

Speciesism and Perceptions of Animal Farming Practices as Predictors of Meat Consumption in Australia and Hong Kong

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Abstract

Many people care about animals and do not wish to cause them harm yet continue to eat them. Past research, largely in Western cultural contexts, has found that people's meat consumption is negatively related to how much they know about animal farming practices, and positively related to their endorsement of speciesism (the assignment of moral worth based on species membership). Little is known, however, about how these variables are related to meat consumption in non-Western samples. The present study aimed to determine to what extent perceptions of farming practices and speciesism predict meat consumption among people living in Australia and Hong Kong. Participants were recruited through Facebook advertising and asked to complete a questionnaire that measured speciesism, animal farming perceptions, meat consumption, and meat reduction intentions. Speciesism and perceptions of animal farming practices significantly predicted meat consumption and meat reduction intentions in the Australian sample, but only predicted some of the outcomes in the Hong Kong sample.

Keywords

animals, culture, farming, meat, speciesism, vegetarianism

The 'meat paradox' is a term used to describe how many people care about animals and do not wish to cause them suffering, and yet they continue to eat them (Bastian & Loughnan, 2017). When people recognise that they eat meat even though it is inconsistent with some of their beliefs, such as believing that animal welfare is important, it



can cause feelings of discomfort known as meat-related cognitive dissonance (Bastian & Loughnan, 2017). Meat eaters usually agree that animals should not suffer needlessly in the production of meat and tend to experience cognitive dissonance when they are asked to reflect on the realities of factory farming (Prunty & Apple, 2013). In general, people tend to believe that animals used for meat are normally treated humanely (Rothgerber & Rosenfeld, 2021). This may in part explain why so many people are able to oppose animal cruelty and continue eating meat. Indeed, even though most people say they do not want to see animals suffer, vegetarians and vegans remain a minority around the world (Rosenfeld, 2018; Ruby, 2012).

In many European countries, meat has traditionally been consumed in relatively large quantities, whereas people in many Asian countries have traditionally had diets that were more vegetable and grain based, with relatively smaller amounts of meat. The reasons for this are complex. For example, in China, meat consumption was in part limited to special occasions and those with higher incomes (Nam et al., 2010). Taboos on meat consumption were also common in Japan and India. As parts of Asia continue to become more Westernized through globalisation, meat consumption has been increasing (Nam et al., 2010).

Most studies on meat consumption and its predictors have been conducted in Western populations (Rosenfeld, 2018; Ruby, 2012), and one cannot assume that these findings will necessarily generalize to other cultural contexts. For example, Ruby and Heine (2012) examined how Canadian, American, Hong Kong, and Indian participants perceived the attributes (e.g., intelligence, capacity to form emotional bonds, appearance) of different animals and how these perceptions were related to their feelings about eating them. Perceived intelligence and appearance of the animal were significant predictors of disgust, which predicted willingness to eat the animals, but this effect was stronger for the Canadian and American samples. Social influence (frequency of consumption by friends and family) was also a significant predictor of willingness to eat the animals, particularly among the Hong Kong and Indian participants, suggesting that friends and family may have more influence on people's food choices in more collectivist cultures. Other research has found that showing a roasted pig with the head still present resulted in more disgust and empathy in participants from the US than participants from Ecuador, possibly because the US participants had less exposure to unprocessed meat (Kunst & Haugestad, 2018). Similarly, research suggested French participants utilise more dissonance-reducing strategies than Chinese participants when reflecting on the animal source of meat (Tian et al., 2016). The authors suggested this may be due to the killing of food animals being more industrialised in France than China, such that people are more disconnected from the animal origins of the meat that they consume. While there has been limited research investigating psychological constructs related to meat consumption in Eastern countries, Tian et al. (2019) found that Chinese omnivores scored

higher on meat rationalisation than vegetarians, similar to research done in Western countries (Piazza et al., 2015).

Speciesism

Speciesism is defined as the “prejudice or attitude in favour of the interests of members of one’s own species and against those of members of other species” (Singer, 1975, p. 6). While some would believe that assigning higher value to human life is justified based on humans having higher cognitive abilities and moral agency compared to other species, it is not clear that this is the case, given that people generally value infants and those with severe mental disabilities more than other animals of other species with higher cognitive capacities, such as chimpanzees (Caviola et al., 2019).

Caviola et al. (2019) developed a scale to measure speciesist attitudes and found that it has high test-retest reliability, supporting the idea that speciesism is a stable psychological concept. Speciesism was correlated with other forms of prejudice including racism, sexism, and homophobia. Participants who scored higher on speciesism were more supportive of donations for charities that help people rather than animals, and charities that help dogs rather than help pigs, and were more likely to choose meat snacks over vegetarian ones (Caviola et al., 2019). Further research found that speciesism is a significant predictor of dietary behaviour (Rosenfeld, 2019). Vegetarians endorsed speciesist attitudes less and showed greater animal welfare motivation when making dietary choices than omnivores. When comparing vegetarians and vegans, vegans endorsed speciesist attitudes less and showed greater animal welfare motivation when making dietary choices. In both cases, speciesist attitudes predicted dietary behaviour better than animal welfare motivation alone.

Caviola et al. (2019) noted that attitudes towards certain animal species can vary greatly between cultures. For example, cats and dogs are valued highly as companions in many Western societies as pets but are sometimes used for food in Korea and China (Bastian & Loughnan, 2017; Caviola et al., 2019). Horses are held in high esteem and human consumption of horse meat is banned in countries like the United States but are considered a delicacy in countries like France, Italy, and Belgium (Jastrzębska et al., 2019). Although preferential attitudes towards different species may differ depending on the use of animals in a specific culture, it is unclear whether speciesism is culturally universal.

Animal Welfare Concerns and Knowledge

Animal welfare is a complex idea that has evolved over time from focusing on the health of the animal to including whether the animal is comfortable, able to express innate behaviours, and not suffering from pain, fear, or distress (Cornish et al., 2016). Concern for animal welfare, however, does not always translate smoothly into behaviour—e.g.,

in a study of UK, Italian, and Swedish consumers, most participants considered animal welfare to be very important, although less than half of the sample always considered animal welfare when buying meat (Mayfield et al., 2007). How much people know about animal welfare and agricultural practices also varies greatly. Worsley et al. (2015) found that Australians knew very little about basic animal agriculture practices, but nonetheless tended to approve of farming activities. In a recent survey of Australian consumers, participants knew the most about welfare standards for laying hens, less about meat chickens, and least about pig welfare. Most people said they wanted to know more about animal welfare conditions, and those who reported having more knowledge about animal welfare conditions rated current welfare conditions as poorer (Cornish et al., 2019). While these studies suggest that having more animal welfare knowledge may lead to more ethically informed decision making, much of the research relies on participants' subjective self-assessment of their level of knowledge.

In China, factory farming is becoming the dominant mode of meat production as meat consumption continues to increase (Hansen & Gale, 2014). Concerns about animal welfare are not well publicised in China, and research into common perceptions has revealed that most respondents have limited understanding of animal welfare (You et al., 2014). In general, however, most participants agreed that conditions for pigs and chickens should be improved and supported laws to improve animal welfare, and more than half of respondents were willing to pay more for products from animals raised in higher welfare conditions. Vegetarian culture in China has in the past been shaped by Chinese Buddhist and Daoist philosophies of compassion and of not killing (Cao, 2018). Today, animal welfare and health concerns are seen by the public as being the main motivations for following a vegetarian diet and there are an increasing number of vegetarian restaurants in mainland China (Cao, 2018).

Although some consumers actively inform themselves about how the meat that they eat is produced, many people are motivated to avoid this information. Rothgerber and Rosenfeld (2021) argue that this sort of wilful ignorance is widespread in many societies, and helps people avoid meat-related cognitive dissonance. For example, Knight and Barnett (2008) found that participants did not want to know more about how animals are used by humans, both because it would be upsetting and because it would make it harder to continue taking part in certain practices like eating meat. Similarly, Onwezen and van der Weele (2016) found that a large segment of meat consumers remains "strategically ignorant", feeling some level of responsibility but actively avoiding information about meat production. The level of ignorance that consumers can achieve may differ due to the level of exposure to the production and killing of animals in their country.

The Present Study

Given the previous research that shows speciesism is a predictor of dietary behaviour, and that knowledge of animal farming practices predicts higher welfare concerns, this

study aims to determine the extent to which speciesist attitudes and perceptions of animal farming practices predict meat consumption and attitudes towards meat reduction. This study also aims to build on previous research done in Western cultures and expand on knowledge of meat consumption and its predictors in Hong Kong. To our knowledge, this is the first study that concurrently uses speciesism and animal farming perceptions to predict current and intended meat consumption in two cultures. **Hypothesis 1** was that participants who score lower on speciesism will eat less red meat and have more positive intentions towards meat reduction. This effect was expected to be weaker for poultry and fish, as they are often seen as less prototypical of “meat” (Rothgerber, 2013). **Hypothesis 2** was that the more often participants believe that common animal farming practices occur, such as separating newborn calves from their mothers and killing unwanted male chicks, the less they will consume meat and the more they will intend to reduce their meat intake. Again, this effect was expected to be weaker for poultry and fish. **Hypothesis 3** was that omnivores would endorse speciesism more and score lower on animal farming perceptions (AFP) than vegetarians.

Method

Procedure

We pre-registered the study’s materials, aims, and hypotheses with the Open Science Framework (see Ruby & Northrope, 2024) prior to data collection. A de-identified copy of the dataset is also available here. This research was part of a larger study comparing cultural differences between Australian and Hong Kong participants and attitudes towards vegetarianism, although the analyses and review were conducted separately for the two studies. The study protocol was approved by the authors’ university Human Ethics committee and adhered to the Declaration of Helsinki. Participants read an informed consent form explaining that participation was voluntary and that they were free to withdraw at any time. After indicating their consent, participants completed the questionnaire online on Questionpro.

Participants

A priori power analysis with G* Power (Faul et al., 2009) indicated a minimum sample size of 172 to detect an effect size of $f = 0.25$ for between-subjects ANOVA with 2 groups or correlations $> .25$ with a power of .90 and Type 1 error rate of .05. We recruited participants through targeted Facebook advertisements. For each completion, we made a \$2 donation to the participant’s choice of three different charities (Vitamin Angels, The Good Food Institute, Conservation International).

Inclusion criteria were for participants to be at least 18 years of age, live in either Hong Kong or Australia, and speak either English or Cantonese. In total, 394 participants

viewed the Australian version of the survey; 341 completed it. In total, 234 participants viewed the Hong Kong version of the survey; 193 completed it.

Most participants in both samples were tertiary educated (90% Australia; 88% Hong Kong). Most of the Australian sample were women (87%), compared to a modest majority of the Hong Kong sample (60%). The mean age of the Australian sample (59.44) was higher than the mean age for the Hong Kong sample (34.15). For a detailed account of participant demographics, see [Northrope & Ruby \(2024\)](#). In Australia, 132 participants identified as omnivores, 31 as omnivores with a few restrictions, 77 as reductarians, 39 as partial vegetarians, 35 as full vegetarians and 19 as vegans (8 missing data). In Hong Kong, 78 participants identified as omnivores, 41 as omnivores with a few restrictions, 55 as reductarians, 7 as partial vegetarians, 3 as full vegetarians and 8 as vegans (1 missing data).

Materials

A bilingual native Chinese translator assisted with the translation from English to Cantonese, and another bilingual native Chinese translator assisted with the back translation. Any disagreements were resolved via discussion. For this study, participants completed the following measures:

Speciesism

This measure was assessed by [Caviola et al.'s \(2019\)](#) Speciesism Scale. This scale consists of 6 questions on a standard 7-point agree/disagree scale—e.g., “Morally, animals always count for less than humans”. Previous work has indicated a high internal consistency of .81 and a test-retest correlation of .88 ([Caviola et al., 2019](#)). In our study, reliability was also high (Australia $\alpha = .76$; Hong Kong for $\alpha = .82$).

Animal Farming Perceptions (AFP)

This was measured by a 9-item scale that the research team developed for this study that describe common practices in the animal farming industry based on information provided from the RSPCA website ([RSPCA, 2021](#)). These items and their means are described in [Table 1](#). Less than 1% of meat and dairy products are produced locally in Hong Kong and are largely imported from Brazil, the US, and China ([Yau et al., 2018](#)). The farming practices assessed in the scale are common in these countries as well as Australia ([World Animal Protection, 2020](#)). Still, individual farms do differ in practices, particularly free-range and organic farms, meaning that participants may not know how to respond if they were asked to rate the items as true or false. Given that most of the meat in Australia and overseas is produced in factory farms, participants were asked to rate how often they thought practices occurred on a 5-point scale ranging from “0% of the time” to “100% of the time”. Two of the items were describing welfare practices that do not typically occur, for example “Male piglets are provided with anaesthesia during

Table 1*Perceptions of the Frequency of Different Animal Farming Practices*

| Item | Australia | Hong Kong |
|-----------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------|
| | (n = 341) | (n = 194) |
| 1. Calves are separated from their mothers within a few hours of birth. | 60.19 | 56.06 |
| 2. Male piglets are provided with anaesthesia during castration (reversed). | 15.39 | 35.70 |
| 3. Sheep in transport are confined up to 48 hours without water. | 57.92 | 50.26 |
| 4. Unwanted male chicks in the egg industry are killed promptly by carbon dioxide gassing or maceration. | 78.37 | 50.90 |
| 5. The space occupied by an egg laying hen can be less than the size of a piece of A4 paper. | 60.19 | 56.70 |
| 6. Cattle are provided with shade in hot weather (reversed). | 35.19 | 38.79 |
| 7. Beak trimming of poultry with hot blades is performed without anaesthetic. | 73.83 | 54.12 |
| 8. Meat chickens are selectively bred to grow so fast that it can cause skeletal abnormalities and lameness. | 69.50 | 58.38 |
| 9. Unwanted male calves are slaughtered in their first week of life so that their mothers' milk can be collected for human consumption. | 61.07 | 53.35 |

Note. Items 2 and 6 are uncommon practices so the lower % is expected.

castration”; as such, these items were reverse-scored, as participants’ perceptions were less accurate. In our study, the Cronbach’s alpha coefficient for this scale was .84 for the Australian sample and .83 for the Hong Kong sample.

Attitudes

Attitudes towards agriculture were measured using a 3-item measure developed for this study on a 7-point agree/disagree scale. This measure was not included as part of the main analyses for this study but was included to provide balance to the AFP measure and as a distractor from the main measures.

Meat Consumption

Participants indicated how many days per week they ate Poultry, Red Meat, and Fish/Shellfish on an 8-point scale, from 0 days to 7 days. Participants then indicated “In the next six months, to what extent do you intend to reduce your meat consumption?” on a 5-point scale from 1 “not at all” to 5 “fully”. Participants also indicated which category best described their eating habits: I am an omnivore. I eat all kinds of meat; I am an omnivore. I eat all kinds of meat with a few restrictions (e.g., I do not eat beef, etc.); I am a reducetarian. I have substantially reduced my intake of meat compared to my prior

intake (at least 25% reduction); I am a partial vegetarian (e.g., I don't eat red meat, but eat fish or poultry, etc.); I am a full vegetarian. I eat no animals; and I am a vegan. I eat no animals or animal products (e.g., eggs or dairy).

Demographics and Donations

Participants indicated their gender, age, ethnicity, and education, and selected a charity to which the research team would donate \$2 (see [Northrope & Ruby, 2024](#)).

Data Analysis

Both the Speciesism and Animal Farming Perceptions items met our criteria for configural and metric invariance, but not scalar invariance (see [Northrope & Ruby, 2024](#) for full details). Thus, one can confidently interpret relationships between variables across cultures, but directly comparing mean scores in the Australian sample with mean scores in the Hong Kong sample is not advisable.

We tested Hypotheses 1 and 2 by running multiple regressions to determine to what extent speciesism and AFP predict red meat consumption, poultry consumption, fish consumption, and meat reduction intentions. We used independent *t*-tests to test Hypothesis 3, that omnivores endorse speciesism more and score lower on AFP than vegetarians. Given the uneven spread between the dietary groups, both omnivore groups were combined in to one group and vegetarians and vegans were combined into a separate group. We excluded reducetarians and partial vegetarians from this analysis, as they can vary wildly in their perceived and actual levels of meat consumption ([Rosenfeld, 2018](#)).

Results

Hypothesis 1 and 2

We completed multiple regressions using speciesism and AFP to predict poultry, red meat, and fish/shellfish consumption, as well as intentions to reduce meat consumption. While it was perhaps unclear how veg*ans participants should answer the question regarding intentions to reduce meat consumption in the next 6 months, most responded that they fully intended to do so. Excluding veg*ans from the intentions to reduce regression did not change the pattern of results (the regressions excluding veg*ans are presented in [Northrope & Ruby, 2024](#)). We conducted analyses separately for the Australian and Hong Kong samples (see [Table 2](#)). In the Australian sample, speciesism scores and AFP scores significantly predicted consumption of poultry, red meat, and fish, and meat reduction intentions. Red meat was most strongly predicted by speciesism, with speciesism explaining twice the variance in red meat scores compared to AFP.

Table 2

Regression Summary Table of Speciesism and Animal Farming Perceptions on Meat Consumption and Meat Reduction Intentions

| Predictor | Australian Sample | | | | Hong Kong Sample | | | |
|----------------------------------|-------------------|---------|-------|--------|------------------|---------|-------|------|
| | R^2 | β | t | p | R^2 | β | t | p |
| Poultry Consumption | .17 | | | | .04 | | | |
| Speciesism | | 0.28 | 4.82 | < .001 | | 0.22 | 2.91 | .004 |
| AFP | | -0.20 | -3.54 | < .001 | | 0.02 | 0.30 | .766 |
| Red Meat Consumption | .23 | | | | .02 | | | |
| Speciesism | | 0.41 | 7.46 | < .001 | | 0.14 | 1.86 | .064 |
| AFP | | -0.18 | -2.11 | .036 | | -0.02 | -0.21 | .835 |
| Fish Consumption | .08 | | | | .06 | | | |
| Speciesism | | 0.16 | 2.57 | .011 | | 0.13 | 1.70 | .090 |
| AFP | | -0.17 | -2.86 | .005 | | -0.18 | -2.50 | .013 |
| Meat Reduction Intentions | .18 | | | | .08 | | | |
| Speciesism | | -0.30 | -5.25 | < .001 | | -0.22 | -3.03 | .003 |
| AFP | | 0.20 | 3.51 | .001 | | 0.11 | 1.55 | .112 |

Table 3

*Comparisons of Omnivore and Veg*ans on Speciesism and Animal Farming Perceptions*

| Attitudinal Variable | M (SD) | | df | t | p | d |
|----------------------|---------------|---------------|-----|-------|--------|------|
| | Omnivores | Vegetarians | | | | |
| Australia | $n = 163$ | $n = 54$ | | | | |
| Speciesism | 3.17 (1.05) | 1.77 (0.93) | 215 | 8.69 | < .001 | 1.41 |
| AFP | 61.32 (17.98) | 81.43 (16.38) | 215 | -7.28 | < .001 | 1.17 |
| Hong Kong | $n = 119$ | $n = 11$ | | | | |
| Speciesism | 3.05 (1.06) | 1.45 (0.71) | 128 | 4.88 | < .001 | 1.77 |
| AFP | 53.36 (19.35) | 85.10 (18.01) | 128 | -5.23 | < .001 | 1.70 |

In the Hong Kong sample, Speciesism scores significantly predicted poultry consumption and meat reduction intentions, but not red meat or fish consumption. AFP scores significantly predicted fish consumption but were not a significant predictor of any other outcomes.

Hypothesis 3

We conducted *t*-tests to test for differences in mean scores for speciesism and AFP between omnivores and veg*ans, separately for Australian and Hong Kong samples (see Table 3). Veg*ans scored significantly lower on speciesism and higher on AFP in both samples, with very large effect sizes.

Discussion

Summary of Findings and Interpretations

The hypothesized relationship between speciesism, meat consumption, and meat reduction intentions was fully supported in the Australian sample. In the Hong Kong sample this was only partially supported, with speciesism only predicting poultry consumption and meat reduction intentions, but not red meat or fish consumption. The Australian findings are concordant those of Caviola et al. (2019) and Rosenfeld (2019).

Similarly, AFP significantly predicted consumption of red meat, poultry, fish, and meat reduction intentions in the Australian sample, but only fish intake in the Hong Kong sample. While there has been limited previous research in this area, what research has been conducted suggests that those who have higher perceived knowledge of farming practices eat less pork (Coleman et al., 2018).

Across the outcomes, speciesism and AFP explained 8–23% of the variance in the Australian sample, but only between 2–8% in the Hong Kong sample. Previous research in a Hong Kong sample found that social influence (e.g., how often family and friends ate a particular animal) was a stronger predictor of willingness to eat said animal than in a Canadian sample (Ruby & Heine, 2012). While the present study did not measure social influence, this may in part explain the differences seen here. Another alternative may be that speciesism is not culturally universal, as the scale used in this study has not previously been validated in different cultural contexts (Caviola et al., 2019). We created the Animal Farming Perceptions measure for this study, and although it predicted outcomes well among Australian participants, it had little utility in the Hong Kong sample. For both measures, the criteria for metric invariance, but not scalar invariance, were met, suggesting that one can confidently interpret relationships between these variables across cultures, but should exercise caution in directly comparing mean scores in the Australian sample with mean scores in the Hong Kong sample. Participants in Australia and Hong Kong likely have different levels of exposure to animal farming practices. Less than 1% of meat and dairy products consumed in Hong Kong are produced locally (Yau et al., 2018), whereas in Australia, the majority is locally produced (Australian Government, 2023). Given the level of secrecy in the animal agriculture industry, it is also difficult to objectively know how often certain farming practices actually occur in Australia and

Hong Kong. It may be that the practices do occur more often in either location, which may also explain some of the variance here.

As predicted, omnivores endorsed speciesism more and scored lower on AFP than veg*ans in both samples. This supports previous research which found that vegetarians are less likely to endorse speciesist beliefs when compared to omnivores (Caviola et al., 2019; Rosenfeld, 2019). It also supports past findings that vegetarians are less willing to ignore information about the problems with eating meat (Onwezen & van der Weele, 2016).

Strengths

This study has built on previous research looking at how speciesism predicts meat consumption in Western cultures and extended it using a Hong Kong sample. It also expanded on previous studies that relied on participants' perception of their own agricultural knowledge by measuring how often participants thought common animal farming practices occurred. Together this has helped develop a clearer understanding of the predictors of meat consumptions and meat reduction intentions in very different cultural contexts. Further, by preregistering on the Open Science Framework, this study also helped to combat selective reporting and publication bias and to advance the principles of open science.

The speciesism scale was originally developed in American MTurk samples, and the authors note it had not yet been validated in different cultural contexts (Caviola et al., 2019). To the best of our knowledge, this is the first documented use of the Speciesism Scale in a Hong Kong sample.

Limitations

Firstly, the results of this study are limited by both the sample size and distribution. Most participants in our sample were women. Given that men tend to score higher on speciesism (Caviola et al., 2019) and tend to consume more meat and endorse more pro-meat attitudes (Rothgerber, 2013), the findings from this study may not be reflective of predictors of men's consumption of meat. Surprisingly, the mean age of the Australian sample (59.44) was much higher than the mean age of the Hong Kong sample (34.15), which limits comparisons between the two samples. Due to the anonymous nature of the data collection, it is unclear why the mean age of the Australian sample was so high. Age was not significantly associated with key variables in our sample, with the exception of animal farming perceptions and age in the Hong Kong sample (see Northrope & Ruby, 2024). Another potential confound was that most participants in both samples were tertiary educated, meaning they may have more knowledge of common farming practices than the general population. Veg*ans were a distinct minority in both samples (54 in Australia and 11 in Hong Kong), which reduces the generalizability of the analyses

comparing them to omnivores. Finally, as this study was cross-sectional, it is not possible to draw causal inferences. For example, while vegetarians scored lower on speciesism and higher on animal farming perceptions, it could be that a third factor influences levels of speciesism, animal farming perceptions, and the likelihood of following a veg*an diet, such as family upbringing or greater exposure to animals in childhood.

Conclusion

Reducing meat consumption has benefits not just for animal welfare but also for human health and the environment. This study supports speciesism and animal farming perceptions as important predictors of meat consumption, at least among Australians. Compared to omnivores, veg*ans scored lower on speciesism and higher on animal farming perceptions in both Australia and Hong Kong, suggesting that these omnivore–veg*an differences may not be limited to Western cultural contexts. Future research should continue to investigate correlates of meat consumption in diverse cultural contexts, particularly in non-Western countries where this has been limited previous research. Qualitative research may be needed to further understand details of cultural differences for speciesism that quantitative scales are unable to address. This research may help uncover mechanisms that work in many cultures to encourage more humane, sustainable food choices.

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Ethics Statement: The study protocol was approved by the authors' university Human Ethics committee and adhered to the Declaration of Helsinki.

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