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Empirical: Single or Multiple Studies

Diet Predicts Mind and Moral Concern Towards a Broad Range of Animal Categories

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Abstract

A compelling body of research demonstrates that diet (e.g. vegetarianism) plays an important role in the moral concern people grant to animals. However, this research has focused mostly on 'food' animals, leaving us with limited understanding of the scope of this effect. We investigated how vegans/vegetarians (veg*ns) and omnivores attribute mind (Study 1) and moral standing (Study 2) across a wide range of animal categories. In Study 1, veg*ns perceived greater mental capacities for most animal categories. Both veg*ns and omnivores gave some categories lesser ratings than others (e.g. evolutionarily distant vs. close to humans), suggesting that veg*ns and omnivores follow similar patterns of mind perception. In Study 2, however, veg*ns both attributed animals greater moral standing overall and gave similar ratings across categories (e.g. toward 'liked' animals such as rabbits and 'disliked' animals such as rats), whereas omnivores drew sharper distinctions between categories. These studies demonstrate that meat avoidance is a meaningful factor not only in the perceptions of animals that people eat, but also other animals.

Keywords

mind attribution, moral standing, speciesism, vegetarians, vegans, diet

Non-Technical Summary

Background

People treat animals in vastly different ways, depending on the species. Chickens are often raised for food on industrial farms, while cats are adored as companions, mice are subjected to experiments, and bulls are used for public entertainment. Various factors influence our moral perceptions and subsequent treatment of animals. For instance, an animal's perceived mental abilities (or 'mind'), aesthetics, harmfulness, and similarity to humans all influence the moral standing we afford them. Moreover, personal diet choice (e.g. vegetarianism) clearly plays an important role in the moral concern we grant to animals. However, research to date has primarily focused on 'food' animals, such as pigs or cows, leaving us with limited understanding of the full scope of this effect. This study explores how dietary preferences relate to our perceptions of animals' mental abilities and moral standing across different animal categories, like food vs. non-food, beloved vs. loathed, and closely vs. distantly related to humans.

Why was this study done?

Previous research has shown that vegetarians and vegans (veg*ns) generally attribute greater mind and moral standing to animals compared to omnivores. However, because much of this research has only looked at 'food' animals, we cannot be sure whether this is an isolated phenomenon or extends across all manner of animals. For example, do veg*ns extend moral standing even to animals widely deemed disgusting or dangerous? This study aimed to investigate whether the effect of diet on mind and moral judgements extends to other animal groups.

What did the researchers do and find?

The study involved two parts.

Study 1: We recruited omnivores and veg*ns and asked them to rate the mental abilities of animals across different categories: edibility status (e.g. pig vs. dog), evolutionary distance (e.g. chimpanzee vs. fly), and developmental stage (e.g. frogspawn vs. tadpole vs. frog). Veg*ns consistently attributed greater mental abilities to all animals compared to omnivores. However, both groups shared similar patterns, with food animals, distantly related animals, and earlier-stage animals receiving lower mind ratings.

Study 2: The second study directly investigated moral standing (in addition to mind) and introduced a new animal categorisation: beloved (e.g. butterflies) vs. loathed (e.g. wasps). Participants rated these animals on their mental abilities, moral standing, and personal liking. Veg*ns showed greater moral concern for all animals and perceived less of a moral divide between beloved and loathed animals compared to omnivores, who attributed significantly higher moral value to beloved animals. Veg*ns also personally liked many of the 'loathed' animals significantly more than the omnivores did, suggesting that veg*ns may not dislike these animals enough to even constitute a 'loathed' category.

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What do these findings mean?
The findings indicate that diet is relevant not just in how we judge food animals but also animals we love, those we loath, those that resemble us, and those that do not. Veg*ns tend to grant greater mental abilities and moral standing to animals overall, even to those that are often disliked. The results suggest that veg*ns have a wider circle of moral concern, seeing more animals as deserving of moral treatment. This study provides valuable insights into speciesism and how dietary choices relate to our treatment and perception of different animal groups.

People have distinct relationships with different animal species, exploiting and killing chickens for food, adoring cats as companions, experimenting on mice, training dogs to protect and aid people, using bulls for entertainment, and exterminating cockroaches *en masse*. From factory farmed food to 'man's best friend', people place nonhuman animals in categories that engender widely different degrees of moral concern (Crimston et al., 2016).

Research has shown that an animal's moral treatment is influenced by various characteristics, including their edibility (Ang et al., 2019; Bastian et al., 2012; Bratanova et al., 2011), perceived harmfulness (Piazza et al., 2014), aesthetic attractiveness (Klebl et al., 2021), and similarity to humans (Miralles et al., 2019). An animal's perceived mental life—their mind—appears to be particularly influential (Bastian et al., 2012; Bratanova et al., 2011; Knight et al., 2004; Leach et al., 2021; Loughnan et al., 2010), with greater mental attributions consistently coinciding with greater moral regard. In fact, Gray et al. (2012) argue that mind attribution is the very essence of moral standing.

Mind for both human and nonhuman entities has been analysed in terms of two dimensions: *agency* and *experience* (Gray et al., 2007). In Gray and colleagues' (2007) seminal work, agency encapsulates capacities for self-control, morality, memory, emotion recognition, planning, communication, and thought. Experience covers capacities for hunger, fear, pain, pleasure, rage, desire, personality, consciousness, pride, embarrassment, and joy. These dimensions are thus related to the concepts of *sapience* and *sentience* in other literatures (e.g. Yolles, 2022) but are not necessarily interchangeable. Research since then has commonly used this framework, or adaptations of it, to investigate our mind attributions toward people, nonhuman animals, and other entities (e.g. Bastian et al., 2012; Gray & Wegner, 2012). Critically, in Gray et al.'s (2007) original work, entities who received higher ratings on both dimensions were granted more moral value, with participants more motivated to save them from destruction, make them happy, and believe them to possess a soul. Our perception of others' minds shapes how we value them morally.

Research following Gray et al. (2007) has also revealed a fascinating association between an animal's edibility and their de-mentalisation, with animals deemed food also

denied the ability to fully think and feel (Bilewicz et al., 2011; Bratanova et al., 2011). The standard explanation is that, through mind-denial, omnivores lessen the cognitive dissonance borne from paradoxically loving animals and eating them (i.e. the 'meat paradox'; Bastian et al., 2012; Loughnan et al., 2010).

However, human judgements do not hinge solely on who or what is being judged; individual differences among perceivers account for nearly as much variance in judgements as individual differences among targets (Jaeger & Wilks, 2023). Dietary comparisons can be informative here. As veg*ns do not consume meat, they have no reason to deny mind or moral status to edible animals. Indeed, contrary to the steep differentiation among omnivores, research shows that veg*ns attribute as much mind to edible animals (e.g. pigs) as they do to companion animals (e.g. dogs; Ang et al., 2019; Bilewicz et al., 2011).

Much of the research using dietary comparisons has emphasised food animals, often to the exclusion of non-food categories of animals (e.g. wild animals; but see e.g. Aytürk & Broad, 2021). As such, it remains unclear whether the association between mind perception and dietary choice is limited to food animals or extends to animals generally. This distinction is theoretically important, as it may speak to the causal direction of the association (perception driving behaviour or behaviour driving perception). It is also timely, as diversification of protein sources moves animals (including several insect species; Ardoin & Prinyawiwatkul, 2021) from the non-food category to the food category. Moreover, it responds to calls in the literature for more work to study the interplay between target and judge factors in shaping moral concern (Jaeger & Wilks, 2023).

The Present Study

It is already clear that a range of target characteristics affect our judgements of animals. For example, animals that are seen as harmful are attributed less moral standing (Piazza et al., 2014). An animal's appearance is also meaningful, with more beautiful and 'baby-like' animals receiving heightened moral concern (Klebl et al., 2021; Piazza et al., 2018). Additionally, people offer greater empathy and compassion to those more closely related to us (e.g. orangutans) than to those more distantly related (e.g. frogs; Miralles et al., 2019). Finally, some evidence demonstrates an overlap between likeability and moral concern (Marriott & Cassaday, 2022; but see Caviola & Capraro, 2020). Other work supports this notion indirectly. For instance, many disliked animals (see Nolan et al., 2006) present the risk of harm through physical attacks (e.g. snakes, sharks) or disease (e.g. ticks, rats), are considered ugly (e.g. spiders, wasps), and are highly dissimilar to humans (e.g. flies, jellyfish). Disliked animals such as these often receive poor moral treatment. Consider, for instance, the practice of shark finning, where sharks are caught, de-finned, and cast back into the ocean, or the extermination of rats through toxins that cause slow and painful death. Therefore, an animal's perceived edibility, mind, harmfulness, aesthetic, similarity to humans, and likeability all impact our moral judgements.

In light of these findings, we aimed to explore how omnivores and veg*ns attribute mind and moral standing across various nonhuman animal categories. In doing so, we hoped to better understand the scope of how diet relates to our attitudes towards animals—examining whether it generalises to a broad category of animals or appears mostly in the domain of relevance (i.e. food animals). To replicate key findings in this area (Ang et al., 2019; Bilewicz et al., 2011) and extend them to new cases, we investigated in Study 1 how omnivores and veg*ns attribute mind to similar 'food' and 'nonfood' animals (e.g. tuna and dogfish). To test for interactions between dietary category and evolutionary distance (Miralles et al., 2019), we compared omnivores' and veg*ns' responses to animals that are close relatives of humans (e.g. chimpanzees) or distant relatives of humans (e.g. flies). Finally, we examined different developmental stages within the same species (e.g. frogspawn, tadpole, and frog) as a novel exploration.

In Study 2 we replicated and extended Study 1 findings. Though an established body of evidence reveals a positive relationship between mind attribution and moral standing (Bastian et al., 2012; Bratanova et al., 2011; Knight et al., 2004; Leach et al., 2021; Loughnan et al., 2010), we could only infer moral standing from the mind attribution ratings in Study 1. To address this gap, we explicitly investigated both mind attribution and moral standing in Study 2. We also incorporated the key issue of likeability, by directly comparing liked and disliked animals. Past work has demonstrated conceptual overlap between likeability and moral concern. For example, in moral circle tasks, villains are consistently granted the lowest levels of moral consideration, in some cases lower even than non-living entities (e.g. a mountain; Jaeger & Wilks, 2023; see also Crimston et al., 2016). Previous research has also emphasised the role of emotion in shaping moral judgement (e.g. Caviola & Capraro, 2020; Marriott & Cassaday, 2022). Animals accorded low moral status tend to attract 'negative' characteristics (e.g. disgusting, harmful); animals accorded high moral status tend to attract positive characteristics (e.g. beautiful, good). Based on the current literature, it is difficult to say where moral standing stops and liking begins. The contrast between omnivores and veg*ns provides some leverage here. Veg*ns typically ascribe higher moral status to animals than do omnivores. The question is whether this tendency extends to animals that people actively dislike.

Study 1

We first aimed to understand how diet impacts attribution of mind to various categories of animals: food versus nonfood, evolutionarily distant versus close, and developmental stage. We expected omnivores to attribute less mind to the animals overall (**H1**). Moreover, across both omnivores and veg*ns we expected food (**H2**), evolutionarily distant (**H3**), and earlier-stage animals (**H4**) to receive lower mind attributions than their nonfood, evolutionarily close, and later-stage counterparts. Additionally, we expected omnivores to report greater discrepancies of mind between these groupings (**H5**), where-

as veg*ns would attribute them more similar mental abilities. For instance, we expected veg*ns to attribute similar minds to food animals like cows and nonfood animals like horses, whereas omnivores would perceive more of a rift between these categories.

Method

This work was approved by the ethics committee of the Department of Psychology at the University of York [Approval No. 334]. All participants gave informed consent prior to participation. The anonymised dataset, R code, codebook, and supplementary materials are available on the Open Science Framework (Hankins, 2024). This study was not pre-registered.

Participants

Data were collected from 42 undergraduate students from the University of York (34 female, 8 male), five of whom were vegan, 14 vegetarian, one pescatarian, and 22 omnivorous.[1] Vegetarian and vegan participants were combined into a single variable (veg*n), and the pescatarian was excluded from analysis, resulting in a final sample of 41 participants. Gender was split evenly between veg*ns (4 male, 15 female) and omnivores (4 male, 18 female). Of the veg*ns, eight were motivated by ethics/animal welfare, six by the environment, four by health, and one by family/culture. Participants' ages ranged from 18 to 22 years (M = 20.23, SD = 1.18).

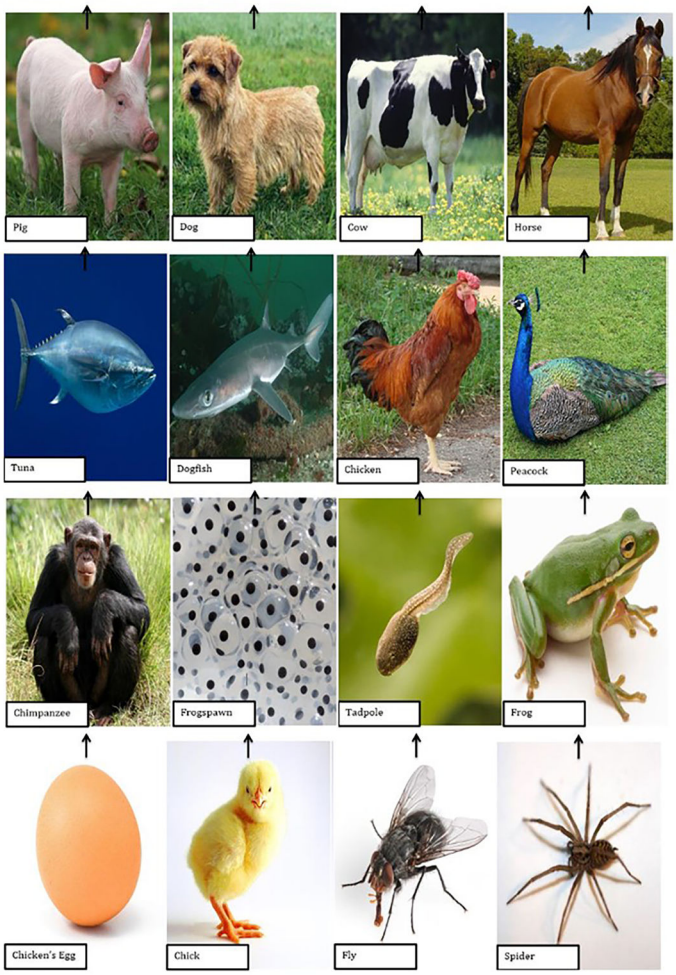
Materials and Measures

A physical scale numbered from 0 to 100 was made for the experiment, labelled with either Gray et al.'s (2007) experience (hunger, fear, pain, pleasure, rage, desire, personality, consciousness, pride, embarrassment, and joy) or agency (self-control, morality, memory, emotion recognition, planning, communication, and thought) characteristics, depending on the dimension participants were rating. Verbatim instructions are available in the Supplementary Materials (Hankins, 2024). Photographs of all targets were printed with the addition of upward-pointing arrows to align with the response scale (Figure 1). Though participants rated additional targets, 16 are discussed in this analysis, divided into the following categories: food/nonfood (pig, cow, tuna, chicken vs. dog, horse, dogfish, peacock), evolutionarily close/distant (chimpanzee, dog, cow, pig, horse vs. tuna, dogfish, spider, fly), and developmental stages 1–3 (chicken's egg and frogspawn vs. chick and tadpole vs. chicken and frog).

1) To ensure a sufficient sample of veg*ns, 21 participants were recruited through an online questionnaire asking them to express a preference between 10 pairs of items (e.g. cat/dog, coffee/tea), designed to disguise the reason for recruitment. The critical item was 'vegetarian/non-vegetarian'. Those who responded vegetarian were invited to participate.

Figure 1

Study 1 Animal Targets



The food and nonfood animals were selected to be as similar as possible to one another (e.g. pig vs. dog), differing only in their edibility status. Evolutionarily close and distant animals were selected according to a clear spectrum, with the close category comprising charismatic mammals and the distant category comprising fish, insects, and arachnids. Animals that fell somewhere in between (e.g. bird species) were thought to be too ambiguous and were excluded from the subset. Moreover, animals that display distinct developmental stages (e.g. frogspawn, tadpole, frog) were chosen as stimuli for our

developmental stages subset, rather than animals with less obvious phases (e.g. newborn dog, puppy, adult dog).

Procedure

Participants were seated in a quiet room and tasked with positioning all targets along the 100-point scale, separately rating agency and experience. The scale tasks were counterbalanced so that participants completed either the agency or experience scale first. Next, participants completed demographic questions regarding age, religion, and gender and were asked to select their dietary preference (meat-eater, pescatarian, vegetarian, vegan, or other). If vegetarian or vegan, participants chose from one of four options regarding their diet motivation: ethics/animal welfare, environment, health, or family/culture. Participants were then fully debriefed.

Results

All statistical analyses were conducted in R (R Core Team, 2022). Post-hoc power analyses in G*Power (Faul et al., 2009) revealed an achieved power of 82.3–86.8%.[2] Though mind attribution was assessed on two dimensions, these were highly correlated (r = .90). Hence, we summed agency scores (0–100) and experience scores (0–100) to form a single variable of 'mind' scored from 0 to 200. Additionally, although we have combined vegetarians and vegans in this study to achieve a large enough sample size, it is important to note that these dietary groups are distinct (e.g. Dhont & Ioannidou, 2024). For example, vegetarians, but not vegans, are likely to experience the 'cheese paradox'—cognitive dissonance between their beliefs (loving animals) and behaviours (harming animals by consuming dairy/egg)—and use various strategies to resolve this discomfort (Docherty & Jasper, 2023). We do not distinguish between vegetarians and vegans in the reported investigations. However, descriptive means for vegetarians, vegans, and omnivores are provided in Hankins (2024).

Subset: Food Versus Nonfood Animals

Using linear mixed effects regression via the lme4 package (Bates et al., 2015), we initially built a null model with mind attribution as the outcome variable and set participant ID as a random intercept to account for individual variability among participants. We added incremental complexity with two additional models, retaining by-participant random effects. We conducted an ANOVA to assess best fit among the three models, finding

2) G*Power settings as follows: F tests; linear multiple regression: fixed model, R^2 deviation from zero; post hoc; effect size f^2 estimated as a large effect (f^2 = 0.35) based on large observed conditional R^2 values in the regression output (edibility subset, R^2 = .37; evolutionary relatedness subset, R^2 = .76; developmental subset, R^2 = .72); alpha = .05; total sample size = 41, number of predictors = 3 (edibility subset, evolutionary relatedness subset) or 4 (developmental subset).

that the model accounting for participants' diet and animal targets' food/nonfood status produced the lowest Akaike information criterion (*AIC*; 3342.9) and Bayesian information criterion (*BIC*; 3361.9) values and was significant ($p < .001$). An interaction between these variables did not improve model fit (*AIC* = 3344.7, *BIC* = 3367.5, $p = .65$). Therefore, the non-interaction model was selected for our investigation. Using this model, we could account for 37% of the variance of mind attribution (conditional $R^2 = .37$).

Diet — Descriptive statistics revealed that omnivores and veg*ns differed in their mind attributions toward the targets, with omnivores attributing less mind to the animals in this subset overall ($M = 97.64$, $SD = 42.64$) than veg*ns ($M = 117.93$, $SD = 43.77$). This trend appeared for each animal (Figure 2A). Multiple linear regression revealed a significant main effect of diet whereby omnivores attributed animals 20.3 units less mind on average than veg*ns ($p = .02$), controlling for an animal's edibility (Table 1A). This dietary group difference is roughly equivalent in magnitude to the overall descriptive difference between a cow ($M = 118.05$, $SD = 34.59$) and a chicken ($M = 94.49$, $SD = 38.82$; see the Supplementary Materials for all mean ratings in Hankins (2024).

Food/Nonfood Status — Animals were perceived differently according to whether they held a food or nonfood status. Descriptively, compared to their inedible counterparts, edible animals were attributed less mind on average, ($M = 113.24$, $SD = 45.80$) and ($M = 100.84$, $SD = 41.92$), respectively; see Figure 2A for all targets. Multiple linear regression further revealed a significant main effect of edibility, with nonfood animals receiving 12.41 greater units of mind attribution on average than their counterparts ($p < .01$), holding participant diet constant (Table 1A).

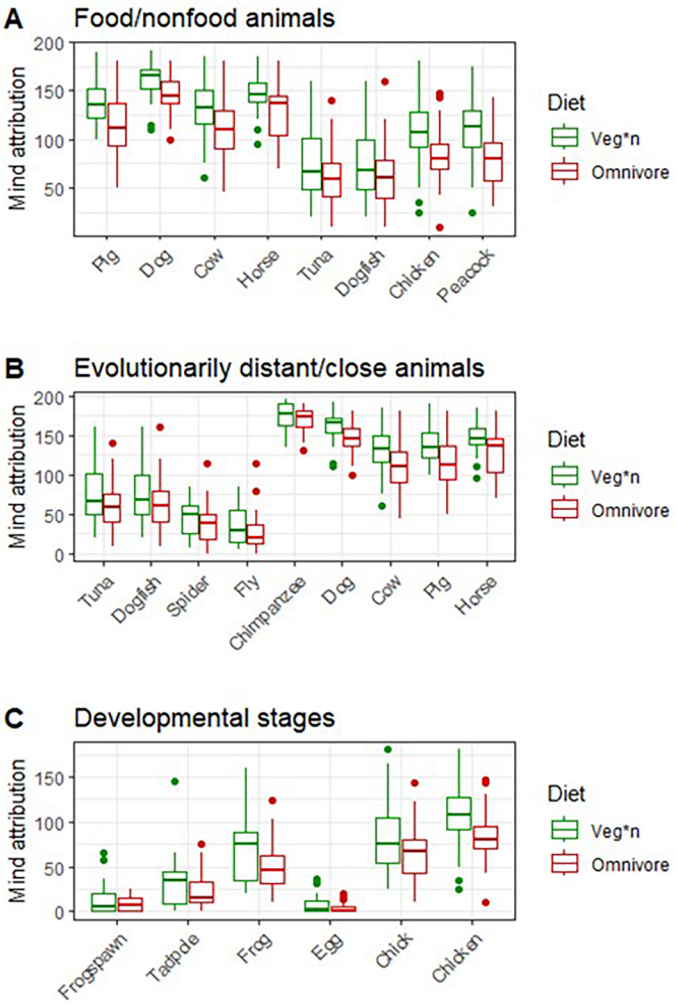
Subset: Evolutionarily Distant Versus Close Animals

Analogous to the previous analysis, we created incrementally more complex multiple regression models to capture the impact of diet and evolutionary relatedness on mind attribution. The model accounting for participants' diet and animal targets' close/distant relationship to humans produced the lowest *AIC* (3569.0) and *BIC* (3588.6) values and was significant ($p < .001$). An interaction between these variables did not improve model fit (*AIC* = 3570.0, *BIC* = 3593.4, $p = .30$). Thus, we selected the non-interaction model, which accounted for 76% of the variance of mind attribution (conditional $R^2 = .76$).

Diet — A person's diet significantly influenced the degree of mind they attributed to the animals in the subset overall. Descriptives revealed that omnivores attributed targets less mind ($M = 94.51$, $SD = 55.01$) than veg*ns ($M = 108.91$, $SD = 55.31$). This trend followed for each individual target (see Figure 2B). Multiple regression analysis further indicated a significant main effect of diet, with omnivores attributing 14.40 units less mind on average ($p < .05$), holding evolutionary distance from humans constant (Table 1B). This

Figure 2

Mind Attribution Per Target and Participant Diet



is nearly the same overall discrepancy as between a dog (M = 151.27, SD = 22.24) and horse (M = 136.78, SD = 27.68; see the Supplementary Materials for all mean ratings in Hankins, 2024). This finding suggests that people who abstain from meat grant more complex minds to animals across categories, not merely to the 'edible' ones.

Table 1A

Full Regression Outputs: Mind Attribution Regressed on Diet and Edibility

Predictor	Estimates	*p*
(Intercept)	111.72	< .001
Diet [Omnivore]	-20.29	.023
Edibility [Nonfood]	12.41	.002
Random Effects		
σ^2	1257.59	
$\tau_{00\ PID}$	596.26	
ICC	0.32	
N_{PID}	41	
Observations	328	
Marginal R^2 / Conditional R^2	.071 / .370	

Table 1B

Full Regression Outputs: Mind Attribution Regressed on Diet and Evolutionary Relatedness

Predictor	Estimates	*p*
(Intercept)	147.74	< .001
Diet [Omnivore]	-14.4	.047
Evolutionary Relatedness [Distant]	-87.37	< .001
Random Effects		
σ^2	746.29	
$\tau_{00\ PID}$	420.11	
ICC	0.36	
N_{PID}	41	
Observations	369	
Marginal R^2 / Conditional R^2	.625 / .760	

Evolutionary Relatedness — Whether an animal was evolutionarily close or distant to humans significantly impacted their mind attribution. Distant animals received lower descriptive ratings (M = 52.64, SD = 35.95) than close animals (M = 140.01, SD = 33.50) overall, and this trend was consistent per target (Figure 2B). The multiple regression analysis indicated a significant effect of evolutionary relatedness, whereby distant an-

Table 1C

Full Regression Outputs: Mind Attribution Regressed on Diet, Developmental Stage, and Species

Predictor	Estimates	*p*
(Intercept)	28.26	< .001
Diet [Omnivore]	-13.53	.056
Developmental Stage [2]	42.74	< .001
Developmental Stage [3]	69.67	< .001
Species [Frog]	-24.63	< .001
Random Effects		
σ^2	561.12	
$\tau_{00\ PID}$	385.12	
ICC	0.41	
N_{PID}	41	
Observations	246	
Marginal R^2 / Conditional R^2	.052 / .715	

imals were granted 87.37 units less mind on average than close animals (p < .001), controlling for participant diet (Table 1B).

Subset: Animals at Different Stages of Development

The process of choosing the most appropriate model differed slightly for our investigation of mind attribution at three developmental stages. In addition to the fixed effects of diet and developmental stage, we included a fixed effect of species, accounting for a potential difference between frogs and chickens. The model accounting for participants' diet and animal targets' developmental stage as well as their species produced the lowest *BIC* value (2355.7) and was significant (p < .001). Though an interaction between the first two variables did yield a slightly lower *AIC* value (2329.8), it did not produce a significant improvement (p = .07). The non-interaction model was therefore chosen. This model accounted for 72% of the variance of mind attribution (conditional R^2 = .72).

Diet — Although omnivores attributed less mind (M = 39.89, SD = 37.78) than veg*ns (M = 53.41, SD = 49.61) to the targets in this subset (see Figure 2C for all targets) descriptively, multiple regression analysis indicated that participant diet did not significantly predict attributions of mind on average (p = .06), controlling for developmental stage (Table 1C).

Developmental Stage — An animal's stage of development significantly impacted the mind they were attributed. Descriptively, as development progressed, ratings of mind

increased incrementally, (M = 8.68, SD = 12.48; M = 51.43, SD = 40.48; and M = 78.35, SD = 39.83) for Stage 1, 2, and 3, respectively; see Figure 2C for individual targets. Multiple regression analysis confirmed this trend, indicating that—holding diet and species constant—animals at developmental Stage 2 were attributed 42.74 greater units of mind than those at Stage 1 on average (p < .001), and those at Stage 3 were attributed 69.67 greater units (p < .001; Table 1C).

Species — Animal species significantly predicted ratings of mind. According to descriptive statistics, frogs (all developmental stages) received lesser mind attributions on average (M = 33.84, SD = 33.74) than chickens (all developmental stages; M = 58.47, SD = 49.59). The regression analysis evidenced that frogs were attributed 24.63 less units of mind on average (p < .001), controlling for developmental stage and participant diet (Table 1C).

Discussion

In line with predictions, a veg*n diet was associated with significantly greater mind attributions toward targets regardless of their food or nonfood status. Overall, veg*ns attributed these targets about 10 percentage points[3] greater mind than omnivores. Furthermore, veg*ns perceived significantly greater mental capacities for creatures no matter how closely or distantly related to humans; veg*ns assigned these targets about 7 percentage points greater mind. However, breaking from this trend, a veg*n diet did not significantly predict greater mind attribution for animals at different stages of development, suggesting that veg*ns do not universally perceive heightened mental abilities but are selective in their judgements.

Additionally, we predicted that food animals, distantly related animals, and animals at earlier stages of development would receive lower mind attribution ratings. These predictions were supported. Evolutionary relatedness was particularly influential, with close animals receiving nearly 44 percentage points greater mind scores than distant ones. Animals at developmental Stage 2 and 3 received about 21 and 35 percentage points greater mind scores, respectively, compared to Stage 1. And nonfood animals received about six percentage points greater mind scores than food animals. Interestingly, animal category had a larger effect than participant diet in each case except for the food/nonfood subset, where participant diet far outweighed the effect of animal edibility on mind attribution.

Regarding developmental stages, species significantly predicted mind attribution, with chickens receiving greater ratings than frogs. As chickens are more closely related to humans than frogs are, this difference in mind attribution could be a consequence

3) References to percentage points are in line with a 0–100 scale (e.g. a score of 117.9/200 = 59.0% and a score of 97.6/200 = 48.8%, resulting in a 10.2 percentage point difference).

of evolutionary distance. The difference could alternatively be owed to factors such as disgust or body size.

Against predictions, omnivores and veg*ns did not significantly diverge in their responses toward food vs. nonfood animals, evolutionarily distant vs. close animals, or animals at progressive stages of development. We expected veg*ns to attribute more similar minds within these groupings and for a larger gap to form between such animals among omnivores. However, omnivores and veg*ns responded to these categories in tandem—attributing greater mind to the nonfood, evolutionarily close, and later-developmental-stage targets. This trend was particularly unexpected regarding food and nonfood animals, where we predicted veg*ns—who are not motivated to deny an animal's mind to resolve the meat paradox—would assign similar minds to animals such as pigs and chickens as they do dogs and peacocks. Furthermore, although veg*ns are prone to attributing greater mind to nonhuman animals than omnivores, even veg*ns did not think substantially dissimilar animals like flies and tuna possess the mental capacities that more closely related—and perhaps more *relatable*—animals possess.

Study 2

Although the previous study addressed whether omnivores and veg*ns perceive the minds of nonhuman animals differently, it did not address how one's diet relates to the way they *value* such animals. Though prior work has established a meaningful connection between mind and moral standing (Ang et al., 2019; Bastian et al., 2012; Bilewicz et al., 2011; Loughnan et al., 2010; Niemyjska et al., 2018), Study 1 stopped short of linking these phenomena. The aim of Study 2, therefore, was to investigate how omnivores and veg*ns attribute moral standing to a range of animal targets, accounting also for differing attributions of mind.

In Study 1, we isolated specific dimensions (edibility, evolutionary relatedness, developmental stage) that we expected would influence mind attribution. In Study 2, we examined a novel categorisation of animal: likeability. This addition helps to shed light on the key relationship between likeability and moral standing (Swim et al., 2023) and examines the question of whether veg*ns' higher levels of moral concern extend to even those animals people tend to dislike.

To explore this, we developed a new range of targets: 'beloved' and 'loathed' animals. These targets allowed us to investigate whether veg*ns and omnivores differently judge animals that often span many of the characteristics that engender lower moral standing among people overall (e.g. low perceived mind, dissimilarity to humans, harmfulness, unattractiveness; Klebl et al., 2021; Knight et al., 2004; Leach et al., 2021; Miralles et al., 2019; Piazza et al., 2014). In line with previous literature on mind perception, evolutionary dissimilarity, harmfulness, and aesthetic attractiveness, we predicted that loathed animals would receive lesser moral standing than beloved animals (**H1**) and omnivores would

attribute lesser moral standing to the animals overall (**H2**). Moreover, we predicted omnivores and veg*ns would diverge in their responses to beloved and loathed animals (**H3**). Finally, addressing a gap from Study 1, we predicted that greater mind attribution would in turn predict greater moral standing (**H4**).

Method

This study was approved by the ethics committee of the University of Edinburgh's School of Philosophy, Psychology and Language Sciences [Approval No. 243-2223/1]. All participants gave informed consent prior to participation. Study design, sample size, inclusion/exclusion criteria, and analyses were pre-registered on the OSF (Hankins & Wilks, 2022), any deviations are noted in the manuscript, and the anonymised dataset, R code, codebook, and supplementary materials are available online (Hankins, 2024).

Pretest

We pretested a range of animals for likeability and used the responses to select our targets. See the Supplementary Materials for a more detailed discussion of the pretest, including the full list of initial targets, results, and subsequent selection (Hankins, 2024).

Participants

Participants were recruited according to G*Power's (Faul et al., 2009) recommendation of 146 participants to detect a small-medium effect (linear multiple regression: fixed model, R^2 deviation from zero; a priori; effect size f^2 = 0.085; alpha = .05; power = 0.8; number of predictors = 4). This is a slight deviation from our pre-registration, which indicated a 150-participant minimum. This minimum was incorrectly calculated, and the issue was caught after pre-registering. Accounting for potential dropouts, failed attention checks, and irrelevant diet categories (e.g. flexitarian), 184 UK participants were recruited on Prolific.[4] Those who reported a diet category other than omnivore or veg*n (e.g. pescatarian) were excluded from analysis (n = 26), as were any remaining participants who failed either attention check (n = 12). The resulting final sample included 146 participants (omnivores = 73, veg*ns = 73). Participants were split evenly between men (n = 72) and women (n = 72), with two participants identifying as nonbinary and with even proportions in each diet category. Participants' ages ranged from 18 to 69 (M = 38.47, SD = 13.07). Full demographic information can be found in the Supplementary Materials (Hankins, 2024).

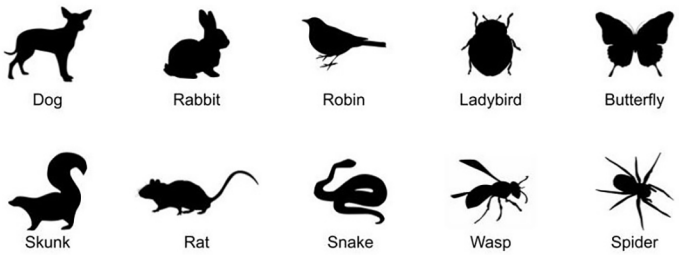
4) An initial 172 participants were recruited, per our pre-registration. However, prior to analysis, we noted we had collected too few veg*ns and recruited an additional 12.

Materials and Measures

To maintain consistency among images, labelled black silhouettes were chosen to represent each animal (Figure 3). Beloved animals included a dog, rabbit, robin, ladybird, and butterfly, and loathed animals included a skunk, rat, snake, wasp, and spider. To avoid potential confounds, we attempted to include animals in each category that are similar to one another (e.g. 'beloved' ladybirds vs 'loathed' wasps).

Figure 3

Study 2 Animal Targets



Each animal's moral standing was assessed with four prompts adapted from Piazza et al. (2014; e.g. 'It is morally wrong for people to harm this animal'). See the Supplementary Materials for all items (Hankins, 2024). Answers were measured from 1 (*Strongly disagree*) to 7 (*Strongly agree*), possible overall scores ranging from 4 to 28 and higher scores indicating greater moral standing. Internal consistency was high for each judgement: dog (α = .94), rabbit (α = .93), robin (α = .96), ladybird (α = .96), butterfly (α = .96), skunk (α = .96), rat (α = .95), snake (α = .95), spider (α = .97), wasp (α = .97).

Participants judged the mind of each target according to five prompts inspired by and adapted from the Mind Attribution Scale (Kozak et al., 2006) and Mind Perception Scale (Gray et al., 2007; see the Supplementary Materials for all items; Hankins, 2024). Similar to Study 1, these items covered aspects of both agency (e.g. 'This animal can engage in a great deal of thought') and experience (e.g. 'This animal can experience pleasure'). Participants again answered items from 1 (*Strongly disagree*) to 7 (*Strongly agree*), with higher scores indicating greater mind attribution. Possible scores ranged from 5 to 35. An analysis of Cronbach's alpha indicated high internal reliability for each judgement: dog (α = .78), rabbit (α = .77), robin (α = .81), ladybird (α = .86), butterfly (α = .87), skunk (α = .80), rat (α = .83), snake (α = .81), spider (α = .86), wasp (α = .89).

Finally, participants rated their personal liking toward each target with the following prompt: 'How do you feel about this animal?' followed by each of the 10 labelled silhouettes. Liking was measured from 1 (*Dislike a great deal*) to 7 (*Like a great deal*).

Procedure

Veg*n and omnivorous participants were recruited on Prolific and directed to an online survey hosted on Qualtrics. Participants were paid £1.40 (average hourly wage: £11.83). Participants completed each of the measures of mind attribution, moral standing attribution, and personal liking for each animal. All prompts were randomised within each section. Instructions for each section were provided, and two attention checks (e.g. 'Fish are the best pets. To indicate that you are paying attention, please disregard this statement and instead select "Strongly agree".') were interspersed within the survey. All participants were exposed to all targets, with each animal presented in randomised order. After completing the main measures, participants completed demographic questions regarding their diet, gender, age, ethnicity, education, and political ideology. Lastly, participants were fully debriefed.

Results

All statistical analyses were conducted in R (R Core Team, 2022). As in Study 1, we do not distinguish between vegetarians and vegans in the reported investigations. However, descriptive means for vegetarians, vegans, and omnivores are provided in the Supplementary Materials (Hankins, 2024).

Beloved Versus Loathed Animals

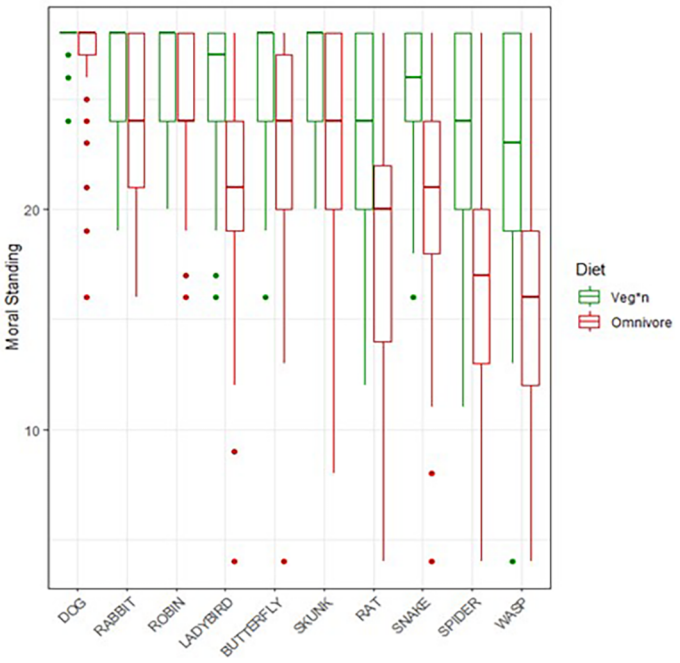
Following the same procedure as our previous investigations, we built multiple linear regression models with incrementally greater complexity to elucidate the effects of diet, likeability, and perceived mind on moral standing attribution. The most complex model—that which accounted for an interaction between diet and likeability plus the effect of mind attribution—was determined to be the best fit of the data, reporting a highly significant p-value ($p < .001$) and the lowest *AIC* (7880.0) and *BIC* (7917.0) values. This model was selected for our investigation.[5] Using this model, we could account for 62% of the variance of moral standing attribution (conditional $R^2 = .62$).

Diet — Omnivores and veg*ns differed in moral standing attribution. Overall, descriptive statistics indicated that veg*ns ($M = 25.15$, $SD = 3.71$) attributed greater moral standing to the targets than omnivores ($M = 21.42$, $SD = 5.92$). Nine out of 10 targets received greater moral standing attribution from veg*ns than omnivores; dogs were the sole exception due to a ceiling effect (Figure 4). Proceeding with the regression revealed a main effect of diet on moral standing attribution. When animal likeability and mind attribution were

5) We initially pre-registered to investigate the effect of mind attribution in a separate regression model with the possibility of then including it as a predictor in the main model. However, after consulting with a member of the university's statistics team before data collection, we chose to include mind as a predictor in our main model without investigating it separately.

Figure 4

Moral Standing Attribution Per Target and Participant Diet



held constant, omnivores granted targets 4.16 units less moral standing than veg*ns on average ($p < .001$; Table 2).

Likeability — According to descriptive statistics, beloved animals ($M = 25.04$, $SD = 3.81$) received greater moral standing scores than loathed animals ($M = 21.53$, $SD = 5.92$) overall. Multiple regression also revealed a significant main effect of likeability on moral standing; beloved animals were attributed 1.72 units greater moral standing on average ($p < .001$) when holding participant diet and mind attribution constant (Table 2).

Diet and Likeability Interaction — Animal targets were judged differently depending on their beloved/loathed status and the diet of the judge. Participant diet and animal likeability interacted such that omnivores responded significantly differently when presented with beloved versus loathed animals, attributing 2.76 greater units of moral standing to beloved animals ($p < .001$; Table 2 and Figure 5).

Table 2

Full Regression Output: Moral Standing Regressed on Diet, Likeability, Mind, and Diet X Likeability

Predictor	Estimates	*p*
(Intercept)	11.63	< .001
Diet [Omnivore]	-4.16	< .001
Likeability [Beloved]	1.72	< .001
Mind	0.44	< .001
Diet [Omnivore]: Likeability [Beloved]	2.76	< .001
Random Effects		
σ^2	10.81	
$\tau_{00\ PID}$	4.99	
ICC	0.32	
N_{PID}	146	
Observations	1460	
Marginal R2 / Conditional R2	.443 / .619	

Mind Attribution — The mental abilities afforded to the targets positively impacted the moral standing they received. According to the regression analysis, for every one-unit increase of mind attribution, moral standing attribution increased 0.44 units on average (p < .001), holding participant diet and animal likeability constant (Table 2).

Exploring Personal Liking

Apart from the regression model outlined, we explored potential differences in participants' personal liking toward the presented animals depending on their diet. We compared omnivores' and veg*ns' liking for each animal with Welch two sample t-tests. As the data was not normally distributed, we ran the analyses with and without bootstrapping. There was no difference between each set of results. Thus, we report the non-bootstrapped results. For every significant difference between samples, veg*ns expressed more positive feelings toward the target (Figure 6).

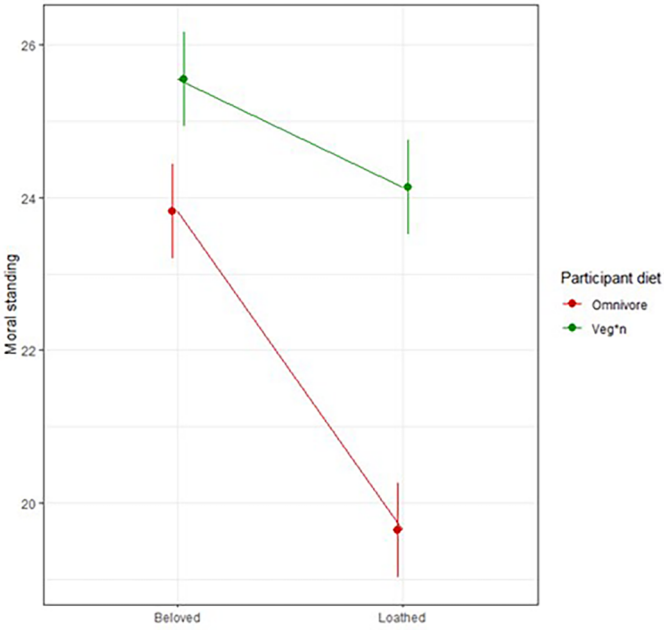
Discussion

In Study 2, we set out to investigate how a person's diet relates to the moral standing and mind attribution they afford to a range of typically beloved and loathed animals. In doing this, we aimed to better understand the possible role of likeability in mind and moral judgements.

As predicted, omnivores afforded significantly less moral standing to the animals overall. Past literature had established that veg*ns grant comparatively greater moral

Figure 5

Predicted Moral Standing According to Participant Diet and Animal Likeability

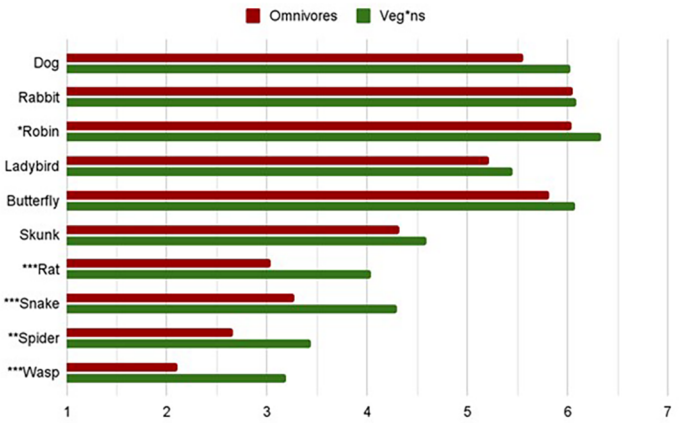


standing to food animals (Ang et al., 2019; Bilewicz et al., 2011). Our findings suggest this increased moral standing extends to animals typically regarded as dangerous, disgusting, and otherwise disliked (see also Aytürk & Broad, 2021). Although veg*ns did grant beloved animals statistically significantly higher moral standing than they granted loathed animals, this difference paled in comparison to the stark differentiation among omnivores. These findings could suggest that omnivores judge liked and disliked animals as distinct categories deserving of different levels of moral concern, whereas veg*ns hold a somewhat more egalitarian view. Put another way, it may be that veg*ns have a wider circle of moral concern (Crimston et al., 2016; Jaeger & Wilks, 2023).

We also found that a target's perceived mind engendered different degrees of moral standing. Those perceived as having greater mental abilities received greater moral standing attributions overall. This observation could be due to anthropocentric speciesism. Animals perceived as having more complex mental abilities may be perceived as more humanlike, and closer similarity to humans may increase our care and concern. Alternatively, greater mind perception may lead to greater moral standing directly, independent of comparisons to humans.

Figure 6

*Omnivore and Veg*n Mean Personal Liking Per Target*



*$p < .05$. **$p < .01$. ***$p < .001$.

Finally, we explored how omnivores and veg*ns differ in personal liking toward the targets. Among the five beloved animals, only robins received significantly different likeability ratings. However, among the loathed animals, four of the five animals received significantly different likeability ratings. For each significant difference, veg*ns reported greater liking. These findings suggest that, regardless of diet, participants generally agreed on the likeability of typically beloved animals (e.g. rabbits, butterflies), and only veg*n participants saw the likeability of typically loathed animals (e.g. rats, spiders).

General Discussion

Previous research has established that omnivores and veg*ns perceive the minds and moral worth of food animals differently. However, few studies have branched out from this narrow scope. In the current studies, we asked how omnivores and veg*ns attribute mind and moral standing to a wider pool of animal types: food/nonfood, evolutionarily distant/close, early to late developmental stages, and widely beloved/loathed. With this widened range of targets, including those that 'should' receive more negative judgements (e.g. spiders) and those that 'should not' (e.g. dogs), we explored the relationship between a person's diet and their judgements of nonhuman others.

Across both studies, compared to veg*ns, omnivores attributed less mind (Study 1) and less moral standing (Study 2) to the presented animals overall, with the sole exception of animals at different developmental stages. Dietary preference appears to be

a salient factor in both mind and moral judgements toward nonhuman animals, even toward animals that ostensibly have nothing to do with diet (i.e. those that are not eaten).

Study 1 showed that even though veg*ns attributed greater mind to animals overall, they still followed the same pattern as omnivores, attributing lesser minds to specific animal categories (e.g. evolutionarily distant) than others (e.g. evolutionarily close). This trend was especially unexpected regarding food and nonfood animals. Omnivores are motivated to deny the minds of the animals they consume (Bastian et al., 2012; Loughnan et al., 2010). As such, lower mind ratings are expected among this diet group when presented with edible targets. However, even the veg*ns in Study 1 granted food animals (tuna, chickens, cows, pigs) lesser minds than their nonfood counterparts (dogfish, peacocks, horses, dogs). Thus, even though veg*ns tend to grant greater mind to animals overall, they still follow similar patterns to their omnivorous peers.

In Study 2, veg*ns attributed greater moral standing to animals overall and also perceived less of a moral divide between the categories than omnivores did. This result is particularly telling, as these targets were especially likely to elicit polar responses; the loathed animals (skunks, rats, snakes, wasps, spiders) encompassing multiple factors that tend to evoke low moral standing (e.g. unattractiveness, harmfulness) and the beloved animals (dogs, rabbits, robins, ladybirds, butterflies) evoking the opposite (Klebl et al., 2021; Piazza et al., 2014).

Study 2 also illuminates a potential rationale behind veg*ns' moral standing attributions for loathed targets. Veg*ns in our study reported significantly greater liking for many of the targets, especially the 'loathed' ones. Hence, veg*ns may grant greater moral standing to 'loathed' animals compared to omnivores simply because veg*ns do not detest them to begin with. As such, personal dislike could present a solid barrier to moral concern among omnivores, whereas this barrier may be weak among veg*ns.

Why did the judgements of veg*ns and omnivores follow a similar pattern in Study 1, but diverge in Study 2? We can attribute this inconsistency to a variety of reasons. For instance, diet motivations could have come into play. As 58% of veg*ns in Study 1 were primarily motivated by non-animal welfare concerns (i.e. health, environment, culture), they may have been less prone to attribute emotionally and cognitively complex minds to the animals. It is possible that veg*ns in Study 2 were more motivated by animal welfare concerns, potentially leading them to assign greater moral standing. However, this possibility is speculative, as we did not measure dietary motivations in Study 2. Alternatively, the differences between Study 1 and 2 may be due to a sense of social identity threat. In cases where veg*nism is more than a diet and becomes its own social identity, it may be subject to threats like any other (Nezlek & Forestell, 2020). Participants in Study 1 were only questioned about minds; they did not make moral judgements. Thus, these veg*ns may not have felt a threat to their identity when assigning mental abilities—even when rating the minds of 'food' animals. Participants in

Study 2, however, explicitly rated moral standing, perhaps leading veg*ns to be keenly aware of their veg*n identity and of how their responses might constitute a violation of that identity.

Our findings reveal psychological differences between these dietary groups that are more extensive than previously recognised. They also provide indirect evidence about causal interactions between belief and behaviour in this context. If ascribing more mind to animals causes us to stop eating meat, we would expect this effect to apply to animals generally (e.g. veg*ns ascribe more mind to chickens and peacocks alike). On the other hand, if eliminating meat causes us to ascribe greater mind to animals, we would expect this effect to apply more selectively to food animals (e.g. veg*ns ascribe more moral standing to chickens but not to peacocks). Given the generality seen in the current studies, our findings could be seen as supporting the notion that mind perception precedes diet change.

However, it is also plausible that initially selective effects of diet change could generalise to other animals, or that influences in both directions contribute to the observed pattern. One way to gain insight into causal direction would be to contrast people who became veg*n for different reasons. For instance, veg*ns who were motivated by animal welfare might show elevated mind perception across a broader range of animals than veg*ns who were motivated by health or environmental concerns. Transitions into and out of veg*nism may be especially informative, as they provide a window into changes in mind perception that immediately follow a change in behaviour. Regardless of the direction of causality, our data show a clear association between adopting a veg*n diet and moral concern across food and nonfood species.

Previous research has shown that veg*ns report less anthropocentric speciesism than omnivores (Caviola et al., 2019; Rosenfeld, 2019)—that is, the type of speciesism that places humans above nonhuman animals. Despite this, the role one's diet plays regarding inter-animal speciesism (i.e. the type of speciesism that places some nonhuman animals above other nonhuman animals) is not well understood. Some research has addressed how omnivores and veg*ns differently judge food versus pet animals (Ang et al., 2019; Bilewicz et al., 2011). However, thus far, other categories have been relatively neglected. The present study addresses this gap, evidencing in part that veg*ns' anti-speciesist sentiments do indeed transcend eating practices; they deem even loathsome animals worthy of moral treatment to a degree omnivores do not.

Of course, we offer caution about generalisations from this study. First, our sample sizes, particularly in Study 1, were relatively small and non-representative, therefore limiting the precision of our estimates. Moreover, these small samples do not allow us to distinguish between vegans and vegetarians. Ideally, future research could separate vegan and vegetarian subgroups. Second, past work has shown that categorisations and perceptions of various animals may be substantially impacted by culture (e.g. Hindus, but not Muslims, categorise specific animals as holy; Manokara et al., 2021). We attempted

to minimise possible cultural effects by limiting participation to UK residents. However, future research should investigate mind and moral standing attributions cross-culturally by choosing animals that are relevant within each culture. Third, we did not measure participants' diet motivations in Study 2. It stands to reason that this would be impactful. For example, health-motivated veg*ns may judge animals differently than animal welfare-motivated veg*ns. Future studies should clarify these motivations and even include them as a predictor of moral standing.

In sum, this study expands our understanding of human-animal interrelations, demonstrating that an animal's moral standing is determined by both characteristics of the entity (edibility, evolutionary relatedness, etc.) and characteristics of the judge (dietary group). We contend that personal diet is a relevant factor for our perceptions not just of the animals people eat, but also those they love, those they loath, those that resemble people, and those that do not.

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Competing Interests: The authors have declared that no competing interests exist.

Data Availability: The anonymised dataset, R code, codebook, and supplementary materials for Study 1 and Study 2 are available at Hankins (2024)

Supplementary Materials

For this article, the following Supplementary Materials are available:

- Codebook for Studies 1 and 2. (Hankins, 2024)
- Study instructions, pre-test, measures, mind perception scores, and demographics for Studies 1 and 2. (Hankins, 2024)
- R code for Studies 1 and 2. (Hankins, 2024)
- Pre-registration for Study 2. (Hankins & Wilks, 2022)

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