Mind your meat: Religious differences in the social perception of animals

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While previous work demonstrated that animals are categorised based on their edibility, little research has systematically evaluated the role of religion in the perception of animal edibility, particularly when specific animals are deemed sacred in a religion. In two studies, we explored a key psychological mechanism through which sacred animals are deemed inedible by members of a faith: mind attribution. In Study 1, non-vegetarian Hindus in Singapore ($N = 70$) evaluated 19 animals that differed in terms of their sacredness and edibility. Results showed that participants categorised animals into three groups: holy animals (high sacredness but low edibility), food animals (low sacredness but high edibility) and neutral animals (low sacredness and low edibility). Holy animals were deemed to possess greater mental life compared to other animal categories. In Study 2, we replicated this key finding with Hindus in India ($N = 100$), and further demonstrated that the observed pattern of results was specific to Hindus but not Muslims ($N = 90$). In both studies, mind attribution mediated the negative association between sacredness and edibility. Our findings illustrate how religious groups diverge in animal perception, thereby highlighting the role of mind attribution as a crucial link between sacredness and edibility.

Keywords: Mind perception; Animal consumption; Meat paradox; Religion; Sacredness.

For centuries, animals have emerged as a recurring theme in the cultural and religious practices of human communities, playing vastly different roles in the lives of people around the world. For example, the Mayans slaughtered animals to appease the gods, while Indus Valley inhabitants worshipped them as proxies of the gods (Kenoyer, 1991). Similar patterns have been observed in contemporary societies, in which religious believers imbue animals not only with divine or sacred status, but also a mind that makes them think and feel like humans. The tendency to represent animals in terms of their mental lives—a process often known as mind perception (Epley et al., 2008)—has been shown to affect a host of social judgements; such as whether animals are considered as food items (Bastian et al., 2012) or treated with moral deservingness (see Herzog, 2010).

While animals have risen as the foundation of social life for their roles in human beliefs and rituals, the scientific understanding of such phenomena has remained underdeveloped. This appears to be surprising given that the topic has attracted considerable interest in the domains of history, sociology and anthropology (e.g., Laland & Galef, 2009). To date, little empirical research has considered the fact that animals are routinely perceived, understood and evaluated through the lens of religion. Addressing this important gap in the literature, the present research focuses on people's attitudes towards animals that are deemed sacred by their religions, thereby, exploring the psychological mechanisms that underpin reverence of such animals.

SOCIAL PERCEPTION OF ANIMALS

Moral philosophers were among the earliest to theorise that people tend to evaluate animals based on the social roles they occupy. Depending on their everyday functions,

animals are grouped into distinct mental categories within the human mind which, in turn, determine how those animals are treated in human societies (Singer, 1990). The insight that animals are central to the fabric of social life has led to various unconventional findings. For example, animals that are phylogenetically closer to humans elicit greater positive affect and caring intentions. This tendency, rooted in the similarity principle, suggests that if a species is perceived to have the capacities to think, feel and behave like humans, people become more likely to conserve it (Tisdell et al., 2006).

Further work in psychology has examined people's perception of animals in terms of food consumption related attitudes (Rozin & Fallon, 1980), mind perception (Waytz, Gray, et al., 2010), moral considerations towards suffering and deservingness of care (Loughnan et al., 2014), as well as intelligence (Piazza & Loughnan, 2016). Not only are animals categorised according to their social roles, but also based on the extent to which they are perceived as warm or competent in a society. Dogs, for example, are typically viewed as high on both warmth and competence in Western societies, which easily makes them perfect house pets or "people's best friends" (Sevillano & Fiske, 2016). Whether an animal is perceived as a pet, livestock, or captive creature has downstream consequences for its eventual treatment (Knight & Herzog, 2009), such as the degree to which it is considered morally appropriate to be consumed as food.

These findings have also revealed a moral dilemma that arises from the ways people treat animals. Commonly known as the meat paradox (Bastian & Loughnan, 2016), it describes the psychological inconsistency experienced by people when they both love animals yet enjoy consuming meat (Loughnan et al., 2010; Piazza et al., 2015). Theories on cognitive dissonance posit that when a person holds juxtaposed attitudes that are in direct conflict with each other, they are motivated to resolve that dissonance by re-aligning their behaviours and attitudes in the sense that they change either one of them (Festinger, 1962). Applying this logic to the context of meat consumption would mean that animal lovers are motivated to put such dissonance to rest when they realise that they are *also* animal eaters. As a result, they are inclined to justify the act of animal consumption by depriving animals of mental life and, thus, moral deservingness (Loughnan et al., 2014).

Likewise, other research has shown that meat eaters attribute less mental capacities to edible than inedible animals and deny moral status to such animals meant for consumption (Bratanova et al., 2011). Accordingly, a negative association has been illustrated between edibility and mind attribution, such that animals which are deemed as edible are perceived as having less of a mind (Loughnan et al., 2010). In other words, people justify their meat consumption by perceiving livestock as less capable of mental life and less deserving of moral treatment than pets or wild animals.

RELIGION AS A BASIS FOR THE PERCEPTION OF ANIMALS

To our knowledge, no literature exists to date which examines the link between religious groups and the meat paradox. While personality traits, cultural socialisation effects, dietary preferences and membership in animal welfare organisations have been discussed in connection with the social perception of animals (e.g., Ang, Chan & Singh, 2019; Dhont & Hodson, 2014; Knight & Herzog, 2009), these studies are mostly descriptive without empirically unpacking the underlying psychological mechanisms. Given that people's perceptions of animals are shaped by how they are socialised to think about such creatures (Serpell, 2004), cultural learning could form an integral part of how people in some cultures view and interact with animals. The present work aims to examine a specific component of socialisation—that is, cultural learning acquired through religion—in shaping social cognition regarding animals. By examining the role of religion in the social perception of animals, we wish to explore the link between culturally-sanctioned sacredness and animal consumption.

In line with prior research on people's justifications for meat consumption (Piazza et al., 2015), we focus on the cognitive processes that underlie the *avoidance* of particular animals for consumption. Just as livestock gets deprived of mental life and moral deservingness by some meat eaters as a way to justify animal consumption (Bastian et al., 2012), we predict that the opposite pattern should be observed when animals are perceived as sacred, that is, as proxies of one's gods (Flood, 2008). While the meaning of sacredness depends on the cultural values of a group, we decided to utilise this concept in its most basic form as an exploratory first step.

The socio-cognitive approach of this research is compatible with theological work. In Hinduism, sacred animals (e.g., cows) are often represented in the form of anthropomorphic gods, portrayed as mighty supernatural beings who could move mountains and hills (e.g., Hanuman the Monkey God), uphold sacred values through literary pursuits (e.g., Ganesh the Elephant God), and destroy evil by physically combating injustice (e.g., Garuda the Eagle God). These animals have been granted a range of anthropomorphic characteristics such as human language and mystical powers (Gottlieb, 1996) that are unobserved in non-sacred animals. Given the portrayal of sacred animals in Hinduism, the slaughter of such creatures for food would be viewed as condemnable moral violations.

Such animals that are deemed holy, and thus, unfit for consumption, should be granted greater mental life

and moral deservingness by religious believers. This prediction is grounded in prior work on the anthropomorphism of supernatural agents (Epley et al., 2008), which describes the tendency to imbue agents in the sacred realm with human characteristics including a sophisticated mind. Going beyond the familiar tendency to see faces in clouds and smoke, anthropomorphic processes are apparent in other domains of social perception, especially when the targets resemble humans in terms of their facial features, bodily shapes, behavioural patterns, and mannerisms (e.g., Waytz, Cacioppo, & Epley, 2010). Sacred animals in Hinduism (Krishna, 2014) and other religions (Moazami, 2005) display a combination of these attributes, often depicted as humanoids capable of higher-order thought and complex emotions, complete with a mind capable of goals, motivations, and desires.

THE PRESENT RESEARCH

Two studies examined the cognitive mechanisms underpinning the sacred values people attach to animals. If people justify the consumption of some animals by depriving them of mental life and moral treatment (Bastian et al., 2012), then the opposite pattern of cognition should be observed when people justify why certain animals should *not* be eaten. Following this logic, we predicted that animals deemed to be sacred in a religion, should be perceived in the eyes of believers as having greater mental life; and hence more deserving of moral treatment and less appropriate for consumption. As such, the attribution of a sophisticated mind should act as a psychological mechanism through which sacred animals are deemed inedible by members of a religion. Given our aim to study people's perceptions of sacred animals, we recruited participants from a Hindu sample, a religion in which animals heavily feature as a part of worship and religious mythology (Flood, 2008). Our hypotheses, determined prior to data collection, were examined in two studies.

Study 1 investigated whether animals cluster into different groups based on perceptions of sacredness and edibility by Hindu participants. If holy animals are deemed sacred and inedible, they should also be perceived higher in mental life and moral treatment compared to non-sacred or edible animals. In addition, we tested whether mind attribution and moral deservingness account for the associations between sacredness and edibility of animals.

Study 2 aimed to replicate the findings of the first study with a Hindu sample from a different nationality. To demonstrate that the results are specific to Hindus, we further compared the effects against a group with differing religious beliefs: Muslims. Together, both studies served to illustrate that religious values of the perceiver as well as the social value of an animal are important in determining mind attribution, which in turn serves as the psychological bridge between sacredness and edibility.

STUDY 1

Study 1 sought to examine Hindu participants' attitudes towards a range of animals. Recent work on how religious values influence perceptions of one's natural environment—including judgements of animals (Flood, 2008)—guided our selection of animal groups: (a) holy animals that are commonly worshipped, (b) food animals that are commonly eaten as meat and (c) neutral animals that are neither sacred nor edible. We expected participants' ratings of animals to cluster along the dimensions of sacredness and edibility, leading to the emergence of conceptually distinct categories. Based on prior research evaluating the effect of animal categories on mind and morality (Loughnan et al., 2010), we postulated that holy animals, given their sacred nature, would be granted greater mental life and deservingness of moral treatment than food animals and neutral animals. In addition, we explored whether mind attribution and moral deservingness mediate the association between sacredness and edibility.

Method

Participants

A priori power analysis using G*Power (version 3.1.9; Faul et al., 2009) indicated that 62 participants would be sufficient to detect a medium-sized effect of animal type (Cohen's $f = 0.25$) with 85% power ($\alpha = .05$) in a repeated-measures MANOVA. We intentionally oversampled in a single wave of data collection to accommodate any necessary exclusion of participants who did not meet study requirements. Seventy-nine Hindu participants from Singapore were recruited online and participated for a lottery draw of $50. Nine respondents were excluded from the final dataset for not fulfilling a priori determined demographic requirements (i.e., non-Hindu = 2, vegetarians = 4, >50 years of age[1] = 1, <10 years spent in Singapore = 2). This left a final sample of 70 participants (33% males), with an age range from 18 to 46 years ($M_{age} = 25.5$, $SD_{age} = 4.79$). All participants reported being non-vegetarian, identified as Hindus, and had lived in Singapore for at least 10 years ($M = 24.8$, $SD = 5.11$). The study received ethical approval from

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[1]Prior to data collection, we imposed an age cap of 50 years for all participants for two reasons. First, our mode of data collection (computer-mediated research) would be potentially unfamiliar and cumbersome for older participants (see Ellis & Allaire, 1999). Second, the age cap helped to diminish possible effects of age on religiosity (see Moberg, 2005).

the Department of Psychology at Nanyang Technological University, Singapore.

Stimuli

Nineteen non-human animals were selected. Among those, seven animals (cow, dog, elephant, snake, monkey, eagle and lion) were sacred animals as they are commonly featured in religious texts and worshipped as deities in Hinduism (Krishna, 2014). Six animals (goat, sheep, chicken, turkey, quail and fish) were food animals as they are routinely consumed as meat by non-vegetarian Hindus in Singapore. Six animals (dove, giraffe, kangaroo, penguin, zebra and flamingo), neither worshipped nor eaten as meat, were included as baseline for comparison. All measures, conditions and data exclusions pertaining to this study are reported.

Procedure

The study was conducted using Qualtrics, a web-based software (Provo, UT). First, participants completed the 6-item Religious Identity Scale (Verkuyten & Yildiz, 2007), which assessed the importance of Hinduism to their lives, as a subtle reminder of their religious identity. Example items were "*I identify strongly with Hinduism*" and "*I am proud of my Hindu background*." Scores for each item ranged from 1 (*strongly disagree*) to 7 (*strongly agree*), with higher values indicating stronger religious identity.

Next, participants rated (1 = *not at all*, 7 = *very much*) all 19 animals, one at a time in randomised order, with respect to sacredness ("*How sacred is this animal to you?*"), mind attribution ("*To what extent does this animal have a mind of its own?*"), moral treatment ("*To what extent does this animal deserve moral treatment?*"), and edibility ("*How likely are you to eat this animal?*"). For each animal, the measure of sacredness always appeared in the first block of questions, followed by measures of mind attribution and moral treatment in the second block, and the measure of edibility in the third block. Finally, participants provided demographic information and were debriefed.

Results

Religious identity

Given that the inter-item consistency of the scale was high ($\alpha = .96$), ratings of religious identity were averaged into a composite, with identification scores significantly above the scale midpoint ($M = 5.30$, $SD = 1.57$), $t(1,69) = 6.90$, $p < .001$, $d = 0.83$.

Clustering of animal targets

Hierarchical cluster analysis was conducted to test whether animals can be classified meaningfully based on ratings of sacredness, edibility, mind perception and moral treatment. Squared Euclidian distances were computed between points, and Ward's method of minimising within-cluster variance while maximising between-cluster variance was applied. The optimal number of clusters was determined based on established conventions (Atlas & Overall, 1994; Yim & Ramdeen, 2015), thereby comparing the agglomeration schedule (cutoff stage = 15, coefficient = 9.04) with the dendrogram (see Appendix S1, Supporting Information). A three-cluster solution was identified. Ratings of animals neatly clustered into 1 of 3 categories (see Figure 1), with (a) holy animals perceived as high on sacredness and low on edibility, (b) food animals perceived as low on sacredness and high on edibility and (b) neutral animals perceived as low on both sacredness and edibility.

Differences between animal categories

The animal targets were collapsed into three categories, and ratings for each animal type were averaged across the exemplars within a category ($\alpha s > .80$). A repeated-measures multivariate analysis of variance (MANOVA) was conducted, with animal category (holy vs. food vs. neutral) entered as a within-subjects variable, predicting all four outcome measures in the same model. As hypothesised, a significant multivariate effect of animal category was found, $F(8,62) = 82.64$, $p < .001$, $\eta_p^2 = .914$, which remained significant when religious identity was entered as a covariate[2] in the analysis, $F(8, 61) = 7.20$, $p < .001$, $\eta_p^2 = .486$. Hence, the observed results could not be attributed to religious identity.

We then examined the effect of animal category on each dependent measure separately. The Greenhouse–Geisser adjustment to the degrees of freedom was applied when the assumption of sphericity was violated. As predicted, there was a significant main effect of animal category on all four dependent measures: sacredness, $F(2,67) = 200.31$, $p < .001$, $\eta_p^2 = .744$, edibility, $F(2,67) = 481.42$, $p < .001$, $\eta_p^2 = .875$, mind attribution, $F(2,67) = 59.59$, $p < .001$, $\eta_p^2 = .463$, and moral deservingness, $F(2,67) = 31.80$, $p < .001$, $\eta_p^2 = .315$.

Pairwise comparisons with Bonferroni-correction showed that holy animals were perceived to be more sacred ($M = 4.89$, $SD = 1.30$) than neutral animals ($M = 2.34$, $SD = 1.40$, $p < .001$) and food animals ($M = 2.42$, $SD = 1.37$, $p < .001$). No significant differences were found between neutral and food animals on
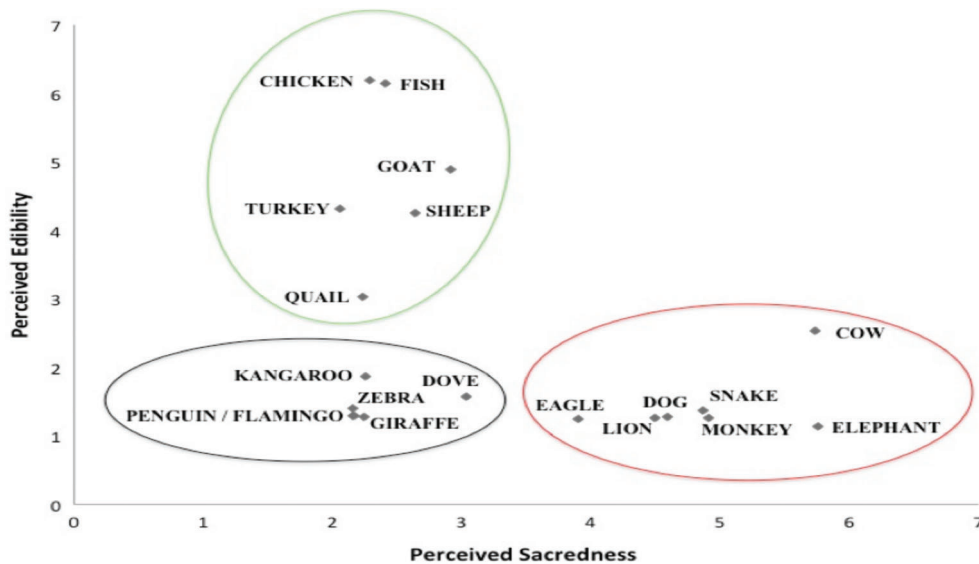
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[2]The interaction term between religious identity and animal category was not significant, $F(8,61) = 1.62$, $p = .138$, $\eta_p^2 = .175$. Hence, religious identity was dropped from all subsequent analyses.

Figure 1. Three clusters of animal categories along the dimensions of sacredness and edibility in Study 1: holy animals (red circle), food animals (green circle), neutral animals (black circle) [Colour figure can be viewed at wileyonlinelibrary.com].

perceived sacredness ($p = .836$). For ratings of edibility, holy animals ($M = 1.44$, $SD = .920$, $p < .001$) and neutral animals ($M = 1.45$, $SD = 1.04$, $p < .001$) were seen to be less appropriate for consumption than food animals ($M = 4.80$, $SD = 1.37$). Both holy and neutral animals were perceived as equally inedible ($p = .999$).

Consistent with our core predictions, holy animals were granted more sophisticated mental life ($M = 5.81$, $SD = 1.12$), and deemed to be more deserving of moral treatment ($M = 6.19$, $SD = 1.06$) than neutral animals (mind attribution: $M = 4.62$, $SD = 1.78$, $p < .001$; moral deservingness: $M = 5.53$, $SD = 1.71$, $p < .001$) and food animals (mind attribution: $M = 4.53$, $SD = 1.81$, $p < .001$; moral deservingness: $M = 5.41$, $SD = 1.64$, $p < .001$). No significant differences were found between neutral and food animals on mind attribution ($p = .294$), and deservingness of moral treatment ($p = .117$). In short, holy animals were deemed more sacred, more mindful and more deserving of moral treatment than other animal categories (Figure 2). Furthermore, food animals—although deemed more edible than neutral animals—were not deprived of mental life or moral deservingness.

Mediation via mind attribution

We next explored if mind attribution and moral deservingness would mediate the association between sacredness and edibility. Given that our data is nested—each participant rated 19 targets on four attributes—a multilevel mediation approach was utilised (Hayes & Rockwood, 2019). For each participant, we expected the association between sacredness and edibility to be
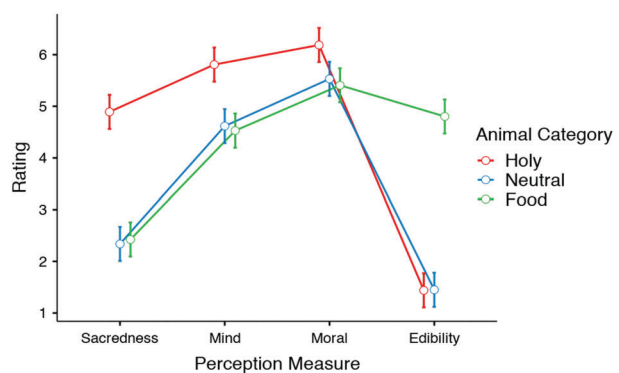

Figure 2. Holy animals (red line) were rated as more sacred, mindful and morally worthy compared to neutral animals (blue line) and food animals (green line) [Colour figure can be viewed at wileyonlinelibrary.com].

mediated by mind attribution and moral deservingness; hence, we report the within-effects findings here.

Sacredness was positively associated with mind attribution ($b = .309$, $SE = .016$, $t = 19.15$, $p < .001$, 95% CI $= .278$, $.341$) and moral deservingness ($b = .172$, $SE = .014$, $t = 12.45$, $p < .001$, 95% CI $= .145$, $.200$), but negatively predictive of edibility ($b = -.178$, $SE = .034$, $t = 5.18$, $p < .001$, 95% CI $= -.245$, $-.110$). These results suggest that the more sacred an animal was perceived to be, the more likely Hindu participants would imbue it with an advanced mind and the rights to be treated morally, and the less likely Hindu participants considered it as appropriate for consumption. Furthermore, the indirect effects of mind attribution ($b = -.061$, $SE = .020$, $z = 3.13$, $p = .002$, 95% CI $= -.100$, $-.024$) and moral deservingness ($b = -.040$, $SE = .013$, $z = 3.07$, $p = .002$, 95%

CI = −.066, −.015) were both found to be significant, thereby indicative of partial mediation. These results suggest that sacred animals were less likely to be consumed as food because of the greater mental life and moral concerns attributed to them.

Discussion

Study 1 revealed three main findings. First, Hindu participants systematically classified animals into three distinct categories based on the dimensions of sacredness and edibility. These results corroborate prior theoretical work on the links between religious sacredness and consumption of animals (Fessler & Navarrete, 2003). Second, holy animals were imbued with rich mental life and deemed worthy of moral treatment, distinguishing them from neutral and food animals in the eyes of Hindu participants. Finally, mind attribution mediated the association between sacredness and edibility, indicative that ascribing mental life to animals is an explanation for why sacred animals are avoided as food, at least in Hindu culture.

STUDY 2

The purpose of the second study was threefold. First, going beyond the Singaporean sample used in Study 1, we explored whether the present results can be generalised to a country with vastly different demographics and cultural history. Furthermore, we added another religious group with contradicting beliefs about animals as a comparison to provide further evidence regarding the role of religious differences in animal consumption. While sacred animals may be deemed inedible in Hinduism, in other cultures they may be considered as fit for human consumption. Finally, we aimed to boost the statistical power of the study with a larger overall sample size.

To this end, we collected data in India with Hindu and Muslim participants to compare the effects in two religious groups, thereby controlling for differences in demographics and cultural background. We expected to replicate the findings of Study 1 with the Hindu sample in the sense that animals cluster into three distinct groups, with sacred animals being granted greater mind and moral deservingness than neutral or food animals. However, this pattern of results should be unique to the Hindu sample, and not be observed in Muslim participants who hold distinct religious views about animals. Unlike Hinduism, Islam embraces the view that certain animals are suitable for consumption, as it was the reason that

god created such animals in the first place (Foltz, 2014). As such, sacred animals should be deemed *edible* rather than inedible, when viewed through the lens of the Islamic faith.

Besides this cross-group comparison, we included a refined measure of mind attribution that taps into both dimensions of mind attribution—agency and experience (Waytz et al., 2010a). We had no a priori predictions about each dimension, but for the sake of completeness, included both dimensions to preserve the psychometric properties of the original scale (Gray et al., 2007). Similar to Study 1, we expected mind attribution to account for the negative association between sacredness and edibility. Furthermore, this pattern was predicted to be unique for Hindu participants.

Method

Participants

A priori power analysis using G*Power (version 3.1.9) indicated that 178 participants would be sufficient to detect a medium-sized interaction effect between animal type and religious group (Cohen's $f = 0.25$) with 85% power ($\alpha = .05$) in a repeated-measures MANOVA. We intentionally oversampled in a single wave of data collection to accommodate any necessary exclusion of participants who did not meet the study requirements. No data warranted exclusion. One hundred and ninety students (43% males), aged 18–34 years ($M_{age} = 23.3$, $SD = 2.70$), from Karnatak University in India participated for course credits. All participants (100 Hindus, 90 Muslims) had lived in India for at least 10 years ($M = 23.3$, $SD = 2.69$). The study received ethical approval from the Department of Psychology at Karnatak University in India.

Stimuli and procedure. The study was conducted as a pencil-and-paper survey in a laboratory. Participants were instructed to evaluate the same 19 non-human animals as in Study 1. The order in which the animal targets were presented was randomised across participants. Within each survey, attributes were presented in three separate blocks and in a fixed order. All measures, conditions, and data exclusions of this study are reported.[3]

Participants first rated all 19 targets on perceived sacredness, followed by measures of perceived agency, experience and moral deservingness, and finally measures of perceived edibility (1 = *not at all*, 7 = *very much*). Agency was measured with the item "*How capable of thinking is animal X?*," and experience was measured

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[3]Data was collected in conjunction with another project on moral purity. In addition to the 19 animal targets that are relevant to the present research, we also measured perceptions towards the *Pig*—an animal deemed unclean by Muslims (Lobban, 1994). Furthermore, we included a one-item measure on perceived impurity regarding each animal target. For exploratory purposes, we administered scales of generalised religiosity (Gorsuch & McPherson, 1989) and anthropomorphic tendencies towards animals (Waytz, Gray, et al., 2010; Waytz, Cacioppo, & Epley, 2010), at the end of the study. None of the scales were found to be reliable (.40 < αs < .66); hence, they were excluded from all analyses.
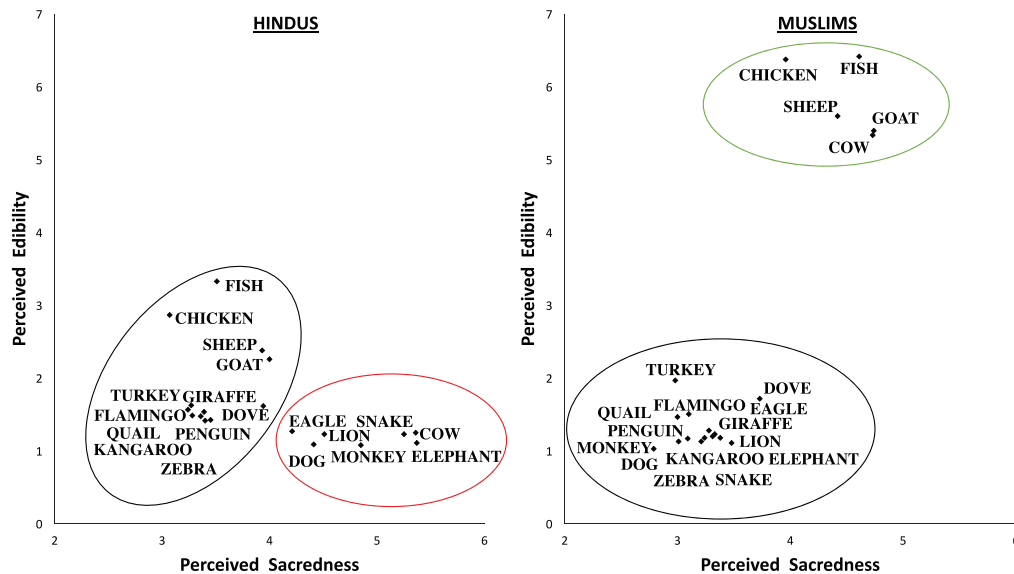
Figure 3. Clustering of animal categories along the dimensions of sacredness and edibility in Study 2: two categories for Hindus (left) reflecting holy animals (red circle) and other animals (black circle), and two categories for Muslims (right) denoting edible animals (green circle) and inedible animals (black circle) [Colour figure can be viewed at wileyonlinelibrary.com].

with the item "*How capable of feelings is animal X?.*" Finally, participants rated their religious identity with the same scale as used in Study 1, answered demographic questions, and were debriefed.

Results

Religious identity

Ratings of religious identity were averaged into a composite for the Hindu and Muslim samples (αs > .95). Religious identity scores were significantly above the midpoint for Hindus ($M = 5.39$, $SD = 2.00$), $t(1,95) = 6.76$, $p < .001$, $d = 0.70$, and Muslims ($M = 6.37$, $SD = 1.55$), $t(1,89) = 14.49$, $p < .001$, $d = 1.53$.

Clustering of animal targets

Similar to Study 1, we employed hierarchical cluster analyses separately for each religious group. For the Hindu sample, comparing the agglomeration schedule with the dendrogram resulted in the identification of two clusters (cutoff stage = 15, coefficient = 5.96). A clear distinction did not emerge between food and neutral animals. However, more importantly, all seven holy animals (*cow, snake, elephant, monkey, dog, lion, eagle*) clustered together in a manner that was identical to the prior findings with the Singaporean sample (see Figure 3).

For the Muslim sample, the emerged solution was systematically distinct from the pattern observed in the

Hindu sample (cutoff stage = 17, coefficient = 13.56). While food-related animals clustered together (*goat, sheep, chicken, fish, cow*), the dispersion pattern of the remaining animal targets could not be meaningfully interpreted (see Appendix S1 for dendrograms and agglomeration metrics).

Given the aim to compare religious groups on attributes granted to animals—with a focus on Hindus' perceptions towards holy animals as creatures that are venerated—we collapsed the animal targets according to the clustering solution obtained for the Hindu sample. Two categories were identified: holy animals and other animals (comprising of both food and neutral targets). Reliability analyses further demonstrated that animal targets could be collapsed into these two categories across all outcome measures (αs > .75) for Hindus.[4]

Differences between animal categories

A mixed-design MANOVA was conducted, with religious group (Hindu vs. Muslim) entered as a between-subjects factor and animal category (holy vs. other) entered as a within-subjects variable, predicting all four outcome measures in the same model. Attributions of agency and experience were highly correlated for both holy animals: $r(184) = .55$, $p < .001$, and other animals: $r(185) = .54$, $p < .001$; hence, they were collapsed into a composite measure of mind perception.

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[4]As mentioned in-text, animals clustered according to food and non-food targets for the Muslim sample. For the sake of completeness, we provide ancillary analyses by collapsing animal targets according to the cluster solution obtained for Muslims (see Appendix S1).
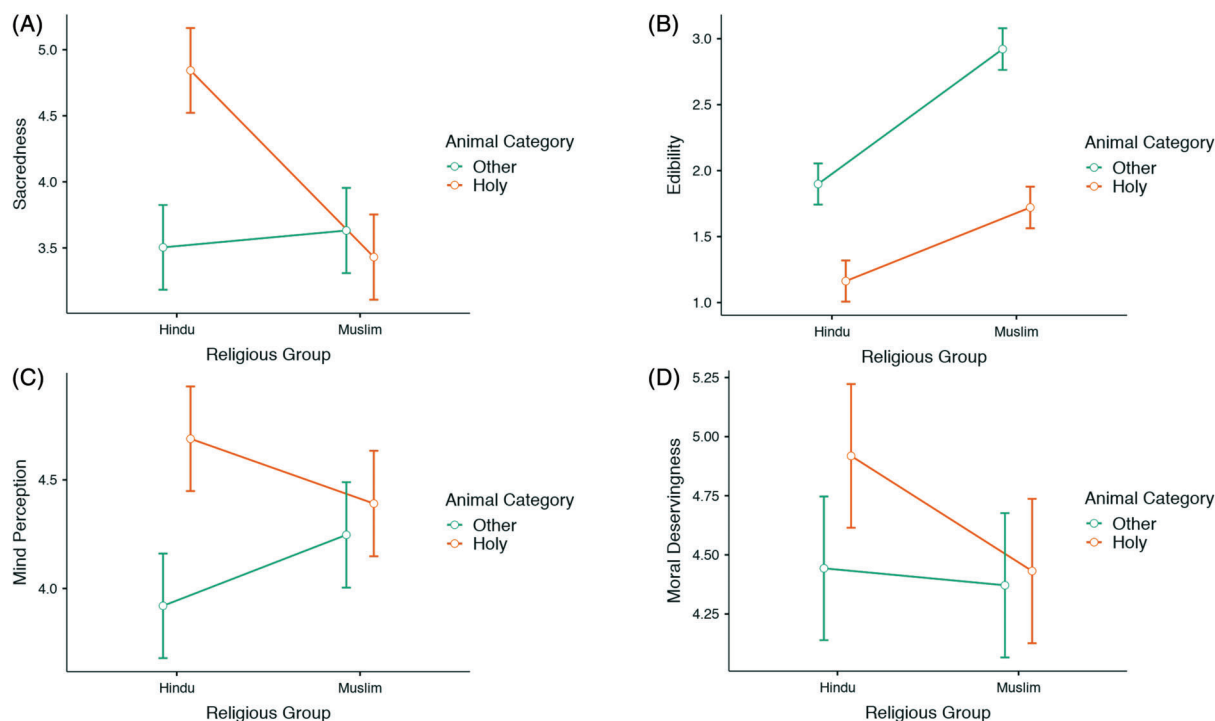
Figure 4. Holy animals (red line) were deemed more sacred (A), less edible (B), worthier of mind, (C) and more deserving of moral treatment (D) than other animals (green line) by Hindus but not Muslims [Colour figure can be viewed at wileyonlinelibrary.com].

As hypothesised, a significant multivariate interaction between religious group and animal category occurred, $F(4,179) = 21.10$, $p < .001$, $\eta_p^2 = .320$. This interaction remained significant when religious identity was entered as a covariate in the analysis, $F(4,174) = 17.55$, $p < .001$, $\eta_p^2 = .288$.[5] Thus, religious identity could not explain the observed results. In univariate terms, the interaction was significant for all four dependent measures: sacredness, $F(1,182) = 62.96$, $p < .001$, $\eta_p^2 = .257$, edibility, $F(1,182) = 11.92$, $p = .001$, $\eta_p^2 = .061$, mind perception, $F(1,182) = 18.41$, $p < .001$, $\eta_p^2 = .092$, and moral deservingness, $F(1,182) = 6.68$, $p = .011$, $\eta_p^2 = .035$. We hence decomposed these univariate interactions to probe for religious differences on each measure (Bonferroni corrected).

Hindus perceived holy animals to be more sacred ($M = 4.87$, $SD = 1.48$) and less edible ($M = 1.18$, $SD = .523$) than did Muslims (sacredness: $M = 3.42$, $SD = 1.73$, $p < .001$; edibility: $M = 1.74$, $SD = .570$, $p < .001$). Hindus also rated holy animals to be more sacred and less edible than other animals (sacredness: $M = 3.52$, $SD = 1.47$, $p < .001$; edibility: $M = 1.94$, $SD = 1.12$, $p < .001$). With respect to the sacredness of other animals, significant differences did not emerge between religious groups (Hindus: $M = 3.52$, $SD = 1.47$; Muslims: $M = 3.62$,

$SD = 1.61$, $p = .643$). In terms of edibility, Muslims perceived other animals ($M = 2.94$, $SD = .754$) to be more edible than did Hindus ($M = 1.94$, $SD = 1.12$, $p < .001$).

As predicted, Hindus deemed holy animals to be more capable of mind ($M = 4.76$, $SD = 1.29$) and worthier of moral treatment ($M = 4.96$, $SD = 1.58$) than did Muslims (mind perception: $M = 4.39$, $SD = 1.10$, $p = .036$; moral treatment: $M = 4.43$, $SD = 1.37$, $p = .016$). Hindus also rated holy animals to be more capable of mental life and worthy of moral treatment than other animals (mind perception: $M = 3.97$, $SD = 1.16$, $p < .001$; moral treatment: $M = 4.46$, $SD = 1.59$, $p < .001$). Religious group differences were non-significant for mind perception (Hindus: $M = 3.97$, $SD = 1.16$; Muslims: $M = 4.25$, $SD = 1.08$, $p = .092$) and moral treatment of other animals (Hindus: $M = 4.46$, $SD = 1.59$; Muslims: $M = 4.37$, $SD = 1.34$, $p = .661$).

We hence replicated the main findings of Study 1, showing that holy animals were deemed more sacred, mindful and worthy of moral treatment, as well as less edible than other types of animals. Taken together, these patterns suggest that an enhanced mind granted to holy animals is a culture-specific phenomenon, observed only in the Hindu sample but not the Muslim sample (see Figure 4).

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[5]The interaction term between religious identity and animal category was not significant, $F(4,174) = 1.92$, $p = .110$, $\eta_p^2 = .042$. As in Study 1, religious identity was dropped from all subsequent analyses.

Mediation via mind attribution

Using the same approach as in Study 1, we conducted multilevel mediation analyses by including religious group (Hindu, Muslim) as a moderating variable. Mind attribution and moral deservingness were entered as potential mediators, and religious group was entered as a moderator. The indirect effect of sacredness on edibility was moderated by religious group (*index of moderated mediation* = −.006, 95% CI = −.012, −.001). Hence, we decomposed the interaction term by examining the mediation model within each religious group.

For Hindus, sacredness was positively associated with mind attribution ($b = .179$, $SE = .018$, $t = 9.88$, $p < .001$, 95% CI = .143, .214) as well as moral deservingness ($b = .156$, $SE = .022$, $t = 7.11$, $p < .001$, 95% CI = .113, .199), *but* negatively predictive of edibility ($b = −.056$, $SE = .020$, $t = 2.78$, $p = .006$, 95% CI = −.096, −.017). Furthermore, the indirect effect of mind attribution ($b = −.010$, $SE = .005$, $z = 2.02$, $p = .043$, 95% CI = −.021, −.001) was found to be significant, hence indicative of partial mediation. However, the indirect effect of moral deservingness was not surfaced as a significant mediator in this model ($b = .005$, $SE = .004$, $z = 1.40$, $p = .161$, 95% CI = −.002, .013). Similar to Study 1, animals perceived to be sacred were granted greater mental life, and hence *less* likely to be consumed as food by Hindus.

For Muslims, sacredness was positively associated with mind attribution ($b = .087$, $SE = .020$, $t = 4.38$, $p < .001$, 95% CI = .048, .125) as well as moral deservingness ($b = .069$, $SE = .023$, $t = 2.95$, $p = .003$, 95% CI = .023, .115), *and* positively predictive of edibility ($b = .392$, $SE = .032$, $t = 12.40$, $p < .001$, 95% CI = .330, .454). In addition, the indirect effect of mind attribution ($b = .016$, $SE = .005$, $z = 3.08$, $p = .002$, 95% CI = .007, .027) was found to be significant, hence indicative of partial mediation. However, the indirect effect of moral deservingness was not surfaced as a significant mediator in this model ($b = .002$, $SE = .003$, $z = 0.85$, $p = .395$, 95% CI = −.003, .008). For Muslims, animals deemed as sacred were granted greater mental life, and thus *more* likely to be consumed as food.

Taken together, these mediation results suggest that religion has a significant impact on animal perception. While mind perception accounted for the link between sacredness and edibility in both Hindus and Muslims, the type of association differed according to religious group.

Discussion

Study 2 replicated the findings of the first study by showing that Hindus perceived holy animals to be categorically different from other types of wildlife or livestock. Animals deemed sacred were perceived to be more capable of mental life and worthy of moral treatment. This pattern of social perception was unique to Hindus and was not observed in a comparable religious group such as Muslims. In addition, mind attribution acted as the psychological mediator in accounting for the negative association between sacredness and edibility; observed only for Hindus.

GENERAL DISCUSSION

Although various attitudes towards animals have been explored in the past (Knight & Herzog, 2009), no studies yet exist that examine the social role of animals in relation to religious teachings. The present research addressed this gap in two studies and examined how people categorise animals based on religiously-determined values, thereby illustrating the mechanisms that underpin people's perception of sacred animals.

In Study 1, holy animals predicted the perception of greater mental life and moral deservingness than food animals and neutral animals. As hypothesised, mind attribution partially mediated the link between sacredness and edibility, suggesting that animals deemed sacred were granted greater mental life, and hence viewed as less fit for human consumption. In Study 2, we further showed that the categorization of animals into two groups was religion-specific and did not generalise to members of a different faith. Furthermore, mind attribution again partially mediated the effect of sacredness on edibility, providing empirical evidence for theorising about the psychological mechanisms that underpin food taboos (Fessler & Navarrete, 2003).

The present findings contribute to the growing literature on the social perception of animals (Loughnan et al., 2014; Sevillano & Fiske, 2016) by bridging the gap between psychological research on religion and mind attribution. To our knowledge, religious differences in the meat paradox (Piazza et al., 2015) have yet to be examined, with only one review paper alluding to the role of religious motivation in determining people's perceptions of animals (Bastian & Loughnan, 2016). In this research, we empirically demonstrated that sacred animals were granted greater privilege in people's minds due to their religious significance, thus being perceived as most worthy of mental life and moral treatment.

Religion, culture, and the meat paradox

Although the meat paradox effect (Loughnan et al., 2010) was not found in our Singaporean sample—where food animals would be expected to be deprived of mental life—one possibility for such lack of finding could be cross-cultural differences in animal perception. While most research on the meat paradox has been conducted with Western samples (Loughnan et al., 2014), a

cross-cultural comparison recently revealed that Chinese are more susceptible to the meat paradox than Westerners (Tian et al., 2016). Compatible with these findings on the importance of cultural traditions, our results indicate that Hindus are more likely to attribute mental life and moral deservingness to holy animals, rather than to deprive food animals of mind and moral status.

The animals did not cluster in the exact same way in the Singaporean and Indian Hindu samples. This observation is not surprising given that the two countries have been shown to differ in numerous ways (e.g., Gelfand et al., 2011; Minkov, 2012), from their cultural history and traditions to tightness, all the way to religious diversity, levels of industrialization, demographic features, and more. How these variables may contribute to the perception of animals among Singaporean and Indian Hindus will be an interesting question for future research.

Furthermore, in Study 2, Indian Hindus did not make a distinction between neutral animals and food animals. One possible explanation for this effect could be the salience of Hinduism and Hindu-related cultural artefacts in India. Not only are Hindus the biggest religious group in India (Klostermaier, 2007), it is noteworthy that religious fundamentalism is on the rise in many parts of India (Saha, 2004). As such, it is possible that the religious teachings of Hinduism exerted a greater impact on our Indian sample who only distinguished between holy and other animals, as compared to our Singaporean sample who delineated three categories instead.

It is also noteworthy that mind attribution, rather than deservingness of moral treatment, emerged as the more stable mental mechanism that mediated the link between sacredness and edibility. A possible reason for our finding could be the relatively higher psychometric quality of the mind perception measure, which stems from a rich literature (Gray et al., 2007). To our knowledge, an established scale that examines moral deservingness towards animals has yet to be validated.

Limitations and future directions

While Hindus were shown to group animals differently compared to Muslims, it should be noted that the present research included only two religious groups. Generalising these findings to other religions and cultures featuring sacred animals will provide important new insights for future theory building. As such, it is feasible that animists who believe that all items on earth possess a living essence (Kenoyer, 1991) may be even more likely than Hindus to anthropomorphize animals. By contrast, while pigs are depicted in Taoist mythology to display higher order mental states, consumption of the animal is commonplace in Taoist traditions (Girardot, 1976). Future research could disentangle the role of cultural depictions and religion-specific beliefs in determining mind attribution and consumption, a link that has been theorised but not yet empirically tested.

In addition, a priori determined cross-religious comparisons could reveal crucial information about mind perception, religiosity and morality. In Study 2, we collected data from a Muslim sample mainly to demonstrate that the findings presently obtained were religion-specific. We therefore did not postulate any a priori hypotheses for this group. However, religious texts from Islam assert that animals created for the consumption of humans should be treated with reverence, as such creatures are believed to be gifts from a higher power (Regenstein et al., 2003). Due to religious teachings that sanction and approve the eating of specific animals, such creatures meant for human consumption could potentially be deemed as sacred in a Muslim sample; in sharp contrast to Hindu perspectives that discourage the eating of holy animals. While our empirical findings are in line with religious theorising, future research could examine why religious differences exist in animal perception, by more systematically selecting and contrasting groups.

For the present research, we intentionally selected participants who strongly identified as being religious. Our results may or may not be generalizable to non-religious individuals. We leave this question to further research. To differentiate between religious socialisation and national culture in shaping social perceptions towards animals, it would be meaningful to survey both religious *and* non-religious Hindus across a broad spectrum of nations, with the expectation that even non-religious Hindus in India would be influenced by the religious values held by the majority members of their community.

In a similar vein, future work should consider multi-item measures when examining animal perception. There exists some debate in the field of psychometrics about the reliability of single-item measures (see Fisher et al., 2016; Gardner et al., 1998). For the present study, where 19 animal targets were rated on multiple characteristics, it was unfeasible to utilise multi-item scales; doing so would have exponentially increased the length of our survey. While single-item measures have their merit (Bergkvist & Rossiter, 2007; Loughnan et al., 2014), subsequent studies could consider reducing the number of targets in favour of more elaborate scales.

CONCLUSION

The present research illustrates that animals deemed to be sacred, are granted greater mental life and moral treatment. Furthermore, mind attribution accounts for why sacred animals are avoided as meat. Our findings bridge the gap between religious psychology and existing

work on the meat paradox, thereby contributing to both domains and opening future avenues for exploration.

SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Appendix S1: Supporting information

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