2019a). Other research also suggests positive relationships between familiarity and perceptions of animals. For instance, pet owners (vs. non-owners) identify more strongly with animals (Auger & Amiot, 2015), whilst greater contact with animals, especially pets, predicts greater identification with animals (Auger & Amiot, 2016). Additionally, 33% of UK households share their homes with dogs (Bedford, 2021) and interact with dogs frequently (unlike with pigs), supporting a role of intergroup contact theory and familiarity with perceptions of dogs.

Similarity

Like familiarity, at the interpersonal level, people typically prefer others who are deemed similar to oneself (e.g., Montoya et al., 2008). For example, greater perceived similarity of another to an observer improves observers' perceptions of them (e.g., reduced victim culpability; Miller et al., 2011; increased attribution of secondary emotions; Rodríguez-Pérez et al., 2011). However, social psychological research on *intergroup* similarity with humans is contradictory. Some theories (e.g., self-categorisation theory; Turner et al., 1987) and research (McDonald et al., 2015) suggest intergroup similarity positively affects perceptions of outgroups ('reflective distinctiveness'). However, other theories (e.g., social identity theory; Tajfel & Turner, 1979) and research (Danyluck & Page-Gould, 2018) indicate intergroup similarity has *negative* effects ('reactive distinctiveness').

Anthrozoological research overwhelmingly supports positive effects of similarity on perceptions of animals (i.e., 'reflective distinctiveness'). For instance, greater human-animal similarity reduces animal-directed prejudice (Costello, 2008) and people prefer (Batt, 2009; Kozachenko & Piazza, 2021) and empathise more with (Prguda & Neumann, 2014; Westbury & Neumann, 2008) species with greater bio-behavioural similarity to humans. Thus, unlike with human outgroups, reflective (vs. reactive) distinctiveness is seemingly the predominant response to animals' perceived similarity. Research also indicates that people are more likely to attribute members of their ingroup (vs. outgroup) with uniquely human emotions (Cortes et al., 2005) and that dogs are typically viewed by people as part of their ingroup ('psychological-kin'; Topolski et al., 2013).

Categorisation

Another possible predictor of pet speciesism is categorisation (Bratanova et al., 2011), whereby people place animal species into different groups, such as 'pets', 'profit' animals and 'pests' (Signal et al., 2018; Taylor & Signal, 2009). People usually value pet welfare more than profit or pest animal welfare (Hazel et al., 2011; Signal et al., 2018; Taylor & Signal, 2009), representing a possible human-imposed hierarchy of animal groups. These labels have significant implications for perceptions of animals and thus possibly animal welfare: For instance, merely classifying an animal as 'food' vs. 'not food' (manipulating profit status) negatively influences its perceived moral status, ability to suffer and mind attribution (e.g., Bastian

et al., 2012; Bratanova et al., 2011). As people typically consume pigs as meat and keep dogs as pets within Western societies, pigs should be typically viewed as 'profit' animals whilst dogs should be categorised as 'pet' animals.

Self-Relevance

Drawing on speciesism literature, another possible predictor of pet speciesism is self-relevance: Whether or how much someone exploitatively uses, and is invested in using, an animal for personal benefit (e.g., for meat-eating, animal testing, bullfighting consumption; Piazza & Loughnan, 2016) with no or little benefit to the animal. For example, if someone consumes dried beef (vs. dried nuts), they view cows as having decreased moral status and feel reduced responsibility to feel moral concern for animals (Loughnan et al., 2010). Furthermore, when an animal is not self-relevant, its purported intelligence informs its perceived moral status, whereby more intelligent animals are perceived as having greater moral status (Piazza & Loughnan, 2016). However, a *self-relevant* animal's (e.g., pig's) purported intelligence does not inform its moral status. That is, the moral status of self-relevant animals is unaffected by whether the animal is labelled 'intelligent' or 'unintelligent' (also see Gradidge & Zawisza, 2019). This finding arises from 'motivated cognition': People wish to avoid harming self-relevant animals, yet consuming them inevitably causes harm, so people intentionally evaluate self-relevant animals negatively (dehumanisation; Bandura, 1999; Bilewicz et al., 2011) to reduce discomfort (see Gradidge et al., 2021, for detailed discussion).

Whilst this previous research indicates consumption of an animal harms perceptions of it, research has not considered alternative sources of self-relevance, such as liking for meat or subjective involvement. We therefore distinguish here between two possible types of self-relevance: 'behavioural self-relevance', referring to behavioural investment in meat consumption (e.g., actual meat consumption), and 'subjective self-relevance', referring to psychological investment in meat consumption (e.g., liking for meat or product involvement). Whilst research has not yet explored subjective self-relevance specifically, 'meat paradox' research (whereby people simultaneously love animals *and* love consuming them) suggests liking for meat impacts perceptions of animals. For example, people often present meat consumption as pleasurable or 'nice' (e.g., Macdiarmid et al., 2016; Piazza et al., 2015) and the more people enjoy meat, the more they

deny animal suffering and defensively legitimise meat consumption (Monteiro et al., 2017), indicating motivated cognition. Whilst 'niceness' of meat is typically an outcome of motivated cognition (Piazza et al., 2015), 'niceness' could equally trigger motivated cognition, whereby people who enjoy and are more (vs. less) involved in consuming meat struggle to reduce meat consumption more and thus are more motivated to dehumanize meat animals. Expanding on the above research, we aim to explore applicability of behavioural self-relevance (behavioural investment) to pigs specifically and subjective self-relevance (psychological investment) to any species.

Individual Differences

Pet speciesism may differ across individuals: That is, individual differences, including empathy towards animals (Powell, 2010) and support for animal utility (approval of using animals for human benefit; Kendall et al., 2006), may moderate pet speciesism. For instance, greater belief in human over animal supremacy and usage of animals is associated with more negative perceptions of animals (Monteiro et al., 2017), especially lower-status 'food' animals (Krings et al., 2021). Conversely, empathy towards animals is associated with more positive views of them (Hills, 1995), reduced meat consumption (Camilleri et al., 2020), increased reported meat avoidance (Rothgerber & Mican, 2014), reduced willingness to consume meat (Kunst & Hohle, 2016; Zickfeld et al., 2018), increased willingness to try a vegetarian alternative (Kunst & Hohle, 2016), and greater perceived human-animal similarity (Rothgerber & Mican, 2014). Extending the above research to the Stereotype Content Model for the first time, we explore the applicability of these individual differences variables to pet speciesism.

Research Questions and Hypotheses

Overall, the current study aims to extend previous pet speciesism literature by uniquely testing pet speciesism within the Stereotype Content Model framework. It also aims to elucidate predictors of pet speciesism for the first time, which can be tested causally in later experiments. The current study therefore asks two research questions: 1) Are dogs viewed with greater warmth and competence than pigs (pet speciesism)? And 2) What predicts pet speciesism?

Following from the above literature review, we propose the following hypotheses:

H1: Dogs will be deemed warmer (**a**) and more competent (**b**) than pigs based on previous pet speciesism research (Bilewicz et al., 2011; Caviola & Capraro, 2020; Gradidge et al., in press)

H2: Dogs will be deemed as more familiar than pigs

H3: Greater familiarity with dogs (**a**) or pigs (**b**) will predict that species' improved warmth and competence

H4: Dogs will be deemed more similar to humans than pigs

H5: Greater perceived similarity of dogs (**a**) or pigs (**b**) will predict that species' improved warmth and competence

H6: Pigs will be deemed profit animals more than dogs,

H7: Dogs will be deemed pets more than pigs

H8: The more dogs (**a**) or pigs (**b**) are categorised as 'pets', the warmer and more competent that species will be deemed

H9: The more dogs (**a**) or pigs (**b**) are categorised as profit animals, the less warm and competent that species will be deemed

H10: The more often people consume pig meat (behavioural self-relevance; **a**) and the more people are psychologically invested in consuming pig meat (subjective self-relevance; **b**), the less they will rate pigs as warm or competent

H11: The more empathy people have for animals, the warmer and more competent dogs and pigs will be deemed

H12: The higher support for animal utility, the less warm and competent dogs and pigs will be deemed

Method

Participants

A volunteer sample of 276 participants were recruited for this online study through social media, posters, flyers, and the Anglia Ruskin University SONA system. Thirty-nine partial responses were excluded and a further five excluded for failing an attention check, leaving a final sample of 232 participants (all 18+; M_{age}=28.57, SD_{age}=10.74). This sample size exceeds the minimum required sample size of 184 per GPower (effect size of 0.15, power of 0.95, 12 predictors and α error rate of 0.05), indicating sufficient statistical power. Anglia Ruskin University undergraduate psychology students (*n*=13) received 0.25 SONA research participation credits as reimbursement. There was no other participant reimbursement.

This sample consisted of 61.2% (*n*=142) meat consumers, 13.4% (*n*=31) vegans, 12.5% (*n*=29) vegetarians, 7.8% (*n*=18) pescatarians, 2.2% (*n*=5) flexitarians (those who consume meat occasionally), 0.9% (*n*=2) meat consumers but who do not consume pig meat and 0.4% (*n*=1) following a Mediterranean diet (which may or may not include meat). Additionally, 1.3% (*n*=3) indicated they would rather not say and 0.4% (*n*=1) gave no response. There were a significant number of non-meat consumers in comparison to the general population[2] as we oversampled this group in order to conduct separate analyses across meat consumers vs. non-meat consumers. However, as we were unable to recruit sufficient numbers of non-meat consumers for these separate analyses, we instead conducted all analyses on the entire sample to maximise statistical power. Controlling for diet by dummy coding the sample into meat consumers (*n*=142) and non-meat consumers (including vegans, vegetarians and pescatarians; *n*=78) did not amend main conclusions (see footnote three).

The majority (78.4%) of the sample was female (*n*=182), followed by males at 17.7% (*n*=41), people who would rather not say at 1.7% (*n*=4), those who are non-binary at 1.3% (*n*=3), one participant who indicated other (0.4%) and another who gave no response (0.4%). Most of the sample identified their nationality as British or American (see Table 1 for all nationalities).

[2]Vegans and vegetarians typically make up approximately 1% and 7% of the population respectively (Wunsch, 2021), although these figures vary (e.g., by country).

Table 1

Participant Nationality

Nationality	Number of participants (percentage of sample)
British	105 (45.3%)
American	27 (11.6%)
Malaysian	10 (4.3%)
Portuguese	10 (4.3%)
French	7 (3%)
German	7 (3%)
No response or N/A	6 (2.6%)
Canadian	3 (1.3%)
Chinese	3 (1.3%)
Dutch	3 (1.3%)
Hungarian	3 (1.3%)

Indian	3 (1.3%)
Irish	3 (1.3%)
Italian	3 (1.3%)
Romanian	3 (1.3%)
South African	3 (1.3%)
Czech	2 (0.9%)
Greek	2 (0.9%)
Pakistani	2 (0.9%)
Polish	2 (0.9%)
Spanish	2 (0.9%)
Vietnamese	2 (0.9%)
Asian (non-specified)	1 (0.4%)
Australian	1 (0.4%)

Dual British and Asian (non-specified)	1 (0.4%)
Dual British and Canadian	1 (0.4%)
Dual British and US American	1 (0.4%)
Dual Mexican and US American	1 (0.4%)
Indonesian	1 (0.4%)
Israeli	1 (0.4%)
Japanese	1 (0.4%)
Kazakh	1 (0.4%)
Maldivian	1 (0.4%)
Maltese	1 (0.4%)
Myanmarese	1 (0.4%)
New Zealander	1 (0.4%)
Norwegian	1 (0.4%)

Palestinian	1 (0.4%)
Serbian	1 (0.4%)
Swedish	1 (0.4%)
Taiwanese	1 (0.4%)
Thai	1 (0.4%)
Zimbabwean	1 (0.4%)

Most participants identified their ethnicity as White (75.9%; *n*=176), followed by Asian (12.9%; *n*=30), mixed (5%; *n*=12), Black (3.1%; *n*=7), Arab (0.9%; *n*=2) and Hispanic and/or Latino (0.9%; *n*=2). Two participants (0.9%) indicated they would rather not say and one participant gave no response (0.4%). Additionally, most participants reported living in the UK (56.9%; *n*=132) or the US (15.1%; *n*=35; see Table 2 for country of residence).

Table 2

Participant Country of Residence

Country of residence	Number of participants (percentage of sample)
UK	132 (56.9%)
US	35 (15.1%)

Malaysia	9 (3.9%)
France	7 (3%)
Australia	5 (2.2%)
No response or N/A	5 (2.2%)
The Netherlands	5 (2.2%)
Canada	4 (1.7%)
Germany	4 (1.7%)
Hungary	4 (1.7%)
Italy	3 (1.3%)
Ireland	2 (0.9%)
Norway	2 (0.9%)
South Africa	2 (0.9%)
Spain	2 (0.9%)

Sweden	2 (0.9%)
Austria	1 (0.4%)
Belgium	1 (0.4%)
Finland	1 (0.4%)
Hong Kong	1 (0.4%)
Kazakhstan	1 (0.4%)
Serbia	1 (0.4%)
Singapore	1 (0.4%)
Switzerland	1 (0.4%)
Vietnam	1 (0.4%)

Note. Average duration for living in country of residence was 21.6 years

Design

The current study follows a regression design with 12 predictor variables : behavioural and subjective self-relevance of pigs, familiarity, similarity, pet status and profit status of dogs and pigs, empathy towards animals and support for animal utility. The four outcome variables are dogs' warmth, dogs' competence, pigs' warmth and pigs' competence. Perceptions of dogs and pigs are analysed separately to gauge if and

how perceptions differ across species. This study received ethical approval from the lead authors' institutional review board (Anglia Ruskin University, ethics code EHPGR-20).

Materials

Empathy Towards Animals

Empathy towards animals was measured with the Empathy Towards Animals Scale (Powell, 2010, adapted from Interpersonal Reactivity Index; Davis, 1983) consisting of two subscales: perspective-taking (α=0.71 for males; α=0.75 for females; Davis, 1980) and empathic concern (α=0.68 for males; α=0.73 for females; Davis, 1980). Participants rated their agreement or disagreement with the 12 items on a Likert scale from one ('*not at all'*) to five ('*very much'*), with higher scores indicating greater empathy. A sample item is '*I often have tender, concerned feelings for animals who suffer misfortune*'. The Interpersonal Reactivity Index from which the current scale was adapted has good test-retest reliability (0.61-0.79 for males; 0.62-0.81 for females; Davis, 1980) and good convergent and discriminant validity (Davis, 1983). Our reliability analysis indicated acceptable reliability (α=0.86; 95% CI [0.84, 0.89]). Statements 2, 4, 5 and 10 were reverse-scored. As the empathic concern and perspective-taking subscales correlated together, r=0.5, p < 0.001, all items were summed to create an overall empathy towards animals score.

Attention Check

A single item was included as an attention check: '*If you are reading this statement, please choose option 3 "Somewhat"*'. Five participants failed this check and were excluded from analyses.

Support for Animal Utility

Support for animal utility was measured through the Animal Utility Scale (Kendall et al., 2006). Participants rated their agreement or disagreement with three items on a Likert scale from one ('*strongly disagree'*) to seven ('*strongly agree'*), with higher scores indicating greater support for animal utility. A sample item is '*It is acceptable to use animals to test consumer products such as soaps, cosmetics, and household cleaners'*. No items are reverse-scored. The scale has good validity (Cembalo et al., 2016) and acceptable reliability (α=0.65; Kendall et al., 2006). Our reliability analysis returned lower reliability (α=0.58; 95%

CI [0.47, 0.66]). However lower reliabilities are not uncommon with short scales (Ponterotto & Ruckdeschel, 2007). All items were summed to form a support for animal utility score.

Perceived Familiarity and Similarity of Dogs and Pigs

Perceived familiarity (the quantity or perceived quality of contact with dogs or pigs) and similarity (the degree to which dogs and pigs are viewed as akin to humans) were measured by single questions developed by the researchers: '*How familiar do you perceive the following animals (dogs/pigs) to be to you?*' and '*How similar do you perceive the following animals (dogs/pigs) to be to humans?*' on a Likert scale from one ('*not at all'*) to five ('*very much'*). Higher scores indicate greater familiarity and similarity respectively.

Perceived Pet and Profit Status of Dogs and Pigs

Perceived pet and profit status were measured by single questions developed by the researchers: '*How much do you perceive the following animals (dogs/pigs) to be a 'pet' animal (an animal that is kept within a household as a companion)?*' and '*How much do you perceive the following animals to be a 'profit' animal (an animal that is used in some way for human consumption, e.g., for meat, leather or animal testing)?*'on a Likert scale from one ('*not at all'*) to five ('*very much'*). Higher scores indicate greater pet or profit status respectively.

Subjective Self-Relevance of Pigs

Subjective self-relevance was measured through an adapted version of the Product Involvement Scale (Jain & Srinivasan, 1990; Kim, 2006; Luna & Kim, 2009) regarding participant's perceptions of pig products (e.g., ham). Participants rated their agreement or disagreement with three items on a Likert scale from one ('*strongly disagree'*) to seven ('*strongly agree'*), with higher scores indicating greater subjective self-relevance of pigs. We adapted these items from an Osgood differential scale (Luna & Kim, 2009) to a non-comparative Likert scale referring to pig products specifically (e.g., '*I am very interested in products made from pigs (e.g., pork, ham)*'). No items are reverse-scored. The original scale had high reliability (α=0.86; Kim, 2006) yet reliability on our sample was considerably lower (α=0.69; 95% CI [0.61, 0.75]). Further analyses revealed that item three '*I am not indifferent to products made from pigs (e.g., pork, ham)'*

correlated poorly with the first, r=0.28, and second items, r=0.26 (Field, 2018), and removing this item improved scale reliability (α=0.85; 95% CI [0.81, 0.89]). We thus excluded this item and summed the remaining two items to create a subjective self-relevance score.

Behavioural Self-Relevance of Pigs

Behavioural self-relevance was measured by a single question: '*How many days a week do you eat products made from pigs (e.g., ham, pork, sausages, bacon)*?' from 0-7 days per week. Higher scores indicate greater behavioural self-relevance.

Perceived Warmth and Competence of Dogs and Pigs

Perceived warmth and competence were measured with abridged warmth and competence subscales (Sevillano & Fiske, 2016). Participants rated how much they perceived dogs and pigs as '*warm*', '*well-intentioned*' and '*friendly*' (warmth subscale) and '*competent*', '*skillful*' and '*intelligent*' (competence subscale) on a Likert scale from one ('*not at all'*) to five ('*extremely'*). Higher scores indicate greater warmth or competence respectively. No items are reverse-scored. The subscales have good discriminant and convergent validity (Diamantopoulos et al., 2017), apply across various contexts (e.g., brands, Zawisza, 2016; cross-cultural, Zawisza et al., 2018; animals, Sevillano & Fiske, 2016) and predict behavioural intentions (Cuddy et al., 2007). The subscales have high reliability (warmth: α=0.83; competence: α=0.87; Sevillano & Fiske, 2016), corroborated by our reliability analyses (dog warmth: α=0.87, 95% CI [0.84, 0.9]; dog competence: α=0.87, 95% CI [0.84, 0.9]; pig warmth: α=0.88, 95% CI [0.86, 0.91]; pig competence: α=0.9, 95% CI [0.88, 0.92]).

Procedure

All participants took part online via Qualtrics. After giving informed consent, participants completed the scales in the order listed above followed by demographic questions (diet, gender, age, nationality, ethnicity, country of residence, duration of time living in country of residence). Participants then reported technical difficulties and offered comments. Seven participants reported technical difficulties, but their responses were complete and therefore included within analyses. Finally, participants were debriefed, automatically redirected to SONA and, if applicable, received their credits.

Results

Analytical Strategy

We hypothesised that dogs would be viewed as warmer (**H1a**), more competent (**H1a**), more familiar to us (**H2**), more similar to humans (**H4**), less as profit animals (**H6**) and more as pets (**H7**) than pigs. To assess these hypotheses, we therefore ran five one-way repeated measures ANOVAs with subsequent Benjamini-Hochberg corrections (Benjamini & Hochberg, 1995), with species (dog vs. pig) as the independent variable, warmth (**H1a**), competence (**H1b**), familiarity (**H2**), similarity (**H4**) and profit status (**H6**) as the dependent variables**.**[3] All ANOVA assumptions were met or resolved. There were either no outliers (pig warmth; pig/dog competence; pig familiarity; dog/pig similarity; pig profit status) or outliers were not extreme and did not change conclusions (dog warmth; dog familiarity; dog profit status). Hence, we report analyses including outliers. Whilst all ANOVAs failed Kolmgorov-Smirnov statistical tests of normality, *p*s<0.05, skewness was acceptable (between -2 to 2; Kim, 2013; West et al., 1995) and ANOVA is robust to non-normality (Blanca et al., 2017). Note that, as single Likert items can be deemed non-parametric (Bishop & Herron, 2015), three non-parametric analyses with species (dog vs. pig) as the independent variable and familiarity, similarity (Wilcoxon signed-rank tests) and profit status (sign test with continuity correction) as the dependent variables respectively revealed same results as the ANOVAs. To assess **H7,** we ran a non-parametric sign test with continuity correction instead of one-way repeated measures ANOVA due to multiple extreme outliers and excessive negative skew on dogs' pet status. A sign test with continuity correction was conducted instead of a Wilcoxon signed-rank test due to failure to meet the assumption of symmetrical distribution.[4]

To assess all of our other hypotheses, we ran multiple regressions with 12 predictors (familiarity, similarity, dogs' and pigs' pet and profit status, pigs' behavioural and subjective self-relevance, empathy for animals and support for animal utility) on each of the four outcome variables (dogs' and pigs' warmth

[3]Note that running all ANOVAs instead as ANCOVAs which controlled for diet (except pet status; see footnote four) did not change findings. We therefore report the original ANOVAs here, which did not control for diet.
[4]An ANCOVA controlling for diet could not be run for pet status as this variable failed ANOVA assumptions and diet cannot be controlled for with a non-parametric sign test.

and competence).[5] All assumptions for the regressions were met or resolved: Residuals were normally distributed, excluding outliers and leverage values did not change main findings,[6] there was no multicollinearity between predictors, and homoscedasticity and linearity assumptions were met. Non-parametric ordinal logistic regressions revealed comparable results. We report the regressions including outliers and leverage values below.

Main Analyses

Species Main Effects

The main effects of species on warmth, competence, familiarity, similarity, profit status and pet status were all statistically significant (see Table 3 for inferential statistics).

Table 3

ANOVA Inferential Statistics of Species on all Outcome Variables

Warmth	Competence	Familiarity	Similarity	Profit status	Pet status
***$F(1, 231) = 195.81$, $p < 0.001$, partial $\eta^2 = 0.46$ (large-sized)[7]	***$F(1, 231) = 69.42$, $p < 0.001$, partial $\eta^2 = 0.23$ (large-sized)	***$F(1, 231) = 231.64$, $p < 0.001$, partial $\eta^2 = 0.5$ (large-sized)	***$F(1, 231) = 61.33$, $p < 0.001$, partial $\eta^2 = 0.21$ (large-sized)	***$F(1, 231) = 349.31$, $p < 0.001$, partial $\eta^2 = 0.6$ (large-sized)	***$z = 13.65$, $p < 0.001$, $r = 0.9$ (large-sized)[8]

[5]Due to the presence of four outcome variables, we ran these multiple regressions as a multivariate multiple regression via SPSS's 'general linear model' menu option instead of via the 'regression' menu option per IBM's guidance (IBM, 2020). However, we only report the univariate statistics here. Including diet as a covariate within these analyses did not change findings except for pig familiarity no longer predicted dogs' warmth, $p = 0.06$, $B = -.26$, $SE = 0.14$, and empathy for animals no longer predicted pigs' competence, $p = 0.06$, $B = .05$, $SE = 0.3$. As main conclusions did not change, we report the original regressions here which did not control for diet.

[6]When excluding outliers and leverage values, pigs' similarity statistically significantly predicted dogs' competence, $F(1, 219) = 4.33$, $p = 0.04$, partial $\eta^2 = 0.02$, $B = -0.35$, $SE = 0.17$ (small-sized). Dogs' profit status, $F(1, 219) = 2.96$, $p = 0.09$, partial $\eta^2 = 0.01$, $B = -0.19$, $SE = 0.11$, and pigs' familiarity, $F(1, 219) = 1.6$, $p = 0.21$, partial $\eta^2 = 0.01$, $B = -0.17$, $SE = 0.13$, no longer statistically significantly predicted dogs' warmth.

[7]Effect sizes are defined throughout as approximately partial $\eta^2 = 0.01$ (small), partial $\eta^2 = 0.06$ (medium) and partial $\eta^2 = 0.14$ (large; Richardson, 2011).

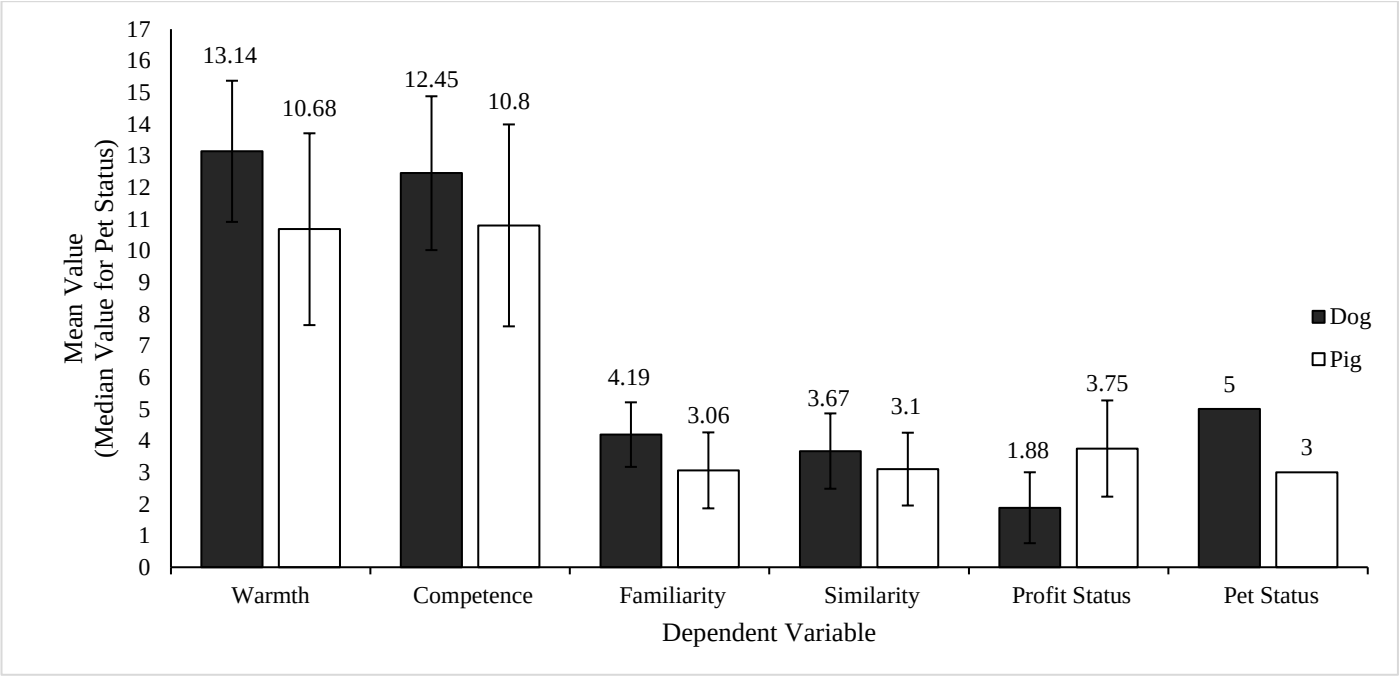
[8]Per Cohen (1988).

Note. * = $p < 0.05$, ** = $p \leq 0.01$, *** = $p \leq 0.001$

Specifically, agreeing with **H1, H2, H4,** and **H6-H7**, dogs were deemed warmer, more competent, more familiar, more similar, less as profit animals and more as pet animals than pigs (see Figure 1). All findings remained statistically significant (all *q*-values = 0.01) after correcting for multiple comparisons using the Benjamini-Hochberg correction, which maintains the false discovery rate at 0.05.

Figure 1.

Mean Values for Main Effects of Species on all Dependent Variables



Note. Error bars depict standard deviations. Pet status depicts median values instead of mean values.

Predictors of Pet Speciesism (H3, H5; H8-H12)

The regression revealed that our model statistically significantly predicted all outcome variables (see Table 4). We report findings relevant to our hypotheses, alongside all unexpected statistically significant findings, below. See Table 4 for all statistics.

Table 4

Regression Statistics

Predictor	*B*	*SE*	*F*	Partial η^2	Adj. R^2
(OV1) Dog Warmth			14.36***		0.41
Pigs' Behavioural Self-Relevance	0.15	0.09	3.26	0.02	
Pigs' Subjective Self-Relevance	0.04	0.09	0.23	0.001	
Dog Familiarity	0.46	0.15	10.06**	0.04	
Pig Familiarity	-0.29	0.13	4.62*	0.02	
Dog Similarity	0.55	0.13	17.67***	0.08	
Pig Similarity	-0.17	0.14	1.32	0.01	
Dog Pet Status	0.77	0.19	15.82***	0.07	
Pig Pet Status	0.46	0.11	15.96***	0.07	
Dog Profit Status	-0.27	0.11	6.09**	0.03	

Pig Profit Status	-0.02	0.09	0.03	< 0.001	
Empathy for Animals	0.07	0.02	16.91***	0.07	
Support for Animal Utility	-0.02	0.04	0.18	0.001	
(OV2) Dog Competence			9.06***		0.3
Pigs' Behavioural Self-Relevance	0.05	0.1	0.27	0.001	
Pigs' Subjective Self-Relevance	0.14	0.1	1.85	0.01	
Dog Familiarity	-0.06	0.17	0.11	0.001	
Pig Familiarity	-0.15	0.16	0.85	0.004	
Dog Similarity	0.47	0.16	9.3**	0.041	
Pig Similarity	-0.2	0.17	1.37	0.01	
Dog Pet Status	0.65	0.23	7.91**	0.04	

Pig Pet Status	0.54	0.14	15.67***	0.07	
Dog Profit Status	-0.1	0.13	0.53	0.002	
Pig Profit Status	-0.19	0.11	3.19	0.01	
Empathy for Animals	0.1	0.02	24.72***	0.1	
Support for Animal Utility	-0.07	0.05	2.08	0.01	
(OV3) Pig Warmth			11.59***		0.36
Pigs' Behavioural Self-Relevance	0.3	0.12	6.31**	0.03	
Pigs' Subjective Self-Relevance	-0.27	0.12	4.77*	0.02	
Dog Familiarity	0.22	0.21	1.11	0.01	
Pig Familiarity	0.14	0.19	0.53	0.002	
Dog Similarity	-0.15	0.19	0.68	0.003	
Pig Similarity	0.52	0.2	6.38**	0.03	

Dog Pet Status	0.85	0.28	9.48**	0.04	
Pig Pet Status	0.71	0.16	19.03***	0.08	
Dog Profit Status	0.14	0.16	0.82	0.004	
Pig Profit Status	-0.16	0.13	1.67	0.01	
Empathy for Animals	0.06	0.02	5.99*	0.03	
Support for Animal Utility	-0.09	0.06	2.06	0.01	
(OV4) Pig Competence			11.99***		0.36
Pigs' Behavioural Self-Relevance	0.1	0.13	0.57	0.003	
Pigs' Subjective Self-Relevance	-0.23	0.13	3.24	0.02	
Dog Familiarity	-0.14	0.22	0.42	0.002	
Pig Familiarity	0.48	0.2	5.97*	0.03	

Dog Similarity	-0.14	0.19	0.54	0.002
Pig Similarity	0.78	0.21	12.83***	0.06
Dog Pet Status	0.97	0.29	11.24***	0.05
Pig Pet Status	0.59	0.17	12.07***	0.05
Dog Profit Status	-0.02	0.16	0.01	< 0.001
Pig Profit Status	0.01	0.13	0.003	< 0.001
Empathy for Animals	0.05	0.03	3.98*	0.02
Support for Animal Utility	-0.05	0.06	0.64	0.003

Note. * = $p < 0.05$, ** = $p \leq 0.01$, *** = $p \leq 0.001$. OV refers to outcome variable.

We hypothesised that greater familiarity with dogs (**H3a**) or pigs (**H3b**) would predict that species' greater warmth and competence. Partially supporting **H3a**, the greater familiarity with dogs, the warmer dogs were perceived (medium-sized effect). However, contradicting **H3a**, familiarity with dogs did not statistically significantly predict dogs' *competence*. Additionally, the greater familiarity with pigs, the more competent pigs were perceived (small-to-medium-sized effect), partially supporting **H3b**. However, contradicting **H3b**, familiarity with pigs did not statistically significantly predict pigs' warmth. Unexpectedly, the greater familiarity with pigs, the less warm dogs were perceived, (small-sized effect).

We also hypothesised that greater perceived similarity of dogs (**H5a**) or pigs (**H5b**) to humans would predict that species' greater warmth and competence. Supporting **H5a**, the greater dogs' perceived similarity to humans, the warmer (medium-to-large sized effect) and more competent (medium-sized effect) they were deemed. Additionally, supporting **H5b**, the greater pigs' perceived similarity to humans, the warmer (small-to-medium sized effect) and more competent (medium-sized effect) they were deemed.

We hypothesised that the more dogs (**H8a**) or pigs (**H8b**) are categorised as 'pets', the warmer and more competent that species will be deemed. Supporting **H8a**, the greater dogs' pet status, the warmer and more competent they were perceived (both medium-sized effects). Unexpectedly**,** the greater dogs' pet status, the warmer and more competent pigs were also perceived (both medium-sized effects). Additionally, supporting **H8b**, the greater pigs' pet status, the warmer (medium-to-large sized effect), and more competent (medium-sized effect), they were perceived to be. Unexpectedly, the greater pigs' pet status, the warmer and more competent dogs were also perceived as (both medium-sized effects).

We also hypothesised that the more dogs (**H9a**) or pigs (**H9b**) are categorised as profit animals, the less warm and competent that species will be deemed. Partially supporting **H9a**, the greater dogs' profit status, the less warm they were perceived (small-to-medium-sized effect). However, contradicting **H9a**, dogs' profit status did not statistically significantly predict dogs' competence, **.** Additionally, contradicting **H9b**, pigs' profit status did not statistically significantly predict pigs' warmth or competence

We hypothesised that the more often people consume pig meat (behavioural self-relevance; **H10a**) and the more people are psychologically invested in consuming pig meat (subjective self-relevance; **H10b**), the less they will rate pigs as warm or competent. Contradicting **H10a**, the greater behavioural self-relevance of pigs, the *warmer* pigs were deemed (small-to-medium-sized effect). Also contradicting **H10a**, behavioural self-relevance of pigs did not statistically significantly predict pigs' competence. Conversely, partially supporting **H10b**, the greater subjective self-relevance of pigs, the less warm pigs were deemed (small-sized effect). However, contradicting **H10b**, subjective self-relevance of pigs did not statistically significantly predict pigs' competence.

We hypothesised that the more empathy people have for animals, the warmer and more competent dogs and pigs will be deemed (**H11**). Supporting **H11**, the greater empathy for animals, the warmer (medium-sized effect), and more competent (medium-to-large-sized effect) dogs were deemed. Additionally, also supporting **H11**, the greater empathy for animals, the warmer (small-sized effect) and more competent (small-sized effect) pigs were deemed.

Finally, we hypothesised that the higher support for animal utility, the less warm and competent dogs and pigs would be deemed (**H12**). Contradicting **H12**, support for animal utility did not statistically significantly predict dogs' warmth or competence, nor pigs' warmth or competence

Discussion

This study uniquely explored support for pet speciesism using the Stereotype Content Model and tested predictors of pet speciesism for the first time. Specifically, the current research aimed to a) investigate support for pet speciesism using the Stereotype Content Model (**H1**), b) test if dogs are deemed more familiar (**H2**), more similar (**H4**), less as profit animals (**H6**) and more as pets (**H7**) than pigs, and c) explore possible pet speciesism predictors: familiarity (**H3**), similarity (**H5**), pet status (**H8**), profit status (**H9**), behavioural and subjective self-relevance (**H10a**-**b**), empathy for animals (**H11**) and support for animal utility (**H12**).

Overall, **H1**-**H2, H4** and **H6**-**H7** were supported. That is, pet speciesism was evidenced. Specifically, dogs (vs pigs) are deemed warmer, more competent (**H1**), more familiar (**H2**), and similar (**H4**), less as profit animals (**H6**) and more as pets (**H7**). Furthermore, familiarity, similarity and pet status in turn all predicted perceptions of dogs and pigs (though in different ways; discussed below). However, whilst dogs' greater profit status predicted dogs' decreased warmth (but not competence), pigs' profit status predicted neither pigs' warmth nor competence. This finding contradicts **H9** and previous research (Signal et al., 2018; Taylor & Signal, 2009) and suggests profit status cannot explain pet speciesism. That is, even though pigs are deemed profit animals more than dogs, profit status does *not* predict pigs' decreased warmth and competence. Our results may differ to previous findings from Signal et al. (2018) and Taylor and Signal (2009), as this previous research did not test if the simple label and categorisation (of being a pet, pest or a

'profit' animal) caused speciesism. Whilst they did find positive perceptions of pets and more negative perceptions of 'profit' animals and pests (evidence of speciesism), it is unclear if these perceptions of different types of animals were caused by mere categorisation (pet vs. profit vs. pest) or by moderating variables. For example, profit animals may not have been viewed negatively merely due to their profit status but instead due to other factors explored within the current study like less familiarity with and lower perceived similarity of profit animals to humans. Unlike profit status, familiarity (**H3**), similarity (**H5**) and pet status (**H8**) could all explain pet speciesism, though with variable effects. For instance, following previous literature (Auger & Amiot, 2015, 2016, 2019a, 2019b), we hypothesised familiarity with a species would predict that species' greater warmth *and* competence (**H3**). Yet, partially contradicting **H3**, familiarity predicted only warmth for dogs and only competence for pigs. This finding thus suggests possible differential relationships between familiarity and warmth vs. competence depending on species.

Contrary to familiarity, and supporting **H5** and previous research (e.g., Batt, 2009), dogs' or pigs' greater similarity predicted that species' increased warmth and competence. This finding partially contradicts Piazza and Loughnan (2016), whereby people ignored pigs' purported intelligence when considering their moral status. However, as the current study reveals associative relationships only, similarity may not be causing increased warmth and competence. Instead, participants may be motivated to view pigs negatively and thus view pigs with decreased warmth, competence *and* similarity.

Like similarity, and agreeing with **H8** and previous research (e.g., Signal et al., 2018), dogs' or pigs' greater pet status also predicted that species' increased warmth and competence. Yet, pet status also positively generalized to perceptions of the other species. That is, the more dogs or pigs were categorised as pets, the warmer and more competent the other species was perceived. This generalization effect is the 'pets as ambassadors hypothesis', whereby positive perceptions of one species inform positive perceptions of another, and is supported by previous research (Auger & Amiot, 2015, 2016, 2019a, 2019b; Auger et al., 2015; Serpell & Paul, 1994). This generalization is usually from perceptions of pets to non-pets but also uniquely occurred here in the opposite direction.

Alongside the above predictors, subjective self-relevance of pigs could explain pet speciesism too. Specifically, subjective self-relevance predicted warmth (though not competence) in the expected negative direction (partially supporting **H10b**), partly agreeing with previous literature (Bastian et al., 2012; Loughnan et al., 2010; Piazza & Loughnan, 2016). Behavioural self-relevance also did not predict competence, and predicted warmth in an unexpected positive direction (contradicting **H10a**). This positive relationship may arise from a third variable. For example, participants may have deliberately underreported pig product consumption (causing low reported behavioural self-relevance, despite higher actual behavioural self-relevance; Rothgerber, 2019) and deliberately dehumanized pigs by viewing them as lacking in warmth.

The **H11** findings indicate empathy for animals improves perceptions of dogs and pigs. This result agrees with previous literature which suggests empathy for animals improves perceptions of them (Hills, 1995). However, it is unclear if having more empathy for animals *causes* more positive perceptions or if people who have more empathy also have more positive perceptions of animals due to another underlying variable.

Finally, contradicting **H12** and previous research (e.g., Krings et al., 2021; Monteiro et al., 2017), support for animal utility did not predict dogs' or pigs' warmth and competence. These findings suggest support for animal utility as measured within the current study does not moderate pet speciesism. This finding may contradict previous research as support for animal utility has previously been measured with various scales and under differing names (e.g., 'human supremacy over animals'; Krings et al., 2021). Whilst these variables may overlap considerably (e.g., in terms of their support for human dominion over animals), these variables may also subtly differ in their operationalisation and measurement. For example, we utilised the Animal Utility Scale, which had low reliability within the current study and could therefore explain our null results. We also theorise that support for animal utility may split into utilitarian-type support (whereby people do not wish to harm animals but believe animal harm is unavoidable in order to meet human needs) and malicious-type support (whereby people feel no concern about animal harm and believe animals can be used without abandon to meet human needs). Whilst both types of support value

485 humans over other animals, we theorise that utilitarian-type support still assigns some value to animals,
486 whilst malicious-type support does not. Subtle differences in operationalisation across studies may in turn
487 affect measurement and thus explain differing findings. Future research should carefully identify if these
488 separate components of support for animal utility exist and, if so, develop finely-tuned measurements for
489 each.

490 Limitations and Directions for Future Research

491 Whilst the current study extends previous literature by evidencing pet speciesism within the Stereotype
492 Content Model framework and uniquely demonstrates predictors and possible causes of pet speciesism, it
493 does have certain limitations, including non-causality, a focus on extrinsic factors only, culture-
494 boundedness and reliance on self-report. We discuss these limitations here and provide suggestions for
495 future research.

496 One limitation is the study's correlational nature which restricts conclusions about causality.
497 Subsequent studies should employ experimental designs to test possible causal effects of the statistically
498 significant predictors of pet speciesism found here. For instance, researchers could manipulate an animal's
499 familiarity to assess causal effects on the animals' warmth and competence. If familiarity has causal effects,
500 this finding may: 1) explain why dogs are deemed warmer and more competent than pigs (as dogs are also
501 deemed more familiar to humans than pigs) and 2) provide opportunities for interventions to improve pigs'
502 warmth and competence (e.g., enhancing pigs' familiarity).

503 The research also only explores extrinsic factors and not the confluence of both extrinsic and
504 intrinsic factors. As pet speciesism may result from both extrinsic and intrinsic factors (Serpell, 2004), we
505 suggest that future research tests the contribution of both types of factors. For example, future research
506 could conduct a regression on all intrinsic (e.g., unchangeable behavioural and physiological
507 characteristics) and all extrinsic (e.g., changeable perceptions of animals) variables and assess the relative
508 contributions of each. It is also possible that intrinsic and extrinsic factors may combine to enhance or
509 reduce pet speciesism. For example, previous research indicates that the positive effects of paedomorphism

on our perceptions of animals are partially moderated by pet owner species preference and pet attachment (Archer & Monton, 2011).

Additionally, this study is culture-bounded, as reflected in the study sample: Most participants were British or American and living in the UK or US. Whilst speciesism is cross-cultural (Joy, 2011), evaluations of, and interactions with, different species are culturally specified (Gray & Young, 2011). Thus, the focus on *dog* vs. *pig* pet speciesism here means our findings apply only to people from cultures which treat dogs as pets and pigs as food and thus potentially exclude certain countries and cultures. For instance, Muslims typically abstain from consuming pigs and thus may view pigs with equivalent warmth and competence as dogs. Conversely, people who follow Chinese traditions of dog meat consumption may view dogs with less warmth and competence than pigs.

However, even the above cultural hypotheses are oversimplified. For instance, as discussed in the introduction, Islam sometimes views dogs as impure (Berglund, 2014). Thus, some Muslims may not consume dogs as part of their diet because they view dogs negatively (e.g., disgust), unlike non-Muslim Westerners who do not consume dogs and view them positively (e.g., cuteness; Zickfeld et al., 2018). To complicate matters further, dog ownership in Islamic countries is increasing (Berglund, 2014). Similarly, there are growing trends within China to reject dog meat consumption (Pettier, 2020). Therefore, Muslims and Chinese people may increasingly view dogs like non-Muslim Westerners and exhibit dog vs. pig pet speciesism.

Future research should: 1) generally, consider how culture influences perceptions of animals and 2) specifically, test the conflicting cultural hypotheses here: Do Muslims view dogs more negatively (due to perceived impurity), and/or pigs more positively (due to no self-relevance) than non-Muslim Westerners? Do Chinese (vs. Western) people view dogs more negatively than pigs due to self-relevance, or just as positively due to increasing rejection of dog meat? These questions are important for understanding pet speciesism in a non-‘Western’ context and determining cultural boundary conditions of (dog vs. pig) pet speciesism.

Finally, the study relies on self-report which may lead to biases in participant responses. For example, people can under-report or otherwise misrepresent their meat consumption when asked about it directly (Rothgerber, 2019). Thus, our measure of behavioural self-relevance (asking participants directly about their weekly meat consumption) may not reflect participants' true meat consumption and instead reflect a more socially desirable response of less meat consumption (Rothgerber, 2019). Future research may instead employ more subtle measurements of behavioural self-relevance such as through food diaries (Gradidge et al., 2021).

Theoretical Implications

The current study has strong theoretical implications for pet speciesism literature by: 1) supporting pet speciesism within novel psychological dimensions (warmth and competence), thus building upon previous support for pet speciesism (e.g., Caviola & Capraro, 2020; Gradidge et al., in press), and 2) uniquely evidencing pet speciesism's predictors, thus extending previous pet speciesism literature by beginning to identify why pet speciesism occurs. The current study also provides a strong foundation for subsequent experiments to test causality of these predictors and use statistically significant causes to inform interventions to reduce pet speciesism. Our findings contribute to and extend social psychological literature (e.g., Sevillano & Fiske, 2016) by demonstrating applicability of the Stereotype Content Model to perceptions of animals and uniquely evidencing the utility of the Stereotype Content Model as a framework for measuring pet speciesism. Moreover, our paper adds to previous literature (e.g., Auger & Amiot, 2019a) by showing how some psychological concepts developed with perceptions of humans (e.g., familiarity; Pettigrew & Tropp, 2006) also apply to perceptions of animals, indicating these concepts extend beyond perceptions of humans only.

Summary for Practitioners: Practical Implications

This study has strong practical implications for human-animal interaction practitioners. For instance, if familiarity causes pet speciesism, interventions may utilise actual or imagined interaction (Auger & Amiot, 2019a) with pigs to improve pigs' perceived warmth and/or competence. Alternative possible interventions from the current study also include: 1) reducing pigs' subjective self-relevance by decreasing the salience

of peoples' liking for pig meat or focussing on negative aspects of pig meat (e.g., eliciting disgust) or 2) utilising 'factual appeals' (highlighting similarities of pigs to humans). However, these factual appeals may be ineffective for pigs (see Gradidge & Zawisza, 2019, for a discussion).

Extending the Stereotype Content Model, the behaviours from intergroup affect and stereotypes map (Cuddy et al., 2007) suggests warmth and competence inform behavioural intentions (and ultimately behaviour) towards others. Thus, improving pigs' warmth and competence through possible effective interventions described above should encourage more positive (active and passive help), and less negative (active and passive harm), behaviours towards pigs, such as reduced willingness to consume pig meat. This possible reduced meat consumption would benefit both human and animal welfare by aiding the global mission to decrease greenhouse gas emissions (Springmann et al., 2018), and would benefit pig welfare specifically through reducing harm caused to pigs (e.g., through slaughter).

Beyond meat consumption, interventions could also have practical implications for enhancing public perception of pigs and improving (non-meat-related) behaviour towards them. For instance, both the current study and previous research (Gradidge et al., in press) indicate people respond less favourably to pigs (vs. dogs) in the real world, meaning people may experience more apathy and less moral outrage when pig (vs. dog) welfare is violated. Policymakers may also view pigs negatively, meaning policies affecting pigs may be less considerate of animal welfare than policies affecting dogs. This disparity in policies is already evident in the UK, whereby, despite dogs' and pigs' multiple similarities, dog meat consumption is illegal, yet thousands of pigs are slaughtered for food monthly (DEFRA, 2020).

Interventions to improve pigs' warmth and competence, and thus improve behavioural intentions towards them, may enable these real-world issues regarding policy and public perception of pigs to be overcome. Specifically, if policymakers have more positive behavioural intentions towards pigs, then pig welfare may be indirectly enhanced through improvements to policy which prevent (e.g., stopping pig slaughter) or mitigate (e.g., implementing further measures to reduce distress during slaughter) harm against pigs. More positive public perception of pigs may also have wide-ranging consequences which better pig

586 welfare,[9] possibly including: exerting pressure on policymakers, raising awareness of pig welfare issues to
587 others, widespread reductions in personal meat consumption, revealing and publicising cases of pig welfare
588 violations, and pressuring pig slaughter organisations (e.g., factory farms) to comply with animal welfare
589 legislation through measures such as boycotting.

590 Finally, where opportunity allows (e.g., at animal sanctuaries), improving perceptions of pigs may
591 also foster positive human-animal interactions between humans and pigs. Whilst research exploring the
592 effects of positive human-animal interactions on well-being is mixed (e.g., Rodriguez et al., 2021), positive
593 human-animal interactions between humans and pigs may at least be a pre-requisite for human-pig bonds.
594 Thus, improving warmth and competence perceptions of pigs may represent the initial stepping-stone to
595 enable deeper human-pig bonds to be potentially formed.

596 Overall, the current study is of practical use to human-animal interaction practitioners as it begins
597 the journey to identifying which variables predict pet speciesism, and which variables may therefore be
598 effective within interventions to enhance perceptions of pigs. These interventions in turn have indirect
599 implications for both pig and human welfare. Such interventions may also foster positive human-pig
600 interactions and relationships.

601 ## Conclusion

602 To conclude, the current research suggests pet status, similarity, familiarity, empathy towards animals and
603 (behavioural and subjective) self-relevance, but not animal utility, all predict perceptions of dogs and pigs
604 and potentially cause or moderate pet speciesism. Animal utility's lack of predictive effects, and profit
605 status's lack of predictive effects on perceptions of pigs, indicate neither variable can explain pet
606 speciesism. Thus, the current research uniquely highlights predictors of pet speciesism. This research adds
607 to emerging pet speciesism literature and extends established social psychological literature by further
608 demonstrating the applicability of concepts developed with perceptions of humans to perceptions of
609 animals. Future research should assess these predictors' causal effects and utilise statistically significant

[9]However, these possible consequences of positive public perceptions of pigs should be explicitly tested.

causes to inform interventions to reduce pet speciesism. This research is especially important and urgent due to required reductions in meat consumption and has strong practical implications for meat consumption, public perception of pigs and policy.

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