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Minding Some Animals but Not Others:
Strategic Attributions of Mental Capacities and Moral Worth to Animals Used for Food in
Pescatarians, Vegetarians, and Omnivores

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Data availability statement

The dataset presented in this study and the measures used can be found online:
<https://osf.io/7ec6x/>

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Abstract

While moral concern for animals has become increasingly important for both consumer food choice and food policy makers, previous research demonstrated that meat eaters attribute lower moral status and mental capacities to animals raised for meat compared to non-food animals. The current research investigated whether this strategic flexibility in moral concern and mind perceptions also occurs when considering aquatic food animals and animals used for dairy and egg products, and the degree to which these concerns and perceptions are evident in pescatarians and vegetarians. We compared perceptions (mind attributions and moral concern) of land food animals versus aquatic food animals, and of animals in the meat versus dairy and egg industry between omnivores ($n = 122$), pescatarians ($n = 118$), vegetarians ($n = 138$), vegans ($n = 120$), and flexitarians ($n = 60$). Pescatarians scored lower than other dietary groups on moral concern and mind attribution for aquatic animals relative to farmed land animals. Unlike the other dietary groups, pescatarians and vegetarians scored lower on moral concern and mind attribution for dairy than beef cows and for layer chickens than broiler chickens. These findings demonstrate that pescatarians and vegetarians were flexible in their moral thinking about different types of food animals in ways that suited their consumption habits, even when the same animal was evaluated (e.g., dairy vs beef cows). This research highlights the psychological barriers that might prevent people from reducing animal product consumption and may need to be addressed in interventions to encourage transitioning towards more plant-based diets.

Keywords: moral concern, mind attribution, speciesism, animal product consumption, dietary groups, food choice, survey

1. Introduction

“I like pondering our relationships with animals because they tell a lot about who we are.”

Marc Bekoff (as cited in Herzog, 2010, p. 1)

Moral concern for the welfare and treatment of non-human animals has become increasingly important for both consumer food choices and legislation on animal farming (Lundmark et al., 2014; Vogeler et al., 2020). However, ethical debates on this topic are often restricted to the welfare of farmed mammals and poultry, whereas less attention has been given to the welfare of fish, shellfish, and cephalopods. The topic is important and current considering the recent announcement of plans to open the world’s first industrial octopus farm in Spain’s Canary Islands, which has sparked indignation and strong opposition from scientists and animal advocates concerned about the welfare of octopuses (Marshall, 2023). It is expected that the farm will raise a million octopuses annually, all housed together under constant light despite being solitary animals that prefer darkness. The proposed slaughter method (ice water slaughtering) is considered particularly cruel as it causes a slow, painful, and stressful death (Foss & Imsland, 2022; World Organisation for Animal Health, 2019). This news comes at a time when there is a growing scientific consensus that octopi are sentient beings with advanced cognitive abilities (Amodio, 2019; Carls-Diamante, 2022; Godfrey-Smith, 2017). These qualities, indicative of possessing a mind, are considered highly relevant for moral judgments, and ascribing moral worth (Gray et al., 2007; Gray et al., 2012; Leach et al., 2021).

To date, research has largely focused on omnivores’ perceptions of farmed land animals compared to non-food animals. Limited research has focused on the perceptions of minds in, and moral concern for, other types of animals used for consumption, such as aquatic food animals (e.g., fish, crustaceans, and cephalopods) or animals in the dairy and egg industry (e.g., dairy

cows and layer chickens). Such a focus is novel and particularly pertinent to investigate among those who abstain from meat consumption but still consume other animal products, such as pescatarians who do not eat meat but still eat aquatic animals (e.g., fish, shellfish) and animal-sourced products such as eggs and dairy, and vegetarians who do not eat meat and fish (or other aquatic animals) but still eat animal-sourced products such as eggs and dairy. Compared to omnivores, who do not restrict their animal product intake, pescatarians and vegetarians typically hold more positive attitudes towards animals and are less accepting of using animals for human benefits (e.g., Ioannidou et al., 2023a). At the same time, they continue drinking milk and eating eggs (vegetarians and pescatarians) or fish (pescatarians), and thus engage in consumption behaviours that involve the use of animals and animal harm (Deckers, 2016; Francione, 2020). The current research considers how it could be possible that some people (e.g., pescatarians and vegetarians) can stop eating meat over concern for animal welfare while at the same time continue consuming other animal products (e.g., fish, dairy, or eggs), knowing this involves relevant animal welfare issues.

Relying on cognitive dissonance theory (Festinger, 1957), researchers have argued that many people care about animal welfare but are also motivated to continue eating meat, which results in psychological tension (cognitive dissonance) between their concern for animal welfare and their consumption of animals, labelled as the meat paradox (Loughnan & Davis, 2020; Rothgerber, 2020). One way to avoid or alleviate these dissonance feelings is to strategically ignore or distort information about food animals and animal minds that could be morally troubling for consumption habits (Dhont et al., 2021; Leach et al., 2022, 2023; Piazza & Loughnan, 2016). Thus, by appreciating the mental capacities of some animals such as certain companion animals (e.g., cats and dogs), while downplaying the mental capacities of others such

as food animals (e.g., pigs and cows), people seem to be flexible in perceiving minds in animals in ways that suits their appetite for animal products (e.g., meat or dairy) (Bastian et al., 2012; Crawshaw & Piazza, 2022; Ioannidou et al., 2024). This raises the question whether pescatarians and vegetarians perceive mental capacities in animals in ways that suit their dietary habits, thereby attributing fewer mental abilities to animal categories that comprise part of their diet (e.g., dairy cows), relative to animal categories that do not comprise part of their diet (e.g., beef cows). This way, they may be able to reduce the psychological tension or avoid feeling morally troubled about the consumption of some animal products (fish, dairy, and eggs), yet simultaneously express care and moral concern for animals by rejecting the consumption of other animal products (meat).

A greater understanding of how people from various dietary groups think about farmed land animals and aquatic food animals adds to the growing body of research on motivated mind perception of animals. Besides omnivores, pescatarians, and vegetarians, we also considered vegans, who do not consume any animal products, and flexitarians, who primarily follow a vegetarian diet but sometimes consume meat or fish. More broadly, understanding the psychological factors associated with animal product consumption may help not only to identify possible barriers but also to find solutions how to overcome these barriers and influence intentions to reduce consumption of animal products. Such insights could facilitate a global shift toward plant-based diets as recommended by the EAT-Lancet commission on healthy diets from sustainable food systems (Willet et al., 2019).

1.1. Motivated Mind Perception and Moral Concern

People attribute moral standing to animals based on a number intrinsic and extrinsic characteristics such as beauty, similarity to humans, dangerousness, and cuteness (Klebl et al.,

2021; Possidonio et al., 2019; Piazza et al., 2014). A quality that is considered quintessential for moral judgments is mind perception, referring to the perceived capacity for feeling and consciousness (experience or sentience), and the perceived capacity for thinking and reasoning (agency or intelligence) (Bastian et al., 2012; Gray et al., 2012; Leach et al., 2021). Both dimensions of mind perception also underpin beliefs about the moral standing of animals and shape moral judgments about the acceptance of eating and harming animals (Feinberg et al., 2019; Leach et al., 2021; Possidónio et al., 2019). For instance, previous research has shown that heightened perceptions of animals' mental sophistication such as the ability to experience pleasure or suffering, or the ability to think, makes people less willing to harm or eat them (Leach et al., 2021; Piazza et al., 2014; Sytsma & Machery, 2012).

Notably, people tend to be sceptical about animal minds, downplaying available evidence of animal mental capacities (Leach et al., 2023), and attribute minds and moral standing to animals in a selective, categorical, and motivated way (Bastian & Loughnan, 2017; Krings et al., 2021; Leite et al., 2019). Existing research has shown that animals that are categorized as *food* such as pigs, cows, and chickens are perceived as having fewer mental capacities (lower perceived sentience and intelligence) than certain non-food animals, including some companion animals such as dogs and cats (Bastian et al., 2012; Loughnan & Davis, 2020). Even when people learn about the sophisticated mental capacities of a food animal, they may ignore this information when judging the moral standing of that animal, while the same information about a non-food animal increases the moral standing of the animal (Piazza & Loughnan, 2016; Henseler Kozachenko & Piazza, 2023). Along similar lines, Leite and colleagues (2019) found that a large majority of participants felt morally obligated to show concern for companion animals and appealing wild animals such as dolphins and chimps, yet only approximately half felt the same

about food animals such as pigs, sheep, and cows. In other words, people attribute moral concern to animals based on their relationship with them and the perceived societal function and utility of the animal to humans (Krings et al., 2021; Leach et al., 2021; Leite et al., 2019). When considering food animals, dietary identity and behaviour appear to play a critical role both for mind attribution and moral concern (Loughnan et al., 2014; Rothgerber, 2020).

The meat paradox illustrates this well by showing how people can care and love animals, but by eating meat, they also engage in a behaviour that is directly associated with animal exploitation and suffering (Bastian & Loughnan, 2017; Loughnan & Davis, 2020). Awareness of this paradox between beliefs and behaviour is considered to cause psychological tension and feels morally troublesome (e.g., Earle et al., 2019, Ioannidou et al., 2023a), motivating people to change their behaviour or to minimise the moral issues surrounding the eating of animals (Loughnan & Davis, 2020; Rothgerber, 2020). Denying or diminishing the mental abilities of food animals seems an effective strategy associated with reduced moral concerns and dissonance feelings, as it downplays the perceived harm inflicted on the animals (Bastian et al., 2012; Bratanova et al., 2011; Ioannidou et al., 2024; Rothgerber et al., 2014). Research has also indicated that the more people are committed to eating meat, the more they are inclined to defend and continue meat-eating (Graça et al., 2015; Piazza et al., 2015), and the more they avoid being exposed to information about food-animal minds (Leach et al., 2022). Hence, disregarding or downplaying the mental capacities of food animals seems to reduce the dissonance borne of moral concern surrounding animal suffering and meat consumption (Bastian et al., 2012; Crawshaw & Piazza, 2022).

While the associations of between meat consumption and animal mind perception and moral concern for farmed land animals used for meat have been well-documented, little is known

about how dietary behaviours are associated with people's mind perceptions of and moral concern for aquatic food animals, such as fish, crustaceans, and cephalopods, or animals used in the dairy and egg industry (e.g., dairy cows and layer chickens). Understanding the perception of mind in different types of animals used for food in pescatarians and vegetarians is required to determine ways to target intervention to reduce intake of non-meat animal products. Given previous research on meat consumption (Bastian et al., 2012; Loughnan & Davis, 2020; Rothgerber, 2020), we predicted that pescatarians and vegetarians would be strategic flexibility in extending minds to certain food animals but not to others in a self-serving way that suits their consumption habits. Even though scientific inquiry into the mental sophistication of aquatic food animals is ongoing, neurological, and behavioural evidence suggests that they experience pain and possess various mental abilities (Brown, 2015; Chandroo et al., 2004; Deckers, 2016; Rose et al., 2014; Webster, 2006). However, rather than being interested in the accuracy of people's perceptions of animal minds (i.e., Leach et al., 2023), we sought to investigate how people who do not eat certain animal products but still eat other animal products (pescatarians and vegetarians) perceive the minds of different food animal categories, including farmed land animals, aquatic food animals, and animals used in the dairy and egg industry, as compared to people who do not restrict their animal product consumption (omnivores) and those who fully abstain from animal product consumption (vegans).

1.2. Motivated Perceptions of Animals in Different Dietary Groups

Evidence for the idea that dietary behaviours and identities can shape people's moral attitudes and perceptions of animals comes from studies that have showed pronounced differences between dietary groups. Several studies have shown that omnivores tend to hold stronger speciesist beliefs, as expressed in a stronger belief in human superiority over animals

and endorsements of exploiting animals for human benefit (e.g., for food, entertainment, clothes, cosmetic and medical testing) when compared to meat abstainers (Ioannidou et al., 2023b; Rothgerber, 2015b; Rosenfeld, 2019a; 2019b). Omnivores are also more inclined to attribute fewer mental capacities to animals or see fewer similarities between humans and animals, particularly when it concerns food animals (Bilewicz et al., 2011; Rothgerber, 2015b). Studies comparing a range of dietary groups (e.g., omnivores, pescatarians, vegetarians, vegans) also indicate that attitudes towards animals deteriorate gradually with greater inclusion of animal products in people's diets (Ioannidou et al., 2023b; Rosenfeld & Tomiyama, 2021; Rothgerber 2015a), with vegans consistently showing lower speciesism and greater concern for animals compared to other dietary groups (Bilewicz et al., 2011; Dhont & Ioannidou, 2024a; Rothgerber, 2015b). In this sense, consistent with cognitive dissonance theory, ethical concerns about animal welfare seem to be applied selectively in ways that serve and justify dietary habits (Loughnan & Davis, 2020; Rothgerber, 2020). For instance, while both vegetarians and vegans are strongly motivated by animal ethics to abstain from meat consumption (e.g., Dhont & Ioannidou, 2024a, 2024b; Hopwood et al., 2020), vegetarians are less motivated by animal ethics to reduce dairy and egg consumption than vegans (Dhont & Ioannidou, 2024a, 2024b). Along similar lines, recent findings indicated that the use of psychological strategies to minimize moral issues surrounding animal harm is not restricted to meat consumption but can also be observed for fish, dairy, and egg consumption (Docherty & Jasper, 2023; Ioannidou et al., 2023a). Specifically, consumers of certain animal products appeared to use justifications to defend the consumption of all products they consume, and thus not only meat consumption among omnivores, but also fish, dairy, and egg consumption among pescatarians, as well as dairy and egg consumption among vegetarians (Ioannidou et al., 2023a). While pescatarians and vegetarians acknowledged the

suffering of animals in the meat industry (whereas omnivores tended to downplay this suffering), they were more likely to minimise the suffering of animals in the industries associated with the fish, egg, and dairy products they consume, compared to those who do not consume these products (vegans) (Ioannidou et al., 2023a). Rather than focusing on justifying beliefs as in previous research, the present research focused on people's perceptions about the specific animals used in these food industries. This way, we seek to understand the fundamental nature of the way people think morally about the animals they eat and do not eat. This could help explaining how it is possible for some people to stop eating meat partly because of concerns about animal suffering while at the same time continue to consume other animal products that are also associated with animal suffering.

1.3. Present study

Omnivores give little moral consideration and attribute relatively low mental capacities to farmed land animals used for meat (Bastian et al., 2012; Bratanova et al., 2011; Leite et al., 2019). Moving beyond the scope of previous research, we focused on motivated perceptions of mind and moral concern for aquatic food animals and animals used in the dairy and egg industry, which should be particularly salient to pescatarians and vegetarians. Specifically, comparing the pescatarians' perceptions of aquatic animals with those of omnivores as well as groups that eat neither meat nor fish (vegetarians and vegans) provides a particularly compelling test of the theoretical idea that dietary identity and behaviour underpins motivated mind perception and the selective application of moral concern for different types of animals in ways that suit their consumption habits. Relative to other dietary groups, we predicted that pescatarians would show particularly low levels of moral concern and mind attribution for aquatic food animals.

Developing this rationale further, we expected that pescatarians and vegetarians would attribute differential levels of moral concern and mind attribution even to the same species depending on how the animal is described in terms of its function for humans. Specifically, both pescatarians and vegetarians do not eat chicken and beef, yet both eat egg and dairy products, which come from the same animals. We investigated whether pescatarians and vegetarians would make a distinction between broiler chickens and layer chickens as well as between beef cows and dairy cows. From a motivated cognition account, pescatarians and vegetarians could be expected to be less concerned for, and attribute fewer mental capacities to layer chickens compared to broiler chickens and to dairy cows compared to beef cows. Dietary groups that eat all animal products (omnivores) or no animal products (vegans) were not expected to show such a distinction between these animals.

In sum, the objective of the current study was to investigate motivated perceptions of moral worth and mental capacities (intelligence and sentience) of a) aquatic food animals among pescatarians and b) animals used in the egg and dairy industry among pescatarians and vegetarians, as compared to the perceptions of these animals among other dietary groups (omnivores, flexitarians, and vegans) and compared to pescatarians' and vegetarians' perceptions of animals used for meat. We also investigated people's general perceptions of non-human animals, and specifically in terms of the speciesist belief in human supremacy over animals. The following preregistered hypotheses were tested (<https://osf.io/7ec6x/>):

Hypothesis 1. We expected that, relative to the other dietary groups, omnivores would endorse more speciesist beliefs, followed by pescatarians (compared to vegetarians and vegans) and vegetarians (compared to vegans), with vegans scoring lowest in speciesist beliefs.

Hypothesis 2. We expected that omnivores would show relatively low moral concern for both farmed land animals and aquatic animals compared to the other dietary groups, while vegans would show relatively high levels of moral concern for both animal categories. Vegetarians were expected to show relatively high levels of moral concern for both animal categories compared to omnivores and pescatarians but lower than vegans. Critically, we expected that, relative to other dietary groups, pescatarians would show particularly low levels of moral concern for aquatic animals compared to farmed land animals.

Hypothesis 3. We expected that omnivores would attribute fewer mental abilities to both farmed land animals and aquatic animals compared to other dietary groups, while vegans would attribute more mental abilities to both animal categories compared to other dietary groups. Vegetarians were expected to attribute more mental abilities to both animal categories compared to omnivores and pescatarians but to a lesser extent than vegans. Critically, relative to other dietary groups, pescatarians were expected to attribute particularly low mental abilities to aquatic animals when compared to farmed land animals.

Hypothesis 4. As a tentative hypothesis, we expected that participants who consume dairy and eggs, but not meat (vegetarians and pescatarians) would show different levels of moral concern for, and mind attribution to cows used for dairy products (dairy cows) compared to cows used for meat (beef cows) as well as different levels of moral concern for, and mind attribution to chickens used for eggs (layer chickens) compared to chickens used for meat (broiler chickens).¹ The motivated cognition account of mind attribution and moral concern would suggest that

¹ For Hypothesis 4, the preregistration only mentioned mind attribution as dependent variable, while both mind attribution and moral concern were the dependent variables, consistent with the analyses testing Hypotheses 2 and 3 and the goal of the research.

pescatarians and vegetarians would be less concerned for, and attribute fewer mental capacities, to layer chickens and dairy cows compared to broiler chickens and beef cows, respectively.

2. Methods

The pre-registration of hypotheses, materials, and data, can be accessed via the *Open Science Framework* (<https://osf.io/7ec6x/>)

2.1. Participants

2.1.1. Sample Size Justification.

We determined the target sample size based on a pre-registered power analysis using Shiny app (ANOVA_Power, Lakens & Caldwell, 2021). A total of 2000 Monte Carlo simulations accounting for pairwise comparisons, and an alpha level of .05 to produce an estimated power of 1-.80 for the ANOVA effects of interest, indicated a target sample size of 100 for each dietary group (i.e., omnivores, pescatarians, flexitarians, vegetarians, and vegans) (N = 500 total). However, to account for participants failing the comprehension check criterion (approximately 20% exclusions), we set the sample size target at 580.

2.1.2. Sample

Of the 580 recruited participants, 22 participants failed two out of three comprehension checks and were excluded (as preregistered), resulting in a final sample of N = 558 participants (387 women, 149 men, 12 non-binary, 5 indicated ‘prefer not to say’ and 5 ‘Other’) ranging in age from 18 to 71 years ($M_{\text{age}} = 33.58$ years, $SD_{\text{age}} = 10.85$ years). In terms of dietary groups, the sample included 122 omnivores, 118 pescatarians, 138 vegetarians, 120 vegans, and 60 flexitarians. To participate in the study, participants had to be 18 years or older, have had no diagnosis of dementia or mental health condition, and have had no history of an eating disorder.

The study received ethical approval by the Chair of the Humanities, Social and Health Sciences Research Ethics Panel at the University of Bradford, UK.

2.2. Measures

Speciesist beliefs were measured with the Human Supremacy Beliefs Scale (Dhont & Hodson, 2014), comprising six items completed on 7-point Likert scales (1= *strongly disagree*; 7 = *strongly agree*). A sample item is “*The life of an animal is just not of equal value as the life of a human being*”. Item scores were averaged with higher scores indicating higher speciesism ($\alpha = .91$).

To measure Mind Attribution to farmed and aquatic animals, participants were presented with a list of 18 animals, followed by two items for each animal asking to what extent they thought the animal is “*capable of thought, self-control, planning, remembering?*” (i.e., intelligence attribution) and can “*experience pain, fear, pleasure, suffering?*” (i.e., sentience attribution) (based on Leach et al., 2021). Participants completed the items on 7-point Likert scales (1 = *not at all* to 7 = *very much*), for nine farmed animals: layer chicken (bred for egg consumption), broiler chicken (bred for meat consumption), sheep, turkey, beef cattle, dairy cow, pig, duck, and goat; and nine aquatic animals: crab, lobster, prawn, octopus, squid, cuttlefish, salmon, mullet, and tuna.

We computed separate scores for perceived a) sentience ($\alpha = .97$) and b) intelligence ($\alpha = .98$) across all farmed animals and for the perceived a) sentience ($\alpha = .99$) and b) intelligence ($\alpha = .98$) across all aquatic animals. Higher scores indicated that participants attributed more mental abilities to the animals.

To assess moral concern for farmed and aquatic animals, we presented participants the same list of farmed and aquatic animals and asked them to indicate to what extent (1 = *not at all*

to 7 = *to a very great extent*) they feel morally obligated to show concern for these animals (adapted from Krings et al., 2021; Leite et al., 2019). Separate moral concern scores were computed for farmed ($\alpha = .97$) and aquatic animals ($\alpha = .99$), with higher scores indicating greater moral concern.

Participants completed three comprehension check items, which were included in the measures described above, asking participants “*If you are paying attention to this study please click strongly disagree*”.

2.3. Procedure

The study was advertised online through several social media platforms (e.g., Facebook, Twitter), asking for volunteers to complete an online survey study (Gorilla) on how dietary groups perceive different animals. Respondents had to provide informed consent before proceeding to the study. Participants first provided demographic data (gender, age) and were asked to self-identify their dietary group (omnivores, pescatarians, vegetarians, vegans, and flexitarians)². Following this, participants completed the measures of speciesism, moral concern, and mind attribution. Upon completion, they were thanked and debriefed. The study took approximately 10-15 minutes.

2.4. Design and Analysis

This was a comparative cross-sectional design with dietary group (between-participants: omnivore, pescatarian, vegetarian, vegan, flexitarian) as a categorical IV, and speciesism, moral concern for animals and attribution of mental abilities to animals as the DVs. Animal category was a categorical within-participants IV (farmed vs. aquatic).

² Note that definitions were provided for each dietary category to ensure that participants had an accurate definition of the dietary practices of each dietary group (see OSF project page: <https://osf.io/7ec6x/>).

Prior to formal analyses, we first checked how many participants failed the comprehension check to exclude them from the analyses (as preregistered). To test our hypotheses, we performed three sets of ANOVAs, followed by pairwise comparisons to determine which pairs of groups were significantly different. We applied Bonferroni corrections to account for multiple comparisons between groups. The reported p -values are Bonferroni-corrected p -values for all pairwise group comparisons, whereby the original p -values have been multiplied the number of comparisons.

We first conducted a univariate ANOVA testing for dietary group differences in speciesist attitudes (Hypothesis 1). The second analysis was a mixed multivariate ANOVA testing for dietary group differences in moral concern for animals and mind attribution, with animal category (farmed vs aquatic) as within-subject factor (Hypotheses 2 and 3). The next set of analyses were two mixed multivariate ANOVAs to test whether vegetarians and pescatarians differed in their levels of moral concern for and mind attribution to beef cow vs dairy cow and broiler chicken vs layer chicken.

3. Results

3.1. Speciesist beliefs (Hypothesis 1)

We investigated differences in speciesist attitudes between dietary groups (Table 1). The results showed a main effect of dietary group ($F(4, 553) = 34.43, p < .001, \eta_p^2 = .20$). Pairwise comparisons indicated that omnivores and pescatarians scored significantly higher on speciesism than vegetarians and vegans, while vegans scored significantly lower than all other dietary groups (Table 2). Flexitarians also scored significantly higher on speciesism than vegetarians and vegans. In sum, the results largely confirmed Hypothesis 1, although no significant differences were observed between omnivores and pescatarians.

Table 1.

Means and Standard Deviations for Speciesism, Moral Concern and Sentience and Intelligence Attributions to Farmed and Aquatic Animals per Dietary Group.

Dependent Variables	Dietary Group									
	Omnivores (n=122)		Pescatarians (n=118)		Flexitarians (n=60)		Vegetarians (n=138)		Vegans (n=120)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Speciesism	3.49	1.54	3.41	1.57	3.01	1.38	2.36	1.11	1.82	1.05
Moral concern farmed animals	4.50	1.58	4.95	1.33	5.16	1.47	5.64	1.10	6.73	.75
Moral concern aquatic animals	3.92	1.71	3.33	1.93	4.40	1.85	5.34	1.34	6.47	.95
Intelligence farmed animals	4.27	1.50	3.98	1.69	4.73	1.75	4.56	1.60	6.27	1.05
Sentience farmed animals	5.88	1.31	5.20	1.50	6.21	1.26	5.90	1.12	6.90	.39
Intelligence aquatic animals	3.72	1.60	2.90	1.90	4.07	1.93	3.84	1.67	5.70	1.42
Sentience aquatic animals	5.02	1.75	3.51	2.25	5.28	1.92	5.56	1.25	6.60	.82

Table 2.

Post-hoc Comparisons of Speciesism Levels between Dietary Groups.

		Mean Difference	95% CI		SE	<i>t</i>	Cohen's d	<i>p</i>
			Lower	Upper				
Omnivores	Pescatarians	0.08	-0.40	0.55	0.17	0.45	0.06	1.00
	Flexitarians	0.47	-0.10	1.05	0.21	2.25	0.35	.251
	Vegetarians	1.13	0.68	1.59	0.17	6.81	0.85	< .001
	Vegans	1.67	1.20	2.14	0.17	9.69	1.25	< .001
Pescatarians	Flexitarians	0.40	-0.19	0.98	0.21	1.87	0.30	.626
	Vegetarians	1.06	0.60	1.51	0.17	6.29	0.79	< .001
	Vegans	1.59	1.11	2.06	0.17	9.16	1.19	< .001
Flexitarians	Vegetarians	0.66	0.09	1.23	0.21	3.19	0.49	.015
	Vegans	1.19	0.61	1.77	0.21	5.64	0.89	< .001
Vegetarians	Vegans	0.53	0.08	0.99	0.17	3.20	0.40	.015

Note. *p*-values are Bonferroni-adjusted *p*-values

3.2. Moral concern and Mind Attribution (Hypotheses 2 and 3)

With respect to dietary group differences in moral concern for, and mind attribution to (intelligence and sentience) farmed vs. aquatic animals (Table 1), we found significant multivariate main effects of dietary group, ($F(12, 1458.10) = 31.21, p < .001, \eta_p^2 = .18$) and animal type, ($F(3, 551) = 168.43, p < .001, \eta_p^2 = .48$) as well as a significant multivariate interaction between dietary group and animal category, ($F(12, 1458.10) = 19.41, p < .001, \eta_p^2 = .12$).

The univariate test results showed that the main effect of dietary group was significant for all three DVs (moral concern, $F(4, 553) = 69.38, p < .001, \eta_p^2 = .33$; intelligence attribution, $F(4, 553) = 46.18, p < .001, \eta_p^2 = .25$; sentience attribution, $F(4, 553) = 49.20, p < .001, \eta_p^2 = .26$). The main effect of animal type was also significant for the three DVs (moral concern, $F(1, 553) = 312.23, p < .001, \eta_p^2 = .36$; intelligence, $F(1, 553) = 343.85, p < .001, \eta_p^2 = .38$; sentience, $F(1, 553) = 327.23, p < .001, \eta_p^2 = .37$), as was the interaction effect between dietary group and animal type (moral concern, $F(4, 553) = 46.01, p < .001, \eta_p^2 = .25$; intelligence, $F(4, 553) = 7.23, p < .001, \eta_p^2 = .05$; sentience, $F(4, 553) = 36.67, p < .001, \eta_p^2 = .21$). These results indicate that the differences between dietary groups in moral concern and mind attribution depended on whether participants evaluated farmed or aquatic animals.

Specifically, pairwise comparisons (Table 3) showed that omnivores expressed significantly lower moral concern for farmed animals compared to flexitarians, vegetarians, and vegans. Pescatarians scored significantly lower on moral concern for farmed animals than vegetarians and vegans, while flexitarians and vegetarians scored significantly lower than vegans (Table 3). As expected, the pattern of results was different when considering moral concern for aquatic animals. Omnivores, pescatarians, and flexitarians expressed significantly lower moral

concern for aquatic animals than vegetarians and vegans, and vegetarians scored lower than vegans. Critically, while pescatarians did not significantly differ from omnivores and flexitarians in moral concern for farmed land animals, they expressed significantly lower moral concern for aquatic animals compared to omnivores and flexitarians. Moreover, while all dietary groups showed significantly lower moral concern for aquatic animals compared to farmed land animals (Table 4), this difference was significantly larger for pescatarians compared to the other groups, as indicated by significant interactions (Table 5, Figure 1).

Table 3.
Post-hoc Comparisons for Moral Concern for Farmed Land Animals and Aquatic Animals between Dietary Groups.

		Mean Difference	95% CI		SE	t	Cohen's d	p
			Lower	Upper				
Concern for Farmed Land Animals								
Omnivores	Pescatarians	-0.44	-0.89	0.01	0.162	-2.73	-0.35	.065
	Flexitarians	-0.65	-1.19	-0.11	0.198	-3.27	-0.52	.011
	Vegetarians	-1.13	-1.56	-0.70	0.156	-7.24	-0.90	< .001
	Vegans	-2.22	-2.66	-1.78	0.161	-13.75	-1.77	< .001
Pescatarians	Flexitarians	-0.21	-0.75	0.34	0.199	-1.029	-0.16	1.000
	Vegetarians	-0.69	-1.12	-0.26	0.157	-4.36	-0.55	< .001
	Vegans	-1.78	-2.22	-1.33	0.163	-10.91	-1.42	< .001
Flexitarians	Vegetarians	-0.48	-1.01	0.05	0.194	-2.48	-0.38	.133
	Vegans	-1.57	-2.11	-1.03	0.198	-7.92	-1.25	< .001
Vegetarians	Vegans	-1.09	-1.52	-0.66	0.157	-6.95	-0.87	< .001
Concern for Aquatic Animals								
Omnivores	Pescatarians	0.59	0.04	1.15	0.20	2.95	0.38	.034
	Flexitarians	-0.49	-1.16	0.19	0.25	-1.97	-0.31	.495
	Vegetarians	-1.42	-1.95	-0.89	0.19	-7.31	-0.91	< .001
	Vegans	-2.55	-3.10	-2.01	0.20	-12.70	-1.63	< .001
Pescatarians	Flexitarians	-1.08	-1.76	-0.40	0.25	-4.36	-0.69	< .001
	Vegetarians	-2.01	-2.55	-1.48	0.19	-10.27	-1.29	< .001
	Vegans	-3.15	-3.69	-2.59	0.20	-15.53	-2.01	< .001
Flexitarians	Vegetarians	-0.93	-1.59	-0.27	0.24	-3.86	-0.59	.001
	Vegans	-2.07	-2.74	-1.39	0.25	-8.37	-1.32	< .001
Vegetarians	Vegans	-1.13	-1.67	-0.60	0.19	-5.81	-0.73	< .001

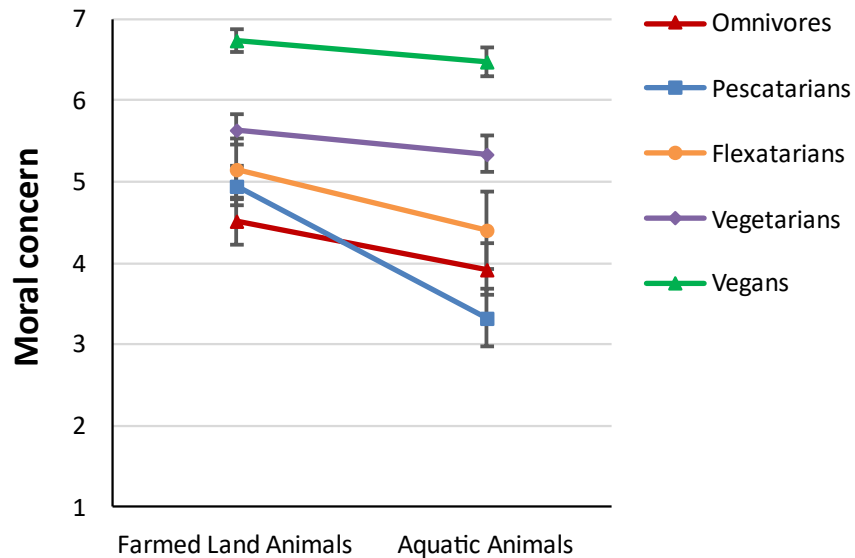
Note. p-values are Bonferroni-adjusted p-values

Table 4

Test of Differences between Moral Concern for Farmed Land Animals and Aquatic Animals for Each Dietary Groups

	Mean difference	95% CI		SE	t	d	p
		Lower	Upper				
Omnivores	0.59	0.43	0.75	.08	7.21	0.41	< .001
Pescatarians	1.62	1.46	1.79	.08	19.64	1.15	< .001
Flexitarians	0.75	0.51	0.98	.12	6.46	0.53	< .001
Vegetarians	0.29	0.15	0.45	.07	3.89	0.21	< .001
Vegans	0.25	0.09	0.41	.08	3.09	0.18	.002

Figure 1. Mean levels of moral concern for farmed land and aquatic food animals by dietary group



Note. Pescatarians showed the largest discrepancy between moral concern for farmed and aquatic food animals compared to all other dietary groups.

Table 5.

Results of interaction effects for the comparisons between pescatarians with each dietary group for the differences in moral concern and mind attribution between farmed land and aquatic animals

	Moral concern for farmed land vs. aquatic animals			Intelligence attribution to farmed land vs. aquatic animals			Sentience attribution to farmed land vs. aquatic animals		
	<i>F</i>	<i>p</i>	η_p^2	<i>F</i>	<i>p</i>	η_p^2	<i>F</i>	<i>p</i>	η_p^2
Pescatarians vs. Omnivores	53.31	<.001	.183	18.74	<.001	.073	31.47	<.001	.117
Pescatarians vs. Flexitarians	15.20	<.001	.127	7.70	.006	.042	11.59	<.001	.086
Pescatarians vs. Vegetarians	134.50	<.001	.346	10.15	.002	.038	101.33	<.001	.285
Pescatarians vs. Vegans	144.99	<.001	.382	19.77	<.001	.077	133.06	<.001	.361

Note. The interaction effects are depicted in Figures 1 and 2. Compared to all other dietary groups, pescatarians showed a significantly larger discrepancy between moral concern for and mind attribution to farmed land animals and aquatic animals, with lower scores for aquatic vs farmed land animals.

With respect to intelligence and sentience attributions, omnivores and pescatarians attributed significantly lower levels of intelligence and sentience to farmed animals than vegans (Table 6). Pescatarians also scored lower on intelligence and sentience attribution to farmed animals than vegetarians and flexitarians, yet lower on sentience attribution to farmed animals than omnivores, while vegans scored higher than all dietary groups for both intelligence and sentience attributions.

When it comes to attributing intelligence and sentience to aquatic animals, omnivores attributed significantly lower levels of intelligence and sentience than vegans, yet higher levels of intelligence and sentience than pescatarians. Pescatarians attributed significantly lower intelligence and sentience to aquatic animals than all other dietary groups, including omnivores, while vegans attributed significantly higher levels of intelligence and sentience than all other groups.

All dietary groups attributed significantly lower levels of intelligence and sentience to aquatic animals than to farmed land animals (Table 7). However, those differences (farmed land vs. aquatic animals) were more strongly pronounced for pescatarians compared to the differences observed in any other group, as indicated by significant interaction effects (Table 5, Figure 2).³

³ As an additional analysis, the zero-order correlations (Table S1) showed positive and significant associations of both intelligence and sentience attributions with moral concern across all dietary groups, and for both farmed animals and aquatic animals, confirming theorizing that mind attribution to animals is associated with people's moral judgements of animals (e.g., Gray et al., 2012).

Table 6.*Comparisons for Mental Attributions to Farmed Land and Aquatic Animals between Dietary Groups.*

		95% CI			SE	t	Cohen's d	p
		Mean Difference	Lower	Upper				
Intelligence- Farmed Land Animals								
Omnivores	Pescatarians	0.29	-0.24	0.83	0.19	1.51	0.19	1.000
	Flexitarians	-0.47	-1.12	0.19	0.24	-1.95	-0.31	.518
	Vegetarians	-0.29	-0.81	0.23	0.19	-1.54	-0.19	1.000
	Vegans	-1.99	-2.56	-1.46	0.19	-10.23	-1.32	< .001
Pescatarians	Flexitarians	-0.76	-1.42	-0.10	0.24	-3.17	-0.50	.016
	Vegetarians	-0.59	-1.11	-0.07	0.19	-3.08	-0.39	.021
	Vegans	-2.29	-2.83	-1.75	0.19	-11.65	-1.51	< .001
Flexitarians	Vegetarians	0.17	-0.47	0.82	0.23	0.78	0.12	1.000
	Vegans	-1.53	-2.18	-0.87	0.24	-6.37	-1.01	< .001
Vegetarians	Vegans	-1.70	-2.22	-1.18	0.19	-8.99	-1.12	< .001
Sentience- Farmed Land Animals								
Omnivores	Pescatarians	0.67	0.25	1.09	0.15	4.42	0.57	< .001
	Flexitarians	-0.34	-0.85	0.17	0.19	-1.81	-0.29	.717
	Vegetarians	-0.03	-0.43	0.37	0.15	-0.18	-0.02	1.000
	Vegans	-1.02	-1.43	-0.61	0.15	-6.75	-0.87	< .001
Pescatarians	Flexitarians	-1.01	-1.51	-0.50	0.19	-5.39	-0.86	< .001
	Vegetarians	-0.69	-1.09	-0.29	0.15	-4.73	-0.59	< .001
	Vegans	-1.69	-2.11	-1.27	0.15	-11.10	-1.44	< .001
Flexitarians	Vegetarians	0.31	-0.19	0.81	0.18	1.70	0.26	.900
	Vegans	-0.69	-1.19	-0.18	0.19	-3.70	-0.58	.002
Vegetarians	Vegans	-0.99	-1.40	-0.60	0.15	-6.78	-0.85	< .001
Intelligence-Aquatic Animals								
Omnivores	Pescatarians	0.82	0.23	1.42	0.22	3.79	0.49	.002
	Flexitarians	-0.35	-1.08	0.37	0.27	-1.33	-0.21	1.000
	Vegetarians	-0.13	-0.70	0.45	0.21	-0.60	-0.07	1.000
	Vegans	-1.99	-2.58	-1.40	0.22	-9.23	-1.19	< .001
Pescatarians	Flexitarians	-1.17	-1.90	-0.45	0.27	-4.41	-0.70	< .001
	Vegetarians	-0.95	-1.52	-0.37	0.21	-4.50	-0.56	< .001
	Vegans	-2.81	-3.41	-2.22	0.22	-12.92	-1.68	< .001
Flexitarians	Vegetarians	0.23	-0.48	0.94	0.26	0.88	0.14	1.000
	Vegans	-1.64	-2.37	-0.91	0.27	-6.18	-0.98	< .001
Vegetarians	Vegans	-1.87	-2.44	-1.29	0.211	-8.91	-1.12	< .001
Sentience-Aquatic Animals								
Omnivores	Pescatarians	1.51	0.93	2.09	0.21	7.14	0.92	< .001
	Flexitarians	-0.26	-0.97	0.45	0.26	-1.01	-0.16	1.000
	Vegetarians	-0.54	-1.09	0.02	0.20	-2.64	-0.33	.085
	Vegans	-1.58	-2.16	-1.01	0.21	-7.53	-0.97	< .001
Pescatarians	Flexitarians	-1.77	-2.48	-1.06	0.26	-6.82	-1.09	< .001
	Vegetarians	-2.04	-2.61	-1.48	0.21	-9.98	-1.26	< .001
	Vegans	-3.09	-3.67	-2.51	0.21	-14.58	-1.90	< .001
Flexitarians	Vegetarians	-0.28	-0.97	0.42	0.25	-1.10	-0.17	1.000
	Vegans	-1.32	-2.03	-0.62	0.26	-5.12	-0.81	< .001
Vegetarians	Vegans	-1.04	-1.61	-0.49	0.21	-5.13	-0.64	< .001

Note. p-values are Bonferroni-adjusted p-values

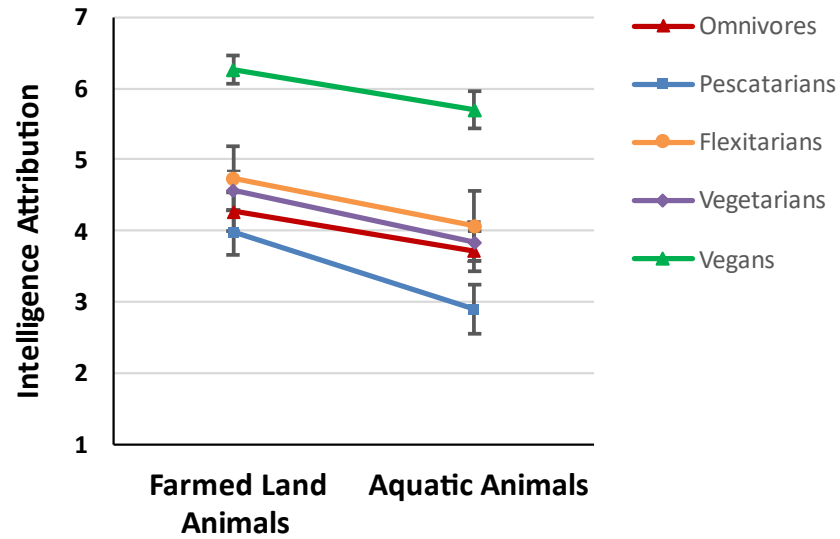
Table 7

Test of Differences between Intelligence and Sentience Attributions to Farmed Land versus Aquatic Animals for Each Dietary Groups

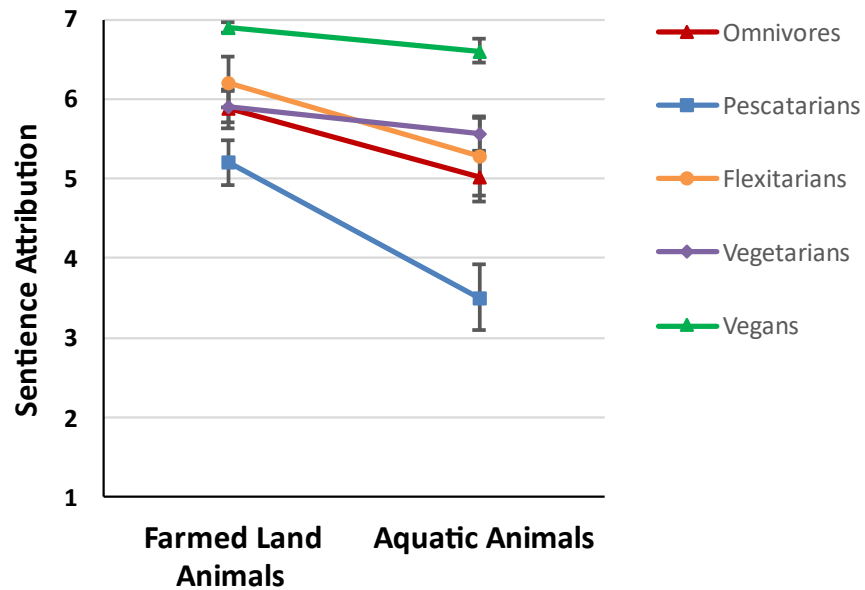
	Mean Difference	95% CI		SE	t	d	p
		Lower	Upper				
Intelligence Attribution							
Omnivores	0.56	0.40	0.71	0.08	7.02	0.35	< .001
Pescatarians	1.08	0.92	1.24	0.08	13.44	0.68	< .001
Flexitarians	0.67	0.45	0.89	0.11	5.94	0.42	< .001
Vegetarians	0.72	0.58	0.87	0.07	9.70	0.45	< .001
Vegans	0.56	0.40	0.72	0.08	6.97	0.35	< .001
Sentience Attribution							
Omnivores	0.86	0.67	1.04	0.09	9.19	0.60	< .001
Pescatarians	1.69	1.51	1.88	0.10	17.89	1.19	< .001
Flexitarians	0.93	0.67	1.19	0.13	7.00	0.65	< .001
Vegetarians	0.35	0.17	0.52	0.09	3.94	0.24	< .001
Vegans	0.29	0.11	0.48	0.09	3.11	0.21	.002

Figure 2. Mean levels of intelligence (A) and sentience (B) attribution to farmed land and aquatic animals by dietary group

A.



B.



Note. Pescatarians showed the largest discrepancy between sentience and intelligence attributions to farmed versus aquatic food animals compared to all other dietary groups.

3.3. Dairy vs Beef Cows and Layer vs Broiler Chickens (Hypothesis 4)

Lastly, we investigated whether pescatarians and vegetarians showed lower levels of moral concern and lower levels of intelligence and sentience attribution for dairy cows compared to beef cows and for layer chickens compared to broiler chickens, given that both groups consume dairy products and eggs, but no meat. The multivariate results for comparing dairy with beef cows showed that the main effect of animal type was significant, $F(3, 551) = 60.59, p < .001, \eta_p^2 = .25$, as was the interaction effect, $F(12, 1458.10) = 15.44, p < .001, \eta_p^2 = .10$. The univariate effects further showed that the main effect of animal type was significant for all three DVs (moral concern, $F(1, 553) = 178.16, p < .001, \eta_p^2 = .24$; intelligence, $F(1, 553) = 106.69, p < .001, \eta_p^2 = .16$; sentience, $F(1, 553) = 154.06, p < .001, \eta_p^2 = .22$), and so was the interaction effect (moral concern, $F(4, 553) = 44.08, p < .001, \eta_p^2 = .24$; intelligence, $F(4, 553) = 31.91, p < .001, \eta_p^2 = .19$; sentience, $F(4, 553) = 43.55, p < .001, \eta_p^2 = .24$).

Pairwise comparisons showed that both pescatarians and vegetarians (Table 8) expressed lower moral concern, and attributed lower intelligence and sentience to dairy cows compared to beef cows. Among vegans and omnivores, the levels of moral concern and mind attribution, did not differ significantly between beef and dairy cows ($ts < 1.19, ps > .235$ for omnivores and $ts < 0.10, ps > .922$ for vegans).

A similar pattern of results emerged for the comparison between layer chickens and broiler chickens (Table 3). The multivariate results showed that the main effect of animal type was significant, $F(3, 551) = 70.27, p < .001, \eta_p^2 = .28$, as was the interaction effect, $F(12, 1458.10) = 15.54, p < .001, \eta_p^2 = .10$. The univariate effects further showed that the main effect of animal type was significant for all three DVs (moral concern, $F(1, 553) = 204.98, p < .001, \eta_p^2 = .27$; intelligence, $F(1, 553) = 76.97, p < .001, \eta_p^2 = .12$; sentience, $F(1, 553) = 151.73, p < .001, \eta_p^2 = .22$).

.001, $\eta_p^2 = .22$), as was the interaction effect (moral concern, $F(4, 553) = 47.07, p < .001, \eta_p^2 = .25$; intelligence, $F(4, 553) = 19.54, p < .001, \eta_p^2 = .12$; sentience, $F(4, 553) = 35.40, p < .001, \eta_p^2 = .20$).

Both pescatarians and vegetarians (Table 8) expressed lower moral concern for and attributed lower intelligence and sentience to layer chickens than to broiler chickens. Among vegans and omnivores, the levels of moral concern and mind attribution did not differ significantly between layer and broiler chickens ($ts < 1.94, ps > .052$ for omnivores and $ts < 0.46, ps > .642$ for vegans).

Table 8.

Test of Differences between Levels of Moral Concern and Mind Attribution for Dairy versus Beef Cows and for Layer versus Broiler Chickens in Pescatarians and Vegetarians.

	Dairy Cow		Beef Cow		95% CI						
	Mean	SD	Mean	SD	Mean Differe nce	Lower	Upper	SE	t	d	p
Moral concern											
Pescatarians	3.81	2.36	5.51	1.18	-1.70	-1.94	-1.45	0.12	-13.71	1.06	< .001
Vegetarians	4.51	2.30	6.08	0.94	-1.57	-1.80	-1.35	0.11	-13.75	0.98	< .001
Intelligence											
Pescatarians	3.45	2.39	5.70	1.24	-2.25	-2.534	-1.98	0.14	-15.83	1.44	< .001
Vegetarians	4.04	2.36	6.34	0.81	-2.30	-2.563	-2.05	0.13	-17.50	1.47	< .001
Sentience											
Pescatarians	4.07	2.64	4.43	1.76	-1.636	-1.870	-1.40	0.12	-13.70	1.06	< .001
Vegetarians	4.85	2.46	4.99	1.58	-1.493	-1.710	-1.28	0.11	-13.53	0.96	< .001
	Layer Chicken		Broiler Chicken		95% CI						
	Mean	SD	Mean	SD	Mean Differe nce	Lower	Upper	SE	t	d	p
Moral concern											
Pescatarians	3.54	2.10	4.97	1.39	-1.43	-1.65	-1.22	0.11	-13.18	0.90	< .001
Vegetarians	4.30	2.23	5.87	1.03	-1.57	-1.77	-1.36	0.10	-15.65	0.99	< .001
Intelligence											
Pescatarians	3.10	2.10	3.81	1.70	-0.70	-0.88	-0.53	0.09	-7.89	0.40	< .001
Vegetarians	3.56	2.12	4.42	1.65	-0.86	-1.02	-0.70	0.08	-10.45	0.49	< .001
Sentience											
Pescatarians	4.00	2.45	5.29	1.49	-1.29	-1.51	-1.07	0.11	-11.53	0.80	< .001
Vegetarians	4.64	2.39	6.10	1.02	-1.46	-1.66	-1.25	0.10	-14.09	0.91	< .001

4. Discussion

This study investigated motivated perceptions of mental capacities and moral worth of different types of food animals (farmed land animals; aquatic animals; animals used for meat; animals used for dairy and eggs) among omnivores, pescatarians, vegetarians, flexitarians, and vegans. We particularly focused on whether pescatarians and vegetarians would be flexible in extending mental capacities and moral worth to different types of animals in ways that suit their consumption habits. Overall, the results showed that pescatarians attributed particularly low levels of mental capacities and moral worth to aquatic animals while both pescatarians and vegetarians attributed lower mental capacities and moral worth to dairy cows and layer chickens as compared to beef cows and broiler chickens, respectively. In other words, pescatarians and vegetarians showed a remarkable flexibility in adjusting their moral concern and perceptions of animal minds that suit their consumption patterns, even when evaluating the same animal but with a different function (i.e., a cow used for meat versus a cow used for dairy). These findings can help explain how pescatarians and vegetarians reconcile the apparent paradox of quitting meat consumption yet continuing the consumption of other animal products despite the associated animal welfare issues. Theoretically, attributing lower mental capacities and moral worth to animals that comprise part of their diet, may help to avoid or reduce cognitive dissonance, felt when thinking about animal suffering associated with their consumption habits (Bastian et al., 2012; Ioannidou et al., 2024; Loughnan & Davis, 2020; Rothgerber, 2020).

In line with our expectations (Hypothesis 1), omnivores scored significantly higher on speciesism than vegetarians and vegans, while vegans endorsed the least speciesist beliefs compared to all other dietary groups. However, unexpectedly, omnivores and pescatarians did not differ from each other in their speciesism levels, and neither dietary group differed from

flexitarians. Put differently, pescatarians and flexitarians did not show a stronger rejection of the belief in human supremacy over animals relative to omnivores. Along with the findings that these three groups significantly differed from vegetarians and vegans, this finding may indicate that anti-speciesist beliefs may not play a prominent role in dietary behaviors that focus on reducing meat consumption and/or still involve the consumption of some animals. In contrast, for vegetarians, and even more so for vegans, dietary choices appear more closely linked with (and thus likely motivated by) the rejection of speciesism and support for more equal moral consideration of human and non-human animals (see also Dhont & Ioannidou, 2024a; Ioannidou et al., 2023a; 2023b).

Dietary groups also differed in terms of moral concern for farmed land animals and aquatic animals, which is largely in line with Hypothesis 2. As expected, omnivores expressed relatively low levels of moral concern for both farmed land animals and aquatic animals, particularly compared to vegetarians and vegans, but unexpectedly, not compared to pescatarians. Vegans showed the highest levels of moral concern for both animal categories. Interestingly, similar to omnivores, pescatarians expressed lower moral concern for both farmed and aquatic animals compared to vegetarians and vegans. Most importantly, however, pescatarians also scored lower on moral concern for aquatic animals compared to omnivores and flexitarians and showed the largest difference in moral concern for aquatic animals compared to farmed animals. Indeed, although all dietary groups expressed lower moral concern for aquatic animals compared to farmed animals, the differential levels of moral concern between aquatic and farmed animals were most pronounced for pescatarians.

The results partially confirmed Hypothesis 3 pertaining to dietary groups differences in mind attribution to farmed and aquatic animals. As expected, vegans scored higher than all other

groups on sentience and intelligence attributions to both farmed and aquatic animals. We expected omnivores to score the lowest but found that they only scored significantly lower on mind attribution to farmed and aquatic animals when compared to vegans and did not significantly differ from flexitarians and vegetarians. However, it was the group of pescatarians that attributed least mind to both farmed land animals and aquatic animals compared to all other dietary groups. In line with our hypothesis, pescatarians scored particularly low on mind attribution to aquatic food animals. Indeed, similar to the findings for moral concern, pescatarians showed the largest discrepancy in mind attribution between farmed land animals and aquatic animals. Taken together, these findings suggest that pescatarians were motivated to attribute lower moral concern and deny mental abilities particularly to aquatic food animals.

Our study adds to the growing body of evidence that the way people attribute minds and moral standing to animals is selective and depended on the functional role of the animal (e.g., edible), motivated by their dietary behaviour (Bastian et al., 2012; Bastian & Loughnan, 2017; Krings et al., 2021; Leite et al., 2019). We have extended the scope of previous research on mind denial and lower moral consideration of farmed animals by showing that similar tendencies apply to people's judgments of aquatic food animals. The comparison between different dietary groups in how they perceive farmed and aquatic animals and especially the inclusion of a sample of pescatarians, provides compelling evidence for the account that moral judgment and mind denial of animals is motivated by dietary behaviours (see also Leach et al., 2022; Rothgerber, 2020). Indeed, the pescatarian group is the only dietary group that makes a clear distinction between farmed land animals and aquatic animals in terms of what is considered food whereas the other dietary groups consider both animal categories as food (omnivores) or neither category as food (vegetarians and vegans). In line with a motivated moral cognition account, the

distinction between farmed land animals and aquatic animals among pescatarians was also reflected in the pronounced discrepancy in moral concern and mind attribution between the two animal categories a difference that was larger than for any of the other dietary groups.

Putting these ideas to an additional test, we also tested whether vegetarians and pescatarians would show differences in moral concern for, and mind attribution to a dairy cow than a beef cow and to a layer chicken than a broiler chicken (Hypothesis 4). This way, we were able to explore whether the use of mind denial and moral consideration would differ between animals belonging to the same species but with a different function (meat vs dairy, meat vs eggs) and whether those differences would be associated with dietary behaviour. The results provided further support for a motivated moral cognition account and demonstrated that both pescatarians and vegetarians attributed lower sentience and intelligence to dairy cows and expressed lower moral concern for them compared to beef cows. Along similar lines, both vegetarians and pescatarians attributed less sentience and intelligence to layer chickens and showed lower moral concern for them compared to broiler chicken. As per comparison, the dietary groups that eat all animal products (omnivores) or no animal products (vegans) did not show any significant differences in mind attribution or moral concern between dairy vs beef cows and layer vs broiler chickens. These findings are consistent with the dietary group effects on perceptions of farmed land animals compared to aquatic animals. Yet, for this test, we did not compare different types of animal species with different physiological and neurological characteristics, but animals of the same species, with the only difference being the function of the animal within the food system. Hence, the results provide strong support for the idea that it is the functional role of the animals and the association with consumption behaviours among vegetarians and pescatarians (eating

dairy and egg products) that can explain why these two groups downplay mental capacities of dairy cows and layer chickens relative to beef cows and broiler chickens.

Taken together, we found consistent evidence that pescatarians and vegetarians are flexible in extending mental capacities and moral worth to animals depending on their consumption patterns, showing a self-serving bias against animals whose products they consume. Theoretically, mind attribution is considered a key factor for moral judgments (Gray et al., 2012). Hence, downplaying the mind of food animals can be an effective way to decrease their moral status, making it easier to justify harming or killing them for food (Bastian et al., 2012; Ioannidou et al., 2024; Leach et al., 2021; Loughnan & Davis, 2020; Rothgerber, 2020). In line with this theorizing, the current study also showed the positive associations between mind attribution (sentience and intelligence) and moral concern for farmed land animals and aquatic animals for all dietary groups and for both animal categories (Table S1).

Previous studies have confirmed that mind denial is a common strategy that meat eaters use to avoid or reduce the cognitive dissonance and moral discomfort they feel when thinking of the harm inflicted on animals, making them feel better about eating them (e.g., Bratanova et al., 2011; Crawshaw & Piazza, 2022; Loughnan & Davis, 2020; Sytsma & Machery, 2012). The current findings indicate that these psychological strategies can also be observed among pescatarians when considering fish consumption and among pescatarians and vegetarians when considering dairy and egg consumption (see also Ioannidou et al., 2024). Concern about animal rights and suffering represent a key motive for people to abstain from meat consumption (Dhont & Ioannidou et al., 2024a; Hopwood et al., 2020), yet is also relevant in the context of fish, dairy and egg product consumption (Dhont & Ioannidou 2024a, 2024b). As pescatarians and vegetarians have quitted meat consumption yet continue the consumption of other animal

products, they might experience cognitive dissonance (fish-, dairy-, and egg-related dissonance) about this apparent paradox in attitudes and behaviours towards different types of animals (Ioannidou et al., 2023a). The current findings suggest that pescatarians and vegetarians may resolve this cognitive dissonance by attributing greater mental capacities and moral worth to some animals (animals used in the meat industry) and less to others (animals used in the fish, dairy, and egg industries).

4.1. Limitations and Future Directions

Despite the clear indication that dietary behaviours are associated with perceptions of animals, the cross-sectional nature of the study limits causal inferences. Theorizing on meat-related cognitive dissonance (Rothgerber, 2020) and motivated mind perception of food animals (e.g., Bastian et al., 2012) propose that mind denial is a psychological reaction among meat eaters that reduces moral concern for animals, thereby justifying and facilitating continued meat consumption. In this sense, consumption behaviour appears to causally predict mind attribution and moral concern. Increased knowledge about animal minds (e.g., Leach et al., 2021; Potocka & Bielecki, 2023) and moral concern for animals may therefore motivate people to stop eating meat or turn vegan, and thus mind attribution and moral concern can also predict consumption behaviour. Longitudinal studies that track people's levels of animal mind attribution and moral concern before and after changes in consumption behaviours (e.g., omnivores who turn vegetarian or vegan, or vegans who relapse to being vegetarian or omnivore) would be highly valuable to determine the extent to which consumption patterns predict attitudes/perceptions and the extent to which attitudes/perceptions predict consumption patterns.

Increasing awareness about animal minds might be particularly effective in reducing animal product intake when people are also provided with information about the harmful living

conditions and suffering of farmed animals (e.g., Ioannidou et al., 2024; Stoeber et al., 2014; Tan et al., 2023). Paradoxically, however, such attempts can also lead to a greater denial of animal minds and reduced moral concern for animals among some people (Ioannidou et al., 2024; Loughnan et al., 2010). The effectiveness of information-based attempts to change people's consumption habits is likely to depend on individual difference factors such as people's pre-existing levels of commitment to animal product consumption (Leach et al., 2022), gender (Salmen & Dhont, 2023; Stoeber et al., 2024), personality factors (Smillie et al., 2024), and dietary motives (animal ethics, environment, health) (Dhont & Ioannidou et al., 2024b; Hopwood et al., 2020). Therefore, future research could take a wider range of demographic and psychological factors into account to determine who is more receptive to information about animal minds and animal suffering. This would allow for a more 'fine-grained' approach and for distinguishing between different types of psychological profiles within dietary groups (Hopwood et al., 2020; Smillie et al., 2024). For instance, pescatarians and flexitarians who are primarily motivated by health motives might attribute lower mental capacities and moral worth to food animals and be less receptive to information about animal minds and animal suffering compared to pescatarians and flexitarians who are primarily motivated by environmental or animal ethics reasons. This could mean that people from different dietary groups with similar motivational profiles (e.g., health pescatarians and health flexitarians) may be more similar in terms of their perceptions of animals than people from the same dietary with different motivational profiles (e.g. health pescatarians and environmentally motivated pescatarians) (see also Rosenfeld & Tomiyama, 2021).

Research on people's perceptions of aquatic animals compared to other animals used for food remains scarce, therefore, many questions remain open. The biological differences between

farmed land animals and aquatic animals, seem to be reflected in the categorically lower ratings of mental capacities and moral concern for aquatic animals in all dietary groups. It would be interesting to conduct more research on how omnivores perceive aquatic animals compared to farmed land animals as they routinely consume products from both types of animals. Reminding meat consumers of the animal origins of meat while presenting a meat dish tends to increase meat consumers' willingness to reduce meat consumption (e.g., Earle et al., 2019; Kunst & Hohle, 2016). However, in dishes with fish, crustaceans, or cephalopods, the animals are often still identifiable (e.g., including complete animals as compared to processed forms). Hence, the psychological dissociation between the dish/product and the animal may be less relevant when it comes to aquatic animals and aquatic animals might in themselves be perceived as fundamentally different than farmed land animals. People, and particularly those who are living further away from coastal areas and fishing harbours, may also feel more removed from the production process of aquatic animals. As such, they may be less aware of the profound animal welfare and environmental issues (e.g., bycatch, bottom trawling, habitat destruction, overfishing) associated with the fish industry compared to increased public awareness of the animal welfare and environmental issues associated with the meat industry. Clearly, more research is needed to further investigate the contextual and psychological factors underpinning fish consumption and the way people think about aquatic animals.

Our data were collected online through convenience sampling, calling for volunteers to participate in a study on how dietary groups perceive different animals. Although this procedure made it possible to recruit relatively large subsamples of each dietary group, we may have recruited participants that were inherently interested in animals, animal welfare and diet type, potentially leading to higher average levels of mind attribution and moral concern, and lower

levels of speciesism compared to the levels in the population. It is also unclear how well each subsample reflects the psychological and demographic profiles of these dietary groups in the wider population. Replication studies, preferably with large and representative samples, are needed to test the generalisability of the current findings.

We assessed dietary group membership with a self-categorisation question. However, levels of animal product consumption and commitment to eating animal products vary widely within the groups of omnivores, pescatarians, and flexitarians (e.g., Leach et al., 2022), and some vegetarians and vegans may self-identify as vegetarian or vegan but occasionally eat meat, fish, or animal products (Rosenfeld et al., 2020). It would be interesting to measure dietary behaviour using observational measures or daily diary sampling in future research (e.g., using a food frequency survey) to investigate the associations between frequency of animal product consumption and perceptions of animals within each dietary group.

4.2. Implications and Conclusion

While previous research has shown the tendencies among some meat consumers to downplay the mental abilities to farmed land animals (Bastian et al., 2012) and to stay ignorant about food animal minds (Leach et al., 2022), the current study showed that pescatarians and vegetarians show a similar tendency towards those animals that comprise part of their diet (aquatic food animals and/or animals used for dairy and eggs). As such, perceptions of moral status and mental capacities of animals varied predictably between people as a function of their dietary group and whether the animal category is considered part of their diet or not. Those who consumed animal products tended to attribute moral status and mental abilities in a flexible and self-serving way, and thus to a lower extent to the animals associated with their consumption behaviour.

A greater understanding of people's perceptions of animals helps with identifying the psychological factors associated with animal product consumption and the cognitive barriers that might prevent people from reducing their animal product consumption. Despite the denial of food animal minds among animal product consumers, the high levels of moral concern and mind attribution among vegans may imply that effective reduction in meat, fish, egg, and dairy intake could be achieved by increasing awareness about food animal minds and increasing moral concern towards food animals.

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