PHAIR
Psychology of Human-Animal Intergroup Relations

PsychOpen GOLD

Empirical: Single or Multiple Studies

Meating of the Minds: Who Denies Animal Mind in Response to the Meat Paradox?

Nicholas P. Tan[1], Brock B. Bastian[2], Luke D. Smillie[2]

[1] *Department of Psychology, University of Zürich, Zürich, Switzerland.* **[2]** *Melbourne School of Psychological Sciences, University of Melbourne, Melbourne, Australia.*

Psychology of Human-Animal Intergroup Relations, 2024, Vol. 3, Article e13335, https://doi.org/10.5964/phair.13335

Received: 2023-11-29 • **Accepted:** 2024-08-09 • **Published (VoR):** 2024-09-25

Handling Editor: Steve Loughnan, University of Edinburgh, Edinburgh, United Kingdom

Corresponding Author: Nicholas P. Tan, Department of Psychology, University of Zürich, Zürich, Switzerland, E-mail: Nicholas.tan@psychologie.uzh.ch

Supplementary Materials: Code, Data, Materials, Preregistration [see Index of Supplementary Materials]

Abstract

Most people abhor animal cruelty but choose to eat meat. To resolve feelings of conflict associated with this so-called "meat paradox", meat-eaters appear to downplay the capacity of animals to think and feel. However, the strength of animal mind denial seems likely to vary between individuals—according to one's concern for animal welfare or enjoyment of meat, for instance. Across two pre-registered studies (S1: N = 355, S2: N = 251), we examined personality traits, attitudes, and beliefs that may predict the strength of animal mind denial in relation to the meat paradox. Results suggest that those lower in openness/intellect or emotion regulation ability, or higher in meat-commitment, deny animal mind more strongly when reminded of the link between meat eating and animal suffering. We discuss the degree to which these findings align with dissonance-based explanations for animal mind-denial in response to the meat-paradox.

Keywords

meat paradox, mind denial, personality, openness/intellect, emotion regulation, cognitive dissonance

People experience moral conflicts every day, and how they resolve these conflicts may help sustain their morally questionable behavior. Consider meat-eating: Most people care about animals and abhor animal cruelty, yet finance animal suffering by choosing to eat meat (Bastian & Loughnan, 2017). This mismatch of attitudes and behaviors has been aptly termed the "Meat Paradox". One common response to the meat paradox is to

deny the extent to which farmed animals have minds—that is, the capacity for thinking, feeling, or suffering (Rothgerber & Rosenfeld, 2021). By doing so, one dampens the perceived immorality of their behaviour, allowing them to continue to eat meat without feeling morally conflicted (Bastian & Loughnan, 2017).

Animal mind denial in response to the meat paradox has been explained in terms of cognitive dissonance reduction (Bastian et al., 2012). Because dissonance processes cannot be observed directly, evidence for this claim is necessarily indirect (Harmon-Jones et al., 2009). One potentially useful—though again indirect—means to evaluate this explanation is by examining differential responses to the meat paradox. Obviously not all individuals respond in the same way to conflict elicited by the meat paradox. For example, many people change their behaviour by becoming vegetarian or vegan, rather than changing their mind by denying the harms of meat-eating (Bastian & Loughnan, 2017). Even more continue eating meat but feel conflicted about doing so (Gendelman, 2017). Moreover, there are well-documented individual differences in the motives and concerns described by the meat paradox, such as concern for animal welfare, enjoyment of meat, and sensitivity to conflict and uncertainty (e.g., Hopwood et al., 2020; Jach & Smillie, 2019; Piazza et al., 2015). As noted by Rothgerber and Rosenfeld (2021), there has been no direct investigation of whether such individual differences predict differential responses to the meat paradox. Evidence for such differential effects could help corroborate the proposed mechanisms underlying responses to the meat paradox, while also revealing how personality shapes responses to common ethical quandaries. Thus, our aim in this research was to explore differential responses to the meat paradox in terms of predictors of animal mind denial.

Mind Perception, the Meat Paradox, and Animal Mind Denial

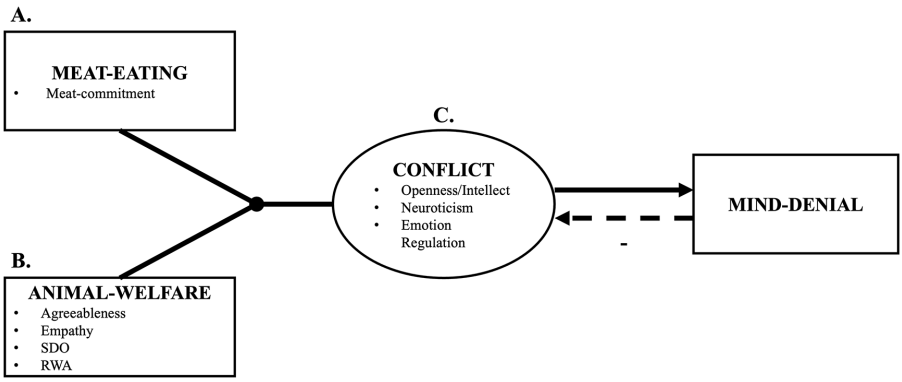
Mind perception is the ascription of mental capacities to others (e.g., joy, anger, suffering). As Gray and colleagues (2012) argue, the perception of mind for a single entity can vary across people and perceiving whether others have minds is crucial to being afforded moral status and the right to humane treatment. Indeed, there is evidence that perception of mind is used to justify the use of animals for their meat (Bastian et al., 2012). Thus, to understand our treatment of animals, one must understand how people come to ascribe (or deny) mental capacities to animals.

The denial of animal mind was first demonstrated in response to reminders of farmed animal suffering. For instance, Bastian and colleagues (2012) found that omnivorous participants attributed less mind to farmed animals described as being taken to be processed for meat, compared to animals described as grazing in a field. They also found that participants attributed less mind to such animals after (versus before) being asked to eat gourmet beef, and compared to participants asked to consume an apple. Extensions of this work have yielded broadly similar findings (Rothgerber & Rosenfeld, 2021).

Bastian and Loughnan's (2017) dissonance-based explanation for animal mind denial in these studies draws on the action-based model of cognitive dissonance. This holds that dissonance arises when a cognition interferes with effective action, thereby producing psychological discomfort. This discomfort then motivates dissonance reduction—i.e., shifts in one's cognitions to resolve the inconsistency. Accordingly, reminders of farmed-animal suffering are thought to elicit conflict between one's willingness to eat meat and one's self-concept of being a morally good person who does not harm others. One way to reduce this dissonance is to downplay the capacity for farmed-animals to suffer. It follows that the degree of dissonance elicited would be related to the importance of both animal welfare and meat-eating to the individual. This set of processes can thus be described in terms of three components: (a) the goal to continue eating meat, (b) the goal to not harm animals, and (c) the conflict between these two incompatible goals (see Figure 1). These components are depicted in Figure 1 as a *conceptual framework* to guide our theorizing around potential individual differences in the experience of the meat paradox. In the following sections, we identify individual differences constructs related to each of these three components and examine whether any predict differences in the strength of animal mind denial when reminded of the animal origins of meat. Evidence for theoretically coherent differential responses to the meat paradox would help corroborate the dissonance-based explanation for animal mind denial.

Figure 1

Conceptual Framework for the Meat Paradox, Animal Mind Denial, and Individual Difference Moderators



Note. The dotted line indicates that the act of mind denial reduces the conflict that motivates it; SDO = Social Dominance Orientation; RWA = Right-Wing Authoritarianism.

Candidate Predictors of Animal Mind Denial

To our knowledge, no previous research has examined individual differences in animal mind denial following reminders of framed animal suffering. Such constructs might

include those capturing attitudes and behaviours towards animals (Amiot & Bastian, 2017; Caviola et al., 2019), commitment to and justification of meat-eating (Piazza et al., 2015), and basic personality traits (i.e., domains, aspects, and/or facets of the Big Five; see DeYoung et al., 2007; Soto & John, 2017). Such variables might reflect an individual's motivation by the concerns summarised in Figure 1, and might therefore predict the strength of response to the meat paradox.

Differential Valuation of Meat-Eating

What individual differences might be associated with the desire to eat meat (Figure 1A)? Although our desire for meat is deeply ingrained, both culturally and biologically (Stanford & Bunn, 2001), people nevertheless vary in their commitment to and enjoyment of eating meat (Piazza et al., 2015). Individuals scoring high on such measures consume more meat and endorse more justifications for eating meat, such as claiming that meat is necessary for good health (Piazza et al., 2015). Such card-carrying carnivores may find it threatening to be reminded of farmed animal suffering, leading them to deny animal mind particularly strongly.

Differential Concern for Animal-Welfare

Meat-eating is thought to create psychological conflict because people typically like animals and don't want them to suffer (Figure 1B). However, because people also differ in their concern for animal welfare, some should experience more conflict than others when reminded of the animal origins of their food. Such relevant individual differences include solidarity with animals—the degree to which one feels close to and identifies with non-human animals (Amiot & Bastian, 2017)—and broader empathic tendencies described by trait agreeableness and its compassion aspect (DeYoung et al., 2007). We would thus expect people scoring higher on such measures to experience more conflict when reminded of farmed animal suffering, and therefore deny animal mind more strongly.

Two other potentially relevant constructs are Social Dominance Orientation (SDO) and Right-Wing Authoritarianism (RWA), which describe inter-group attitudes and beliefs. Specifically, SDO describes the endorsement of inequality between groups, whereas RWA describes the endorsement of tradition and authoritarian submission (Sibley & Duckitt, 2008). Although SDO and RWA are conceptualized in relation to human groups, they also capture attitudes toward non-human groups (Dhont et al., 2016). Indeed, individuals high on these traits hold more speciesist attitudes—i.e., they view animals as morally inferior to humans, and less worthy of our concern (Caviola et al., 2019). We might therefore expect such individuals to experience less conflict when reminded of farmed animal suffering, and thus deny animal mind less strongly.

Differential Sensitivity to Conflict

Finally, what traits might confer susceptibility to the conflict described within the dissonance account of the meat paradox (Figure 1C)? Interestingly, some basic personality traits are thought to reflect sensitivity to goal conflict. First, neuroticism—and especially its anxiety facet—is thought to arise from sensitivity to goal conflict and goal-related uncertainty (Corr et al., 2013). Thus, if animal mind denial is indeed a response to reduce conflict-related discomfort, individuals higher in neuroticism and anxiety might deny animal mind more strongly when reminded of the suffering required for meat consumption. Second, a key feature of openness/intellect is willingness to embrace uncertainty (DeYoung et al., 2007). Indeed, although openness/intellect and neuroticism are not strongly correlated, both predict tolerance of ambiguity and uncertainty—negatively for neuroticism, positively for openness/intellect (Jach & Smillie, 2019). Finally, because ambiguity and uncertainty are inherent features of goal conflict, we might also expect to observe stronger responses to the meat paradox in individuals who are less tolerant of ambiguity and uncertainty. In sum, individuals higher on neuroticism, lower on openness/intellect, or lower on ambiguity and uncertainty tolerance, might deny animal mind more strongly when reminded of the animal origins of meat.

The Present Research

To summarize, in the present research we aimed to explore differential responses to the meat paradox, in terms of several individual difference variables that might predict animal mind denial following reminders of farmed animal suffering. Across two studies, we first attempted to conceptually replicate the finding that the average omnivore denies animal mind when reminded of the suffering of farmed animals (Bastian et al., 2012)—this directional prediction was pre-registered (Tan et al., 2018). We then explored whether psychological characteristics related to: (a) the desire for meat (i.e., meat-commitment and enjoyment), (b) concern for animal welfare (i.e., solidarity with animals, agreeableness, compassion, empathy, RWA, and SDO), and (c) sensitivity to conflict (neuroticism, openness/intellect, anxiety, and ambiguity tolerance), predict the strength of animal mind denial. Additional exploratory analyses noted in our pre-registration are reported in the supplementary materials.

Study 1

Method

Participants

We recruited N = 355 self-identified omnivores aged 19–72 (M = 36.4, SD = 11.0; 39.7% female; US residents) through Amazon's Mechanical Turk (MTurk). We preregistered a sample size target of N = 350, which provided > 90% power to detect an effect size of r

= .20 (see Supplement B in Tan et al., 2024, for full details of this analysis). Participants were reimbursed USD$4 contingent on passing two attention checks embedded in the questionnaires described below, which requested participants to respond "Agree" and "Somewhat Disagree" (participants received USD$3 if they missed the attention checks). Twenty-one participants failed one or more of the attention checks, and 18 were deemed to have suspicious survey completion times (defined as < 927 seconds, i.e., faster than the lead author could complete the survey without reading any questions). The final sample size was $N = 311$, which a sensitivity analysis for our largest moderation model indicated gave 80% power to detect an effect size of $r = .20$ (see Supplement B for full details of this analysis and Supplemental Table S1 for full demographics, both in Tan et al., 2024). As pre-registered, data including and excluding these participants were analyzed and the results including these participants is reported in Supplemental Tables S6 to S8, Tan et al. (2024).

Individual Differences Measures

Measures of meat-commitment and enjoyment, solidarity with animals, agreeableness, empathy, SDO, RWA, neuroticism, openness/intellect, anxiety, and ambiguity tolerance are summarized in Supplementary Table S2, Tan et al. (2024). Each measure was scored as the standardized mean response to each scale item. Because there were two measures for the Big Five domains, we estimated a single domain as a latent variable each indicated by the relevant BFAS and BFI-2 items of each domain. All measures had satisfactory internal consistency as measured by McDonald's Omega.

Meat Paradox Conflict and Responses

To make meat-eating salient, participants were asked to select from a list of meat-based dishes one to prepare and consume in the next week. Images portraying each dish were sourced from the *Food Pics* Database (Blechert et al., 2014). To make these choices meaningful, we advised that two randomly selected participants would be sent the recipe for their chosen meal and reimbursed for the cost of the ingredients and preparation time.

Next, participants were assigned to one of two conditions of the procedure used to elicit meat paradox conflict through reminders of farmed animal suffering. Each condition involved viewing an image of either a cow or pig with an accompanying text description. In the *Harm-absent* condition the cow/pig was described as standing in a field with other farm animals, whereas in the *Harm-present* condition the animal was described as experiencing harm by being processed for human consumption (all stimuli appear in Supplement A, Tan et al., 2024). After viewing the stimuli for their assigned condition, participants completed a mind attribution measure. They subsequently viewed the stimuli for the alternative condition, and again completed the mind attribution measure followed by a negative affect scale[1].

The animal mind attribution scale adapted from Bastian and colleagues (2012) comprised 18 mental capacities (e.g., pain, imagination, joy, etc.) on which participants rated the animal just viewed (1 = *Definitely does not possess,* 7 = *Definitely does possess*; Harm-absent: ω_t = .96, Harm-present: ω_t = .98). The negative affect scale (from the Positive and Negative Affect Scales; Watson et al., 1988) comprised 10 negative affective terms (e.g., guilty, upset) that participants rated as descriptors of their current state (1 = *Very slightly or not at all,* 5 = *Extremely;* ω_t = .95).

Procedure

All questionnaires and tasks were administered in *Qualtrics*™. Following some demographic questions, participants completed measures of RWA, SDO, empathy, solidarity with animals, and meat-commitment (randomized order). They next completed the first of the two conditions of the meat paradox conflict task, after which they completed measures of anxiety, ambiguity tolerance, and the Big Five personality traits (randomized). Finally, they completed the second condition of the meat paradox conflict tasks.

Data Analyses

All tests assumed a statistical significance threshold of α = .05. Due to the exploratory nature of this study and in the interest of brevity, only significant findings are reported in text (full results appear in Table 1). Bonferroni corrections for multiple comparisons are made, but these were not applied to our exploratory analysis as this would inflate our Type II error rate (Althouse, 2016). Because of this, we regard all significant findings as preliminary, pending replication in our second study.

1) Bastian and colleagues (2012) reported a negative correlation between mind denial and negative affect, suggesting that the former may alleviate the latter. We sought to replicate this effect, but this was mistakenly omitted from our pre-registration, and thus should be considered exploratory.

Table 1

Study 1 Repeated Measures Analysis of Covariance Results

	Main Effects						Interaction Effects					
Variable	df_{Num}	df_{Den}	***F***	***p***	η_p^2	***VIF***	df_{Num}	df_{Den}	***F***	***p***	η_p^2	***VIF***
Conflict Component												
Openness/Intellect	1	307	24.14	< .001	.07	2.03	1	307	5.18	.024	.02	2.03
Openness	1	310	12.84	< .001	.04	1.62	1	310	0.43	.512	.001	1.62
Intellect	1	310	0.28	.595	.001	1.62	1	310	5.23	.023	.02	1.62
Intellectual Curiosity	1	309	1.54	.215	.01	2.50	1	309	1.16	.282	.004	2.50
Aesthetic Sensitivity	1	309	4.76	.030	.02	2.49	1	309	0.53	.467	.002	2.49
Creative Imagination	1	309	0.43	.511	.001	2.56	1	309	1.08	.300	.003	2.56
Neuroticism	1	307	0.40	.528	.001	2.19	1	307	3.00	.084	.01	2.19
Volatility	1	310	5.74	.017	.02	3.00	1	310	0.75	.387	.002	3.00
Withdrawal	1	310	3.98	.047	.01	3.00	1	310	0.01	.916	< .001	3.00
Anxiety	1	309	2.21	.138	.01	3.67	1	309	2.14	.144	.01	3.67
Depression	1	309	< .001	.987	< .001	3.34	1	309	0.50	.480	.002	3.34
Emotional Volatility	1	309	5.81	.017	.02	2.63	1	309	5.73	.017	.02	2.63
Ambiguity Tolerance	1	311	1.83	.177	.01	1.23	1	311	0.17	.679	.001	1.23
BIS-Anxiety	1	311	3.90	.049	.01	1.24	1	311	0.02	.875	< .001	1.24
Animal Welfare Component												
Agreeableness	1	307	0.38	.536	.001	2.16	1	307	1.79	.182	.01	2.16
Compassion (aspect-level)	1	310	3.11	.079	.01	1.80	1	310	2.98	.085	.01	1.80
Politeness	1	310	0.03	.866	< .001	1.80	1	310	0.77	.381	.002	1.80
Compassion (facet-level)	1	309	3.74	.054	.01	2.21	1	309	0.10	.749	< .001	2.21
Respectfulness	1	309	1.46	.228	.01	1.98	1	309	0.06	.812	< .001	1.98

Psychology of Human-Animal Intergroup Relations
2024, Vol. 3, Article e13335
https://doi.org/10.5964/phair.13335

Variable	Main Effects						Interaction Effects					
	df_{Num}	df_{Den}	F	p	η_p^2	VIF	df_{Num}	df_{Den}	F	p	η_p^2	VIF
Trust	1	309	2.50	.115	.01	2.03	1	309	0.54	.462	.002	2.03
SDO	1	311	12.99	< .001	.04	1.24	1	311	0.20	.654	.001	1.24
Dominance	1	310	8.22	.004	.03	3.27	1	310	4.07	.045	.01	3.27
Anti-Egalitarianism	1	310	0.23	.635	.001	3.27	1	310	5.16	.024	.02	3.27
RWA	1	311	37.23	< .001	.11	1.26	1	311	0.75	.386	.002	1.26
Conservatism	1	309	10.86	.001	.03	4.40	1	309	5.42	.021	.02	4.40
Traditionalism	1	309	0.61	.437	.002	2.56	1	309	5.92	.016	.02	2.56
Authoritarianism	1	309	0.86	.356	.003	3.58	1	309	0.01	.924	< .001	3.58
Animal-Identification (SwAS)	1	311	27.68	< .001	.08	1.25	1	311	0.23	.632	.001	1.25
Empathy (QCAE)	1	311	5.44	.020	.02	1.24	1	311	2.00	.158	.01	1.24
Cognitive Empathy	1	310	0.80	.372	.003	1.68	1	310	1.86	.174	.01	1.68
Affective Empathy	1	310	4.25	.040	.01	1.68	1	310	0.31	.581	.001	1.68
Animal Empathy	1	311	19.30	< .001	.06	1.25	1	311	0.62	.430	.002	1.25
Meat-Eating Component												
Meat-Commitment	1	311	11.41	< .001	.04	1.24	1	311	1.51	.220	.01	1.24
Nice	1	311	20.62	< .001	.06	1.25	1	311	2.14	.067	.01	1.25

Note. VIF = Variance Inflation Factor (all values are below 5, indicating low multicollinearity); BIS-Anxiety = Behavioral Inhibition System account of anxiety; SwAs = Solidarity with Animals Scale; QCAE = Questionnaire of Cognitive and Affective Empathy.

Results and Discussion

Descriptive statistics are summarized in Supplementary Tables S3 to S5, Tan et al. (2024). We found no significant differences between seeing a cow or a pig in either the Harm-absent or the Harm-present conditions (see Supplement B, Tan et al., 2024, for full analysis). Thus, ratings for cows/pigs were collapsed within conditions for remaining analyses. There were also no order effects (see Supplement B, Tan et al., 2024, for further details).

Replicating Effects on Mind Denial and Negative Affect

Animal Mind Denial — To test our hypothesis that participants would deny animal mind following reminders of farmed animal suffering, we ran a paired samples *t*-test examining differences in mind attributions between the Harm-absent and Harm-present conditions. This revealed a significant decrease in mind attributions from the Harm-absent condition (M = 4.84, SD = 1.14), to the Harm-present condition (M = 4.64, SD = 1.44), $t(312) = 3.13$, $p = .002$, $d = 0.15$, replicating Bastian and colleagues' (2012) results.

Negative Affect — To explore whether negative affect was associated with mind denial, we computed a mind denial score by subtracting mind attributions in the Harm-absent condition from the Harm-present condition (the mind denial score had satisfactory reliability $\omega_t = .94$). To ensure comparability with results from Bastian and colleagues (2012), who did not counterbalance the presentation of the meat paradox stimuli, we report the correlation only for participants who saw the Harm-absent condition first (as was the case for all participants in their study). Unexpectedly, the association between mind denial and negative affect was not significant, $r = .14$, $p = .068$[2].

Exploring Effects of Personality on Mind Denial

As shown in Table 1, we employed a series of repeated measures Analysis of Covariance (rmANCOVA) to explore the effects of personality on animal mind denial. Each model predicted participants mind attribution scores from a two-level Harm-intensity factor (Harm-absent vs. Harm-present), a personality trait, and the interaction between the two. To assess unique effects of personality traits on mind attributions, the Big Five domains were entered into one model, and a separate model was specified for each pair of aspects (e.g., volatility, withdrawal), and each trio of facets (e.g., anxiety, depression, emotional volatility). We took this same approach for other multi-scale measures, where the total scale (e.g., SDO) was tested in models separate to their sub-scales (e.g., dominance and anti-egalitarianism). This approach enabled us to clearly distinguish between the unique and common variance of hierarchically nested traits. Conversely, the model for the 4Ns

2) This correlation remained non-significant when assessing the participants who saw the Harm-present condition first and when collapsing across both order conditions.

only included the Nice subscale, as factor analyses show that the 4Ns subscales are not particularly distinct and including all within a single model could create issues with multicollinearity (Piazza et al., 2015). Finally, the interaction between the Harm-intensity factor and each trait predictor served to test whether any candidate traits moderated effects of Harm-intensity on mind denial.

Conflict Component — Of the measures we hypothesized to relate to the conflict component of Figure 1: For neuroticism, there were main effects of the aspect traits volatility and withdrawal, and the facet trait emotional volatility. Partial correlations showed that lower volatility (controlling for withdrawal) r = -.13, p = .017, and emotional volatility (controlling for anxiety and depression), r = -.14, p = .017, were associated with higher mind attributions. In contrast, higher withdrawal (controlling for volatility) was associated with lower mind attributions, r = .11, p = .047. There was also a marginally significant effect of BIS-anxiety suggesting a weak positive relation between BIS-anxiety and mind attributions, r = .11, p = .049.

For openness/intellect, there was a significant domain level main effect along with effects of the openness aspect and the aesthetic sensitivity facet. Partial correlations revealed that higher openness/intellect (controlling for remaining Big Five domains) was associated with higher mind attributions, r = .27, p < .001, as was openness (controlling for intellect), r = .23, p < .001, and aesthetic sensitivity (controlling for creative imagination and intellectual curiosity), r = .12, p = .03.

There were also significant interaction effects between Harm-intensity and openness/intellect, intellect, and emotional volatility, suggesting that these traits predicted the strength of animal mind denial. Follow-up simple slopes analyses depicted in Table 2 show the effect of Harm-intensity was significant at both low and mean levels of the openness/intellect domain and its intellect aspect, but not at high levels of these traits (Figure 2A and 2B). Conversely, the effect of Harm-intensity was significant at mean levels and high levels of emotional volatility, but not at low levels (Figure 2C). Remaining effects were not significant (see Table 1).

Table 2

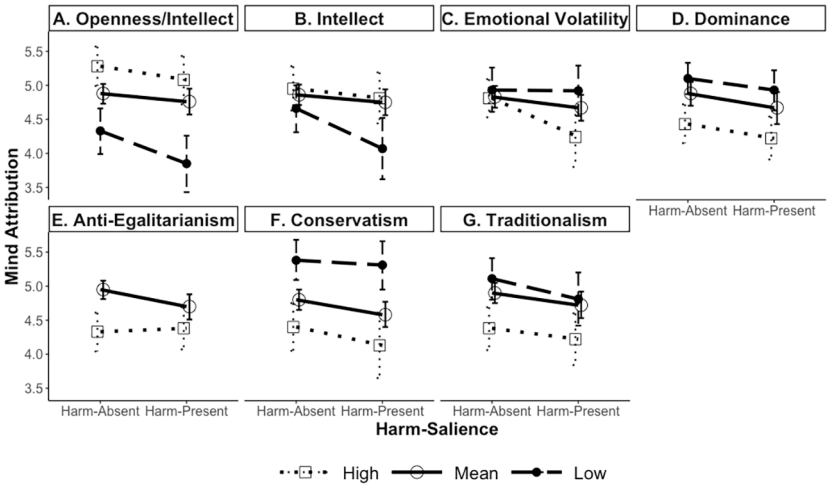
Simple Slopes Analysis for Significant Trait Moderators of Harm-Intensity in Study 1

	Effect of Harm-Intensity		
Trait Moderator	**+1 *SD***	***M***	**-1 *SD***
Openness/Intellect	-.01 (.04)	-.08** (.02)	-.15*** (.04)
Intellect	-.01 (.04)	-.08** (.02)	-.14*** (.04)
Emotional Volatility	-.16*** (.04)	-.08** (.03)	.01 (.04)
Dominance	-.16** (.05)	-.08** (.02)	.003 (.05)
Conservatism	-.18*** (.05)	-.08** (.02)	.03 (.05)
Anti-Egalitarianism	.01 (.05)	-.08** (.02)	-.17*** (.05)
Traditionalism	.01 (.04)	-.08** (.02)	-.16*** (.04)

Note. Each standardized effect reflects the Harm-intensity manipulation on animal mind denial at the indicated levels of each trait. Standard errors are reported in parentheses.
*p < .05. **p < .01. ***p < .001.

Figure 2

Effect of Harm-Intensity on Mind Attributions for Significant Moderating Traits (Study 1)



Note. For all traits, 'High' = +1 *SD* and 'Low' = -1 *SD*; Error bars represent 95% confidence intervals (with positions are jittered for clarity). There were no participants who scored low on anti-egalitarianism (i.e., *SD* = 1.54, Min = 1).

Animal-Welfare Component — Next, we found significant main effects of animal-empathy, SwAS, affective-empathy, SDO, dominance, RWA, and conservatism. Correlations revealed that animal-empathy, r = .24, p < .001, and SwAS, r = .29, p < .001, were associated with higher mind attributions, whereas SDO, r = -.20, p < .001, and RWA,

r = -.33, p < .001, were associated with lower mind attributions. Moreover, partial correlations showed that affective empathy (controlling for cognitive empathy), r = .12, p = .04, was associated with higher mind attributions, whereas dominance (controlling for anti-egalitarianism), r = -.16, p = .004, and conservatism (controlling for traditionalism and authoritarianism), r = -.18, p = .001, were associated with lower mind attributions.

There were also significant interactions between Harm-intensity and the SDO facets dominance and anti-egalitarianism, and the RWA facets conservatism and traditionalism. According to the simple slopes analyses reported in Table 2, the effect of Harm-intensity was significant at mean and high levels of dominance and conservatism, but not at low levels (see Figure 2D and 2E). In contrast, for both anti-egalitarianism and traditionalism, the effect of Harm-intensity was significant at mean and low levels, but not at high levels (see Figure 2F and 2G). Remaining effects were not significant (see Table 1).

Meat-Eating Component — Finally, there were significant main effects of meat-commitment and Nice rationalizations: Lower mind attributions were correlated with lower meat-commitment, r = -.19, p < .001, and lower Nice rationalizations, r = -.25, p < .001. Remaining effects were not significant (see Table 1).

Summary

Results supported our pre-registered hypothesis that participants would deny animal mind after a reminder of farmed animal suffering, conceptually replicating findings by Bastian and colleagues (Bastian et al., 2012). We did not replicate the positive association they reported between mind denial and reduced negative affect, although this non-significant correlation was nevertheless in the expected direction.

We also identified several individual difference predictors of the strength of animal mind denial. First, those lower on openness/intellect and intellect, or higher on emotional volatility, denied animal mind to a greater extent after viewing the Harm-present (vs. Harm-absent) stimulus. Given established links between these traits and conflict sensitivity, this finding aligns with the interpretation of animal mind denial as a response to conflict induced by the meat paradox. Second, those higher on SDO dominance and RWA conservatism denied animal mind more strongly whilst those higher on SDO anti-egalitarianism and RWA traditionalism denied animal mind less strongly. Given links that SDO and RWA have with speciesist attitudes, the effects for anti-egalitarianism and traditionalism are consistent with the view that animal mind denial stems from one's concern for animal welfare. However, the effects for dominance and conservatism are opposite to what we might expect—as those who we would expect to experience *less* conflict denied animal mind *more*. Again, we regard these exploratory findings as preliminary, pending a successful replication in Study 2.

Study 2

In Study 2 we sought to replicate key findings from Study 1 and explore additional variables that may provide a more complete picture of differential responses to the meat paradox. Specifically, in addition to earlier arguments, we considered that moderating effects of intellect and emotional volatility on mind denial might also be understood in terms of individual differences in cognitive and emotional resources (Kanfer & Ackerman, 1989). That is, the conflict elicited by a reminder of the animal suffering required for one's food might impose a cognitive or emotional "load" that may be easier for some individuals to manage or regulate (i.e., those higher on intellect or lower on emotional volatility). We thus included additional measures relating to cognitive and emotional capacities—measures of working memory capacity, emotion regulation, and thinking styles—as additional candidate predictors of mind denial in Study 2.

We also sought to align our study more closely with Bastian and colleagues' (2012) design by varying the magnitude of animal harm. Specifically, we added a second 'moderate intensity' condition in which the reminder of farmed animal harm was elicited by text only. Finally, we modified the task instructions to ensure that attributions of mind pertained to the animal category rather than the individual animal (e.g., "cows", rather than "this cow"). This is because our focus concerns how people perceive animals more generally rather than an individual animal.

For Study 2, we hypothesized that: (1) participants would attribute less mind to animals when reminded that they must suffer to produce meat, regardless of the degree of harm portrayed (i.e., we expected that both the moderate and high intensity harm conditions would elicit mind denial, as reported by Bastian and colleagues (2012), (2) higher scorers on emotional volatility would deny mind to a greater extent (as in Study 1), and (3) low scorers on intellect would deny animals mind to a greater extent (as in Study 1). We described all remaining analysis as exploratory. As for Study 1, both our directional hypotheses and exploratory research questions were pre-registered (Tan et al., 2019).

Method

Participants

We recruited 251 American self-identified omnivores aged 20–71 (M = 37.3, SD = 11.5, 44.22% female) through MTurk. Participants were reimbursed $4USD, plus a $1USD bonus contingent on passing two attention checks similar to those in Study 1. Four participants failed one or more of the attention checks and 15 were deemed to have implausible completion times (< 900 seconds, determined using the method described in Study 1) and careless responding (Yentes & Wilhelm, 2018). The final sample size was N = 232, which a sensitivity analysis for our largest moderation model indicated gave 80% power to detect an effect size of r = .23 (see Tan et al., 2024, Supplement C for full details

of this analysis and Supplemental Table S1 for full demographics). Again, data including and excluding these participants were analyzed and analysis including these participants appears in Tan et al. (2024), Supplementary Tables S16 to S18.

Individual Differences Measures

We intended to also measure RWA as we had done in Study 1 but the traditionalism facet was accidentally omitted. Moreover, to manage participant burden and budgetary constraints, not all the measures and subscales in Study 1 were administered in Study 2. The measures of openness/intellect, agreeableness, neuroticism, SDO, conservatism, ambiguity tolerance, meat-commitment, working memory, emotion regulation, and thinking styles are summarized in Supplementary Table S2, Tan et al. (2024). These measures were scored as the standardized mean response to each scale item. We again estimated each Big Five domain as a latent variable comprised of the relevant BFAS and BFI-2 items for each domain. All measures were had satisfactory internal consistency as measured by McDonald's omega.

Meat Paradox Conflict and Responses

As in Study 1, we asked participants to select a meal to prepare and consume in the next week from a list of meat-based dishes. They were told that a randomly selected few (n = 2) would be reimbursed for the cost of the ingredients and their time to prepare the dish.

Next, participants viewed the stimuli for the Harm-absent condition described in Study 1 (again the image was randomly determined to be either a cow or pig; ω_t = .95). They then completed a mind attribution measure along with their negative affect. In contrast to Study 1, participants were then assigned to one of two conditions varying the magnitude of animal harm portrayed. Those assigned to the *Moderate-harm* condition viewed the same image used in the Harm-absent condition in Study 1 (i.e., a cow/pig standing in a field), but with accompanying text stating that the animal was about to be slaughtered and processed for meat. Those assigned to the *High-harm* condition viewed the same stimuli used in the Study 1 Harm-present condition (i.e., a cow/pig being slaughtered; see Tan et al., 2024, Supplement A for stimuli). After viewing the stimuli for their assigned condition, participants completed a measure of mind attribution and negative affect.

The same measure of animal mind attribution as Study 1 was used with the exception that participants were instructed to rate the extent that '*cows*'/'*pigs*' (rather than '*this animal*') possessed various mental capacities. The negative affect scale (from the 12-point Affect Circumplex scale; Yik et al., 2011) comprised 10 negative affective terms corresponding to displeasure (e.g., distressed) and unpleasantness (e.g., jittery) that participants rated on a 5-point scale ranging from 1 (Not at all) to 5 (Extremely). This measure had satisfactory internal consistency (ω_t = .95).

Procedure

All questionnaires and tasks were administered in *Qualtrics*™. Following some demographic questions, participants completed measures of Big Five traits, SDO, uncertainty intolerance, and meat commitment (randomized order). They next completed the Harm-absent condition, followed by measures of emotion regulation use and ability, conservatism, working memory, thinking styles, and ambiguity tolerance (randomized order). Finally, they completed either the Moderate- or High-harm condition.

Data Analysis

The same statistical analysis from Study 1 were again deployed in Study 2.

Results and Discussion

Descriptive statistics for animal mind attributions are summarized in Tan et al. (2024), Supplementary Tables S13 to S15. We found no significant differences between seeing a cow or a pig in either the Harm-absent, Moderate-harm, or the High-harm conditions (see Tan et al., 2024, Supplement C for full analysis). Thus, ratings for cows/pigs were collapsed within-condition for remaining analyses.

Replicating Effects on Mind Denial and Negative Affect

Animal Mind Denial — To test our hypothesis that participants would deny animal mind after being reminded of farmed animal suffering, we ran paired-samples *t*-tests. These revealed a significant decrease in mind attributions from the Harm-absent (M = 4.94, SD = 1.08) to the High-harm condition (M = 4.76, SD = 1.27), $t(116) = 2.13$, p = .03, d = 0.16, but not from the Harm-absent (M = 5.01, SD = .97) to the Moderate-harm condition (M = 4.97, SD = 1.08), $t(114) = 1.00$, p = .32, d = 0.04. Thus, participants only denied animal mind in response to reminders that portrayed a high degree of farmed animal suffering.

Conversely, an independent sample *t*-test of mind denial scores—i.e., the difference in mind attributions between Harm-absent and High/Moderate-harm (ω_t = .89)—between those in the High-harm and Moderate-harm conditions revealed no significant differences, $t(230) = 1.44$, p = .15, d = 0.19. We therefore collapsed across both conditions (as pre-registered) and henceforth refer to this as the *Harm-present condition*. A paired-sample *t*-test indicated that there was a significant decrease in mind attributions from the Harm-absent (M = 4.98, SD = 1.02) to the (collapsed) Harm-present condition (M = 4.86, SD = 1.19), $t(231) = 2.35$, p = .02, d = 0.11 (Alternate analyses that do not collapse the Harm-absent and High-harm conditions are reported in Tan et al., 2024, Supplement C).

Negative Affect — Next, to examine the association between mind denial and negative affect reduction, we computed a difference score subtracting negative affect before viewing the Harm-present stimuli from negative affect after viewing these stimuli. In contrast

to Study 1, the correlation between mind denial and negative affect was significant, r = .20, p = .002, matching prior findings by Bastian et al. (2012).

Exploring Effects of Personality on Mind-Denial

To test our hypothesis that intellect and emotional volatility would moderate the effect of Harm-intensity on mind attributions and explore the effects of our other individual differences measures, we again employed a series of rmANCOVAs. Full results appear in Table 3.

Conflict Component — Similar to results from Study 1, there were significant main effects of domain-level openness/intellect and aspect-level openness. Partial correlations showed that higher openness/intellect (controlling for remaining Big Five domains), r = .18, p = .007, and higher openness (controlling for intellect), r = .18, p = .005, were associated with higher mind attributions. Among the variables added to Study 2, there were significant main effects of ambiguity tolerance, working memory, emotion regulation ability, Need for Cognition, and suppression use. Correlations revealed that higher ambiguity tolerance, r = .16, p = .018, working memory, r = .17, p = .012, emotion regulation ability, r = .22, p < .001, and Need for Cognition, r = .19, p = .004 were all associated with higher mind attributions. In contrast, partial correlations indicated that higher suppression use (controlling for rumination, relaxation, reappraisal, distraction, and engagement) was associated with lower mind attributions, r = -.14, p = .033.

Against our pre-registered hypotheses, there was no significant interaction between Harm-intensity and either emotional volatility or intellect. Thus, we failed to directly replicate key findings of Study 1. Interestingly, however, our exploratory analysis revealed that there were significant interaction effects between Harm-intensity and both the openness aspect and emotion regulation ability. We probed these interactions further through simple slopes analysis (see Table 4). For both openness and emotion regulation ability, the effect of Harm-intensity was significant at mean and low levels, but not at high levels (Figure 3A and 3B). Remaining effects were not significant (see Table 3).

Animal-Welfare Component — Similar to Study 1, there was a significant main effect of RWA conservatism. Correlations indicated that higher conservatism was associated with lower mind attributions, r = -.17, p = .011. In contrast to Study 1, there was a significant main effect of the compassion aspect. Partial correlations revealed that higher compassion (controlling for politeness), r = .18, p = .005, was associated with higher mind attributions. Remaining effects were not significant (see Table 3).

Table 3

Study 2 Repeated Measures Analysis of Covariance Results

	Main Effects						Interaction Effects					
Variable	df_{Num}	df_{Den}	***F***	***p***	η_p^2	***VIF***	df_{Num}	df_{Den}	***F***	***p***	η_p^2	***VIF***
Conflict Component												
Openness/Intellect	1	226	7.35	.007	.03	1.70	1	226	2.67	.104	.01	1.70
Openness	1	229	7.94	.005	.03	1.44	1	229	5.94	.016	.03	1.44
Intellect	1	229	3.14	.078	.01	1.44	1	229	0.67	.413	.003	1.44
Intellectual Curiosity	1	228	3.96	.047	.02	2.37	1	228	0.46	.496	.002	2.37
Aesthetic Sensitivity	1	228	0.04	.836	< .001	2.00	1	228	0.12	.731	.001	2.00
Creative Imagination	1	228	0.74	.391	.003	1.86	1	228	0.89	.348	.004	1.86
Neuroticism	1	226	0.27	.605	.001	1.93	1	226	1.06	.303	.005	1.93
Volatility	1	229	0.01	.941	< .001	2.73	1	229	0.31	.578	.001	2.73
Withdrawal	1	229	0.01	.944	< .001	2.73	1	229	0.24	.628	.001	2.73
Anxiety	1	228	2.84	.093	.01	3.44	1	228	0.57	.451	.002	3.44
Depression	1	228	2.09	.150	.009	2.80	1	228	3.16	.077	.01	2.80
Emotional Volatility	1	228	0.27	.605	.001	2.62	1	228	0.30	.584	.001	2.62
Ambiguity Tolerance	1	230	5.65	.018	.02	1.14	1	230	0.71	.399	.003	1.14
Uncertainty Intolerance	1	230	3.79	.053	.02	1.13	1	230	0.69	.407	.003	1.13
ER-Ability	1	230	11.60	< .001	.05	1.14	1	230	4.27	.040	.02	1.14
Working Memory	1	230	6.46	.012	.03	1.14	1	230	2.50	.115	.01	1.14
Faith in Intuition	1	230	0.75	.387	.003	1.13	1	230	1.00	.320	.004	1.13
Need for Cognition	1	230	8.54	.004	.04	1.14	1	230	2.38	.124	.01	1.14
Rumination	1	225	0.07	.791	< .001	1.52	1	225	1.25	.264	.006	1.52
Distraction	1	225	0.37	.546	.002	1.42	1	225	1.58	.210	.007	1.42
Reappraisal	1	225	0.41	.520	.002	1.43	1	225	1.66	.199	.007	1.43

Psychology of Human-Animal Intergroup Relations
2024, Vol. 3, Article e13335
https://doi.org/10.5964/phair.13335

Variable	Main Effects						Interaction Effects					
	df_{Num}	df_{Den}	F	p	η_p^2	VIF	df_{Num}	df_{Den}	F	p	η_p^2	VIF
Engagement	1	225	0.12	.730	< .001	1.61	1	225	1.95	.164	.009	1.61
Suppression	1	225	4.62	.033	.02	1.74	1	225	2.65	.105	.01	1.74
Relaxation	1	225	1.30	.255	.006	1.62	1	225	0.72	.396	.003	1.62
Animal-Welfare Component												
Agreeableness	1	226	3.88	.049	.02	1.58	1	226	0.90	.343	.004	1.58
Compassion (aspect-level)	1	229	7.87	.005	.03	1.64	1	229	0.63	.428	.003	1.64
Politeness	1	229	0.12	.726	.001	1,64	1	229	1.03	.312	.004	1.64
SDO	1	230	3.82	.052	.02	1.13	1	230	1.43	.233	.01	1.13
Dominance	1	229	2.29	.131	.01	3.63	1	229	1.75	.187	.01	3.63
Anti-Egalitarianism	1	229	0.13	.720	.001	3.63	1	229	0.38	.540	.002	3.63
Conservatism	1	230	6.64	.011	.03	1.14	1	230	1.47	.227	.006	1.14
Meat-Eating Component												
Meat-Commitment	1	230	6.86	.009	.03	1.13	1	230	6.00	.015	.03	1.13

Note. VIF = Variance Inflation Factor (all values are below 5, indicating low multicollinearity); ER-Ability = Emotion Regulation Ability; SDO = Social Dominance Orientation.

Table 4

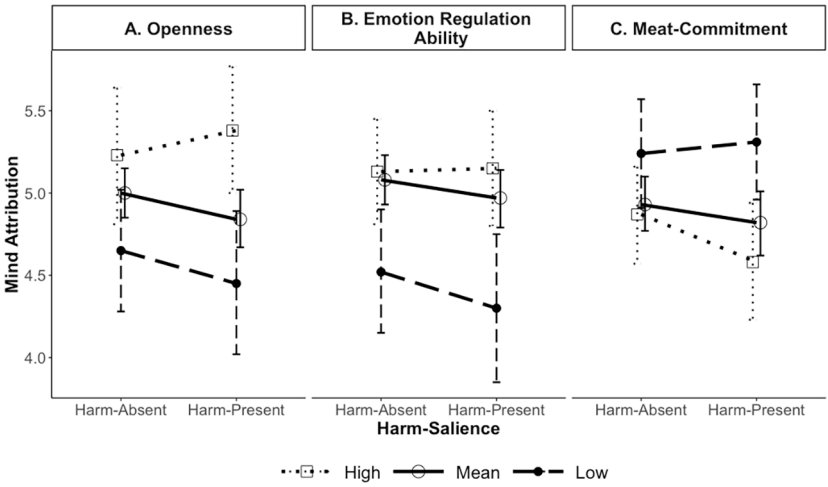
Study 2 Simple Slopes Analysis for Significant Trait Moderators of Harm-Intensity

Trait	+1 *SD*	Mean	-1 *SD*
Openness	.01 (.03)	-.05* (.02)	-.11** (.03)
Emotion Regulation Ability	-.01 (.03)	-.05* (.02)	-.10** (.03)
Meat-Commitment	-.11** (.03)	-.05* (.02)	.002 (.03)

Note. Each standardized effect reflects the harm intensity manipulation on animal mind denial at the indicated levels of each trait; Standard errors are reported in parentheses.
*p < .05. **p < .01. ***p < .001.

Figure 3

Effect of Harm-Intensity on Mind Attributions for Significant Moderating Traits (Study 2)



Note. Levels of openness, emotion regulation ability, and meat-commitment are defined as High (+1 *SD*), at the mean, and Low (-1 *SD*). Error bars represent 95% confidence intervals and their positions are jittered for clarity.

Meat-Eating Component — Similar to Study 1, there was a significant main effect of meat-commitment. Correlations indicated that lower meat-commitment was associated with higher mind attributions, r = -.17, p = .009. In contrast to Study 1, there was also a significant interaction between meat-commitment and Harm-intensity. As reported in Table 4, the effect of Harm-intensity was significant at mean and at high levels of meat-commitment, but not at low levels (see Figure 3C).

Summary

Results partially supported our pre-registered hypothesis that participants would attribute significantly less mind to animals after being reminded of farmed animal suffering,

regardless of the Harm-intensity portrayed (as found by Bastian et al., 2012). Specifically, describing animals as being processed for meat consumption led to significantly less attributions of mind, but only when the accompanying image depicted harm to the animal. In contrast to Study 1, but consistent with Bastian and colleagues (2012), we found that mind denial was associated with significantly lower negative affect.

Concerning the predictors of animal mind denial, results of Study 2 were somewhat mixed. Against predictions, neither intellect nor emotional volatility predicted strength of mind denial. Nevertheless, exploratory analysis revealed that openness predicted less animal mind denial, again suggesting that traits within the openness/intellect domain predicted the strength of animal mind denial. We also found that emotion regulation ability predicted less animal mind denial, which resembles our finding in Study 1 concerning emotional volatility (e.g., of all the Big Five domains, neuroticism is most related to emotion regulation ability; Hughes et al., 2020). Indeed, our decision to assess emotion regulation ability was predicated on the significant effect of emotional volatility in Study 1. Thus, these exploratory findings and the direction of their effects broadly match our expectations for Study 2, despite failing to directly replicate the specific findings of Study 1. Additionally, but again contrary to Study 1, we found that meat-commitment predicted stronger denial of animal mind. Overall, these patterns of differential effects identified in Study 2 appear consistent with the idea that mind denial is a response to conflict elicited by the meat paradox. Surprisingly, none of the measures concerning sensitivity to animal-welfare moderated animal mind denial—SDO was a significant moderator when analyzing those in the high-harm condition (see Supplement C, Tan et al., 2024). This includes the SDO traits dominance and anti-egalitarianism and the RWA trait conservatism, all of which moderated mind denial in Study 1.

General Discussion

Most people abhor cruelty to animals but choose to eat meat, a contradiction in motives and actions dubbed the "meat paradox" (Bastian & Loughnan, 2017). Reminders of this contradiction are thought to create experiences of psychological conflict, which can be reduced by downplaying the mental capacities of animals (Bastian et al., 2012). Across two studies, we sought to replicate the effects of such reminders on animal mind denial reported by Bastian and colleagues (2012), and examine whether various theoretically relevant individual differences predict the strength of animal mind denial. Both studies supported our pre-registered hypothesis that reminders of animal origin suffering would result in mind denial, at least when using stronger portrayals of animal harm. We also replicated Bastian and colleagues' (2012) finding that mind denial was associated with decreases in negative affect, although this association was significant only in Study 2. Finally, we observed inconsistent yet theoretically interpretable effects of personality traits and other individual differences on the strength of mind denial. These effects were

mostly consistent with the cognitive dissonance account of the meat paradox (Bastian & Loughnan, 2017).

Effects of Harm-Intensity on Animal Mind Denial

Our findings offer the first pre-registered conceptual replications of the effects of meat-paradox conflict on animal mind denial. Because our stimuli and design differed in some respects to that of previous studies (i.e., counterbalancing the reminder of animal suffering in Study 1; including new stimuli for our High-harm condition; collecting data online), the effects of Harm-intensity on animal mind denial appear to be somewhat generalizable. However, the mind denial effect in both studies was relatively small (Cohen's $d \sim .20$), and smaller than that reported by Bastian and colleagues (2012). Moreover, in Study 2 we did not replicate the mind denial effect when using stimuli that not only portrayed a lower degree of farmed suffering but more closely matched those used by Bastian and colleagues (2012). This may suggest that such stimuli need to be sufficiently evocative to elicit the conflict described by the meat paradox. For instance, Bastian and colleagues' presented participants with appetizing cured meats, which may be a particularly effective way to heighten participants desire to continue eating meat. Constrained by the online environment, we instead attempted to increase this salience by asking participants to choose a meat-based meal they would most like to eat. Such design elements may help explain why some studies have not found an effect of Harm-intensity on mind denial (Kunst & Hohle, 2016), and inform future research in this area.

Differential Responses to the Meat Paradox

Based on the putatively conflicting motives and concerns described by the meat paradox (see Figure 1), we identified several individual difference constructs that might predict the strength of animal mind denial in response to the meat paradox. First, we reasoned that if mind denial arises as a response to the conflict elicited by the meat paradox, then traits describing how people respond to conflict and ambiguity—such as openness/intellect and neuroticism—should influence the strength of mind denial. In line with this reasoning, we found that higher scorers on openness/intellect, intellect (Study 1), and openness (Study 2), denied mind less strongly when reminded of farmed animal suffering. We also found that those higher on the emotional volatility facet of neuroticism (Study 1), and lower in emotion regulation ability (Study 2), denied mind more strongly. Surprisingly, given the conflict-based account of the meat paradox, measures of ambiguity intolerance (related both to low neuroticism and high openness/intellect; Jach & Smillie, 2019) did not relate to mind denial in either study.

Next, given the importance of concerns for animal welfare in theoretical explanations for the meat paradox, we reasoned that any traits describing sensitivity to suffering might predict differential responses to the meat paradox. However, we found no evidence

that traits within the agreeableness domain predicted animal mind denial. It is possible that individuals scoring high on such traits are indeed sensitive to the conflict elicited by the meat paradox, but remain conflicted (Gendelman, 2017), or resolve this conflict in different ways (e.g., by giving up meat; Tan et al., 2021). More in line with expectations, Study 1 revealed that those higher on anti-egalitarianism and traditionalism—facets of SDO and RWA, respectively—denied animal mind less strongly. However, the opposite was true for those higher on dominance—the other facet of SDO. Given that people do not tend to think about the animal origin of meat, perhaps for those higher on dominance, our stimuli only served as a reminder of their dominance over animals. This would imply that for these individuals the reduction in mind attributions following reminders of animal suffering is not driven by the conflict described in the meat paradox. Critically, as neither facet of SDO related to the strength of mind denial in Study 2, these associations may not have been reliable.

Finally, given that the desire to eat meat is an important component of the meat paradox, we reasoned that individual differences in enjoyment of and commitment to meat-eating would be associated with the strength of mind denial. Indeed, we found that those who were more committed to eating meat (Study 2) denied animal mind more strongly. This matched our expectations, given that such individuals likely view alternate avenues for relieving conflict induced by the meat-paradox (e.g., vegetarianism) as unfeasible (Bastian & Loughnan, 2017).

Future Directions

Given the apparent reproducibility of the meat-paradox on animal mind denial, future research might shift focus to evaluating potential practical implications of this phenomenon. For instance, animal mind denial may act as a barrier for interventions targeting reduced meat consumption (see Bastian & Loughnan, 2017). Moreover, our findings suggest that some individuals are more susceptible to this barrier than others. Future research is needed to understand how groups advocating for plant-based diets might overcome this barrier, and tailor their persuasive appeals for different individuals. For instance, recent work by Tan and colleagues (2023a) has targeted peoples' animal welfare motivations in persuasive appeals to reduce meat consumption and found evidence of differential effects. Nevertheless, more research is needed to replicate Tan and colleagues' findings, examine the different motives for adopting a plant-based diet (Hopwood et al., 2020), and test the efficacy of tailored or 'personalized' messaging (e.g., Hirsh et al., 2012).

Limitations

A potential explanation for the somewhat inconsistent findings across our two studies is the well-documented decrease in the quality of data collected on Amazon's Mechanical

Turk (Chmielewski & Kucker, 2020). We attempted to mitigate the impact of inattentive responding through the use of attention checks, although future research might adopt a more rigorous quality control protocol (e.g., Wood et al., 2017). If data quality was indeed a limitation to the present studies, then it is at least reassuring that we were still able to recover the crucial effect of Harm-intensity on animal mind denial and find broadly consistent evidence for individual differences in mind denial. Another limitation is that we focused on a culturally homogenous sample. Specifically, our sample in both studies consisted of US residents. Thus, it is unclear whether our findings would generalize to other cultures. Finally, the present research focused only on self-report data. Self-reports only capture one perspective and the addition of, for example, informant-reports could lead to more robust measurement.

Conclusion

In closing, we have provided the first pre-registered conceptual replication of the meat-paradox effect on animal mind denial. We have also obtained the first evidence for differential responses to the meat paradox, in terms of the role that individual difference constructs may play in the denial of animal mind. Specifically, we found evidence that those who are higher on traits within the openness/intellect domain; less emotionally volatile; better emotion regulators; less dominant; more anti-egalitarian; less conservative; more traditional; and less committed to meat-eating were less likely to deny animals mind when reminded of the animal suffering required for meat consumption. Though these findings were not consistent across studies, they were broadly in line with the theoretical accounts of the meat-paradox. Indeed, when taking into consideration relative replicability and effect size, traits within the openness/intellect domain appear to be the most relevant for predicting animal mind denial. Future extensions of this work may help shed further light on how our personalities shape our responses to ethical quandaries, and the processes by which everyday morally questionable behaviors are facilitated and maintained.

Funding: The authors have no funding to report.

Acknowledgments: We would like to thank all members of the Personality Processes Lab for their insightful advice and feedback at various points in the research process. We are also grateful to Dominic Giuca for the assistance developing the stimuli used in this research.

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

Ethics Statement: Ethics approval for data collection was obtained from the Human Ethics Advisory Group of the authors' university.

Data Availability: The study materials, data and analysis scripts used for this article can be accessed at Tan et al. (2023b)

Supplementary Materials

For this article, the following Supplementary Materials are available:

- Supplemental stimuli for Study 1 and 2. (Tan et al., 2024)
- Supplemental analyses for Study 1 and 2. (Tan et al., 2024)
- Preregistration of Study 1. (Tan et al., 2018)
- Preregistration of Study 2. (Tan et al., 2019)

References

Althouse, A. D. (2016). Adjust for multiple comparisons? It's not that simple. *Annals of Thoracic Surgery, 101*(5), 1644–1645. https://doi.org/10.1016/j.athoracsur.2015.11.024

Amiot, C. E., & Bastian, B. (2017). Solidarity with animals: Assessing a relevant dimension of social identification with animals. *PLoS One, 12*(1), Article e0168184. https://doi.org/10.1371/journal.pone.0168184

Bastian, B., & Loughnan, S. (2017). Resolving the meat-paradox: A motivational account of morally troublesome behavior and its maintenance. *Personality and Social Psychology Review, 21*(3), 278–299. https://doi.org/10.1177/1088868316647562

Bastian, B., Loughnan, S., Haslam, N., & Radke, H. R. M. (2012). Don't mind meat? The denial of mind to animals used for human consumption. *Personality and Social Psychology Bulletin, 38*(2), 247–256. https://doi.org/10.1177/0146167211424291

Blechert, J., Meule, A., Busch, N. A., & Ohla, K. (2014). Food-pics: An image database for experimental research on eating and appetite. *Frontiers in Psychology, 5*, Article 617. https://doi.org/10.3389/fpsyg.2014.00617

Caviola, L., Everett, J. A. C., & Faber, N. S. (2019). The moral standing of animals: Towards a psychology of speciesism. *Journal of Personality and Social Psychology, 116*(6), 1011–1029. https://doi.org/10.1037/pspp0000182

Chmielewski, M., & Kucker, S. C. (2020). An MTurk crisis? Shifts in data quality and the impact on study results. *Social Psychological & Personality Science, 11*(4), 464–473. https://doi.org/10.1177/1948550619875149

Corr, P. J., Deyoung, C. G., & McNaughton, N. (2013). Motivation and personality: A neuropsychological perspective. *Social and Personality Psychology Compass, 7*(3), 158–175. https://doi.org/10.1111/spc3.12016

DeYoung, C. G., Quilty, L. C., & Peterson, J. B. (2007). Between facets and domains: 10 aspects of the Big Five. *Journal of Personality and Social Psychology, 93*(5), 880–896. https://doi.org/10.1037/0022-3514.93.5.880

Dhont, K., Hodson, G., & Leite, A. C. (2016). Common ideological roots of speciesism and generalized ethnic prejudice: The Social Dominance Human–Animal Relations Model (SD-HARM). *European Journal of Personality, 30*(6), 507–522. https://doi.org/10.1002/per.2069

Gendelman, B. (2017). *Conflicted omnivores: Meat, morals, and money* [Bachelor's thesis, Wharton School, University of Pennsylvania]. University of Pennsylvania ScholarlyCommons. http://repository.upenn.edu/wharton_research_scholars/152

Gray, K., Waytz, A., & Young, L. (2012). The moral dyad: A fundamental template unifying moral judgment. *Psychological Inquiry, 23*(2), 206–215. https://doi.org/10.1080/1047840X.2012.686247

Harmon-Jones, E., Amodio, D. M., & Harmon-Jones, C. (2009). Chapter 3 Action-Based Model of Dissonance. A review, integration, and expansion of conceptions of cognitive conflict. *Advances in Experimental Social Psychology, 41*, 119–166. https://doi.org/10.1016/S0065-2601(08)00403-6

Hirsh, J. B., Kang, S. K., & Bodenhausen, G. V. (2012). Personalized persuasion: Tailoring persuasive appeals to recipients' personality traits. *Psychological Science, 23*(6), 578–581. https://doi.org/10.1177/0956797611436349

Hopwood, C. J., Bleidorn, W., Schwaba, T., & Chen, S. (2020). Health, environmental, and animal rights motives for vegetarian eating. *PLoS One, 15*(4), Article e0230609. https://doi.org/10.1371/journal.pone.0230609

Hughes, D. J., Kratsiotis, I. K., Niven, K., & Holman, D. (2020). Personality traits and emotion regulation: A targeted review and recommendations. *Emotion, 20*(1), 63–67. https://doi.org/10.1037/emo0000644

Jach, H. K., & Smillie, L. D. (2019). To fear or fly to the unknown: Tolerance for ambiguity and Big Five personality traits. *Journal of Research in Personality, 79*, 67–78. https://doi.org/10.1016/j.jrp.2019.02.003

Kanfer, R., & Ackerman, P. L. (1989). Dynamics of skill acquisition: Building a bridge between intelligence and motivation. In R. J. Sternberg (Ed.), *Advances in the psychology of human intelligence* (1st ed.). Psychology Press.

Kunst, J. R., & Hohle, S. M. (2016). Meat eaters by dissociation: How we present, prepare and talk about meat increases willingness to eat meat by reducing empathy and disgust. *Appetite, 105*, 758–774. https://doi.org/10.1016/j.appet.2016.07.009

Piazza, J., Ruby, M. B., Loughnan, S., Luong, M., Kulik, J., Watkins, H. M., & Seigerman, M. (2015). Rationalizing meat consumption. The 4Ns. *Appetite, 91*, 114–128. https://doi.org/10.1016/j.appet.2015.04.011

Rothgerber, H., & Rosenfeld, D. L. (2021). Meat-related cognitive dissonance: The social psychology of eating animals. *Social and Personality Psychology Compass, 15*(5), Article e12592. https://doi.org/10.1111/spc3.12592

Sibley, C. G., & Duckitt, J. (2008). Personality and prejudice: A meta-analysis and theoretical review. *Personality and Social Psychology Review, 12*(3), 248–279. https://doi.org/10.1177/1088868308319226

Soto, C. J., & John, O. P. (2017). The next Big Five Inventory (BFI-2): Developing and assessing a hierarchical model with 15 facets to enhance bandwidth, fidelity, and predictive power. *Journal of Personality and Social Psychology, 113*(1), 117–143. https://doi.org/10.1037/pspp0000096

Stanford, C. B., & Bunn, H. T. (2001). *Meat-eating and human evolution*. Oxford University Press.

Tan, N. P., Bastian, B. B., & Smillie, L. D. (2023a). Evaluating the effectiveness of vegetarian appeals in daily life: Comparing positive and negative imagery, and gauging differential responses. *Appetite, 180*, Article 106358. https://doi.org/10.1016/j.appet.2022.106358

Tan, N. P.-J., Bastian, B., & Smillie, L. (2023b). *Meating of the minds: Who denies animal mind in response to the meat paradox?* [OSF project page containing study materials, pre-registration, code, and data for Study 1 and 2]. OSF. https://doi.org/10.17605/OSF.IO/W4CYM

Tan, N. P., Bastian, B. B., & Smillie, L. D. (2024). Supplemental materials to *"Meating of the minds: Who denies animal mind in response to the meat paradox?"* [Supplemental stimuli Study 1 and 2; Supplemental analyses Study 1 and 2]. PsychOpen GOLD. https://doi.org/10.23668/psycharchives.15423

Tan, N. P., Conner, T. S., Sun, H., Loughnan, S., & Smillie, L. D. (2021). Who gives a veg? Relations between personality and Vegetarianism/Veganism. *Appetite, 163*, Article 105195. https://doi.org/10.1016/j.appet.2021.105195

Tan, N. P. J., Smillie, L., & Bastian, B. (2018). *Individual differences in animal mind denial* [Preregistration of Study I]. OSF. https://doi.org/10.17605/OSF.IO/UK2N9

Tan, N. P. J., Smillie, L., & Bastian, B. (2019). *Replication and extension* [Preregistration of Study 2]. OSF. https://doi.org/10.17605/OSF.IO/FCW5Z

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54*(6), 1063–1070. https://doi.org/10.1037/0022-3514.54.6.1063

Wood, D., Harms, P. D., Lowman, G. H., & DeSimone, J. A. (2017). Response speed and response consistency as mutually validating indicators of data quality in online samples. *Social Psychological & Personality Science, 8*(4), 454–464. https://doi.org/10.1177/1948550617703168

Yentes, R. D., & Wilhelm, F. (2018). *Careless: Procedures for computing indices of careless responding* (R package Version 1.1.3). R Foundation for Statistical Computing.

Yik, M., Russell, J. A., & Steiger, J. H. (2011). A 12-point circumplex structure of core affect. *Emotion, 11*(4), 705–731. https://doi.org/10.1037/a0023980