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Misogyny on the menu: Gender role beliefs and the evaluation of meat alternatives

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THIS IS A PREPRINT OF A MANUSCRIPT THAT HAS NOT BEEN PEER-REVIEWED.

Abstract

Meat alternatives could play an important role in global meat reduction, yet there may be psychological obstacles for adopting a meat-free diet relating to gender roles. In two experiments (Study 1, $N = 268$ US-Americans; Study 2, $N = 216$ UK students), we found that omnivores rated identical images of dishes as less masculine and more negatively (including lower willingness to try them) when labelled as plant-based vs. regular meat. Furthermore, lower perceived masculinity was associated with more negative dish evaluations, especially among participants higher in traditional gender role beliefs. Study 2 further showed that participants also rated lab-grown meat (i.e., cultured meat) as less masculine and more negative than regular meat, but as more masculine and equally negative as plant-based meat. We discuss the importance of symbolic values (i.e., meat-masculinity link) and social norms (i.e., traditional gender roles) for people's perceptions of meat alternatives and the implications for marketing.

Keywords: Gender roles, masculinity, meat consumption, veganism, cultured meat

GENDER ROLES AND MEAT ALTERNATIVES

Food groups differ vastly in their impact on the environment. Animal-based food production disproportionately contributes to the degradation of terrestrial and marine ecosystems and produces significantly higher greenhouse gas emissions (Godfray et al., 2018; Poore & Nemecek, 2018). Animal-based food production also poses substantial ethical challenges to people's values of avoiding harm to sentient beings (Bastian & Loughnan, 2017; Dhont & Hodson, 2020) and a significant risk for public health (e.g., emergence of antibiotic resistance, infectious disease outbreaks; Phillips, 2003; Rohr et al., 2019). Hence, from sustainability, ethical, and health perspectives, there is an increasing consensus that a shift to plant-based products is urgently needed (Poore & Nemecek, 2018; Willett et al., 2019).

However, meat-eaters are often strongly attached to meat consumption and reluctant to replace meat (Graça et al., 2015; Siegrist & Hartmann, 2019). While using animals as a food source can be justified by ascribing lower moral value to food animals (Caviola et al., 2019, 2021; Dhont et al., 2020) there also may be psychological losses people feel when giving up meat. One such key barrier for consumer acceptance of meat alternatives might be the symbolic masculine value of meat, representing strength, health, and virility (Nakagawa & Hart, 2019; Rozin et al., 2012). Yet, this has received little research attention to date. Here, we investigated how masculinity perceptions of alternatives to regular meat may distort evaluations of these alternatives and people's willingness to try them as well as the role of individual differences in gender role beliefs.

Meat, Masculinity, and Negative Views of Vegans

Food groups are associated with various symbolic meanings, including gender stereotypes (Sobal, 2005). Meat is arguably the food group most strongly symbolizing power, strength, and masculinity. Historically, this may be rooted in the male practice of hunting to provide meat (Gelfer, 2013; Rozin et al., 2012) and the fact that meat has been selectively

GENDER ROLES AND MEAT ALTERNATIVES

made available for men rather than women (Nath, 2011; Rozin et al., 2012; Ruby & Heine, 2011), which helped meat become a patriarchal symbol of dominance and masculinity (Adams, 2015; Sumpter, 2015). Although no longer imposed, gender differences in meat consumption prevail. Across cultures, men consume more and larger portions of meat and are less likely to be vegetarian or vegan than women (Pfeiler & Egloff, 2018; Rosenfeld, 2018; Ruby, 2012).

The association of meat with masculinity has also endured and is reinforced through advertisements and other media content (Julier & Lindenfeld, 2005; Rogers, 2008; Rothgerber, 2013). Meat is typically considered manly, healthy, and necessary for strength (Love & Sulikowski, 2018; Rozin et al., 2012) and those who avoid meat consumption (e.g., vegetarians or vegans) are perceived as less masculine than those who eat meat (Ruby & Heine, 2011; Thomas, 2016). The meat-masculinity link is also reflected in gendered negative attitudes towards veganism. For example, while both vegan men and women are subject to bias, vegan men are evaluated more negatively than vegan women, presumably because they violate masculine gender role expectations (MacInnis & Hodson, 2017). However, it is unclear whether the gendered nature of anti-veganism is also expressed in evaluations of vegan meat alternatives, even when considering products that look highly similar to regular meat.

Plant-Based Meat Alternatives

Plant-based meat alternatives contain some form of textured plant protein and imitate the texture, flavour, appearance, and nutritional value of meat. These products are typically more sustainable to produce than meat (Hashempour-Baltork et al., 2020; Kumar et al., 2017), and have the potential to facilitate global meat reduction without the need for pervasive dietary changes (Hoek et al., 2011). However, overall consumer acceptance of plant-based meat alternatives is low (Siegrist & Hartmann, 2019; van Loo et al., 2020). Given

GENDER ROLES AND MEAT ALTERNATIVES

the generally negative attitudes towards veganism (MacInnis & Hodson, 2017), even when meat alternatives are extremely similar to meat, consumer evaluations may be relatively negative. We argue that this is, in part, because they lose the symbolic masculine value afforded to regular meat products.

To the best of our knowledge, no research has investigated the perceived masculinity (or femininity) of plant-based meat alternatives. Their production requires no killing or butchering of animals, processes that are arguably integral to meat's symbolic value representing masculinity and dominance over animals (Adams, 2015; Sobal, 2005). Meat substitutes may also evoke the symbolic feminine value associated with veganism (Ruby & Heine, 2011; Sobal, 2005). Hence, we expect that people will perceive meat dishes as less masculine if they are labelled as plant-based rather than as regular meat. Furthermore, given how strongly people value meat for its symbolic masculinity (Bogueva et al., 2017), we further expect that the less masculine people perceive plant-based (vs. regular) meat to be, the more negative their evaluation will be. Moreover, we expect these associations to be particularly pronounced for individuals who endorse traditional gender role beliefs.

Traditional Gender Role Beliefs

Given the gendered nature of how people perceive meat and vegan products, their general beliefs about gender roles (i.e., traditional vs. progressive) likely play an important role in evaluations of meat and meat alternatives. Indeed, consumers are generally more favorable towards a product when its symbolic value matches their personal values (Allen et al., 2008). Traditional gender role beliefs constitute the stereotypes and prescriptive norms that masculinity is associated with agentic qualities and positions of power, and therefore more suited for men, whereas femininity is associated with communal qualities, caring responsibilities, and subordinate roles, and therefore more suited for women (Connor et al., 2017; Davis & Greenstein, 2009). People who strongly value such traditional notions of

GENDER ROLES AND MEAT ALTERNATIVES

masculinity may thus also strongly value the masculine symbolism of meat, which in turn, can have negative implications for the evaluation of meat alternatives and willingness to reduce meat intake (de Backer et al., 2020). In contrast, those who endorse less traditional notions of masculinity may care less about the masculine symbolism of meat and thus consider the perceived masculinity of products less relevant when evaluating them. Therefore, we expected that traditional gender role beliefs would moderate the effect of perceived masculinity of plant-based (vs. regular) meat, such that lower masculinity would predict more negative evaluations especially for those high (vs. low) in traditional gender role beliefs.

Cultured Meat

We also considered perceptions of cultured (or clean) meat. Cultured meat is meat grown from animal-cells and has been proposed as a possible solution to the problems of excessive global meat consumption (Bryant & Barnett, 2018; Post, 2012). On the one hand, cultured meat may be viewed similarly to plant-based meat because the production of cultured meat does not involve the killing of animals. Hence, it could be expected that people will perceive meat dishes as less masculine and evaluate them more negatively when labelled as cultured (vs. regular) meat. On the other hand, cultured meat might retain the symbolic masculine status of meat because it consists of actual animal flesh, and thus receive higher masculinity ratings and more positive evaluations than plant-based meat, but no marked differences with regular meat.

The Present Research

In two experiments, we investigated whether masculinity perceptions and traditional gender role beliefs are associated with evaluations of plant-based and cultured (vs. regular) meat among omnivores. In Study 1, we presented participants with photos of food dishes

GENDER ROLES AND MEAT ALTERNATIVES

which were either labelled as plant-based meat or regular meat (see also Krings et al., 2022), using a between-subjects design. We tested the following hypotheses:

- 1) Dishes labelled as plant-based meat are perceived as less masculine and evaluated more negatively than dishes labelled as regular meat.
- 2) Lower masculinity perceptions of plant-based (vs. regular) meat dishes are associated with more negative evaluations of plant-based versus regular meat.
- 3) The association between perceived masculinity and evaluations of plant-based meat dishes (vs. regular meat) will be stronger for those higher (vs. lower) in traditional gender role beliefs.

In Study 2, we aimed to replicate and extend Study 1 and tested the same hypotheses in a within-subjects design, while also exploring the perceived masculinity and evaluations of cultured meat. Both studies received ethical approval and all materials and datafiles are available at https://osf.io/f6ytk/?view_only=967c0f8eea274d668caf91f2a9c7d4ff.¹

Study 1

Method

Participants and Procedure. Participants were 302 adults based in the USA and recruited via MTurk (Buhrmester et al., 2011) who were invited to participate in an online experiment for \$0.50 as compensation. Given the focus on omnivores' evaluations of plant-based and regular meat, those with restricted diets were excluded from all analyses, leaving 268 participants (48.1 % women; 51.9 % men; age range 18-80, $M = 35.76$; $SD = 11.55$). Sensitivity analysis in G*Power revealed that we had 80% power to detect a small interaction effect ($f^2 = 0.02$). Participants were asked to evaluate images of dishes followed by a survey including a measure of traditional gender role beliefs.²

Materials and Design. Participants were presented with the same six food images in random order. Three images showed dishes made from regular meat from farmed animals

GENDER ROLES AND MEAT ALTERNATIVES

(i.e., a regular meat burger, meatballs, and meat tacos), and three images showed parallel dishes made from plant-based meat alternatives, which looked highly similar to regular meat (see online supplement; Krings et al., 2022). Critically, to test the effect of “regular meat” versus “plant-based meat”, while controlling for what was in fact presented in the images, we manipulated how the dishes were labelled, and randomly allocated participants to a *meat* or *plant-based* condition. In one condition, the dishes were labelled as regular meat, while in the other condition, they were labelled as plant-based meat.

Participants were asked to evaluate the dishes in terms of appeal (1, *extremely appealing*; 7, *extremely repulsive*), smell (1, *smells extremely good*; 7, *smells extremely bad*), and taste (1, *tastes extremely good*; 7, *tastes extremely bad*) and how likely they would be to eat each dish (1, *extremely likely*; 7, *extremely unlikely*) if it was offered on a buffet. The items were averaged across images into a single score with higher scores indicating more positive evaluations ($\alpha = .95$, $M = 5.04$, $SD = 1.15$).

Participants rated the *masculinity* of the dishes on a 7-point scale ranging from *extremely masculine* to *extremely feminine*. Scores were averaged across images and reversed so that higher scores reflect higher masculinity ($\alpha = .79$, $M = 4.39$, $SD = 0.88$).

We measured *traditional gender role beliefs* with Glick and Fiske’s (1996) 22-item Ambivalent Sexism Inventory, tapping into both hostile (e.g., “Many women are actually seeking special favors, such as hiring policies that favor them over men, under the guise of asking for ‘equality’”) and benevolent sexism (e.g., “A good woman should be set on a pedestal by her man”). Participants responded on 7-point scales (1, *completely disagree*; 7, *completely agree*) and items were averaged into a single score, with higher scores reflecting stronger endorsement of traditional gender role beliefs ($\alpha = .93$, $M = 3.55$, $SD = 1.21$).

Results

GENDER ROLES AND MEAT ALTERNATIVES

To test Hypothesis 1, we investigated the differences in masculinity ratings and dish evaluations between conditions. As expected, a univariate ANOVA showed that dishes were perceived as significantly less masculine in the plant-based meat condition ($M = 4.27$, $SD = 0.86$) than the regular meat condition ($M = 4.50$, $SD = 0.89$), $F(1, 266) = 4.33$, $p = .038$, $\eta^2 = .016$. Furthermore, participants evaluated the dishes more negatively in the plant-based meat condition ($M = 4.84$, $SD = 1.18$) than the regular meat condition, ($M = 5.23$, $SD = 1.08$), $F(1, 266) = 8.84$, $p = .003$, $d = \eta^2 = .032$.

Next, we tested Hypotheses 2 and 3 by investigating whether the label effect on perceived masculinity was associated with dish evaluations and whether this association was stronger for participants higher in traditional gender role beliefs. We tested a moderated mediation model with 5000 bootstrap samples in SPSS (model 14 in Process; Hayes, 2017) with label condition (plant-based vs. regular meat) as the predictor of masculinity perceptions, which in turn was associated with dish evaluations. Furthermore, we entered gender role beliefs as a moderator of the association between masculinity perceptions and dish evaluations. Perceived masculinity and gender role beliefs were mean-centered prior to the analysis.

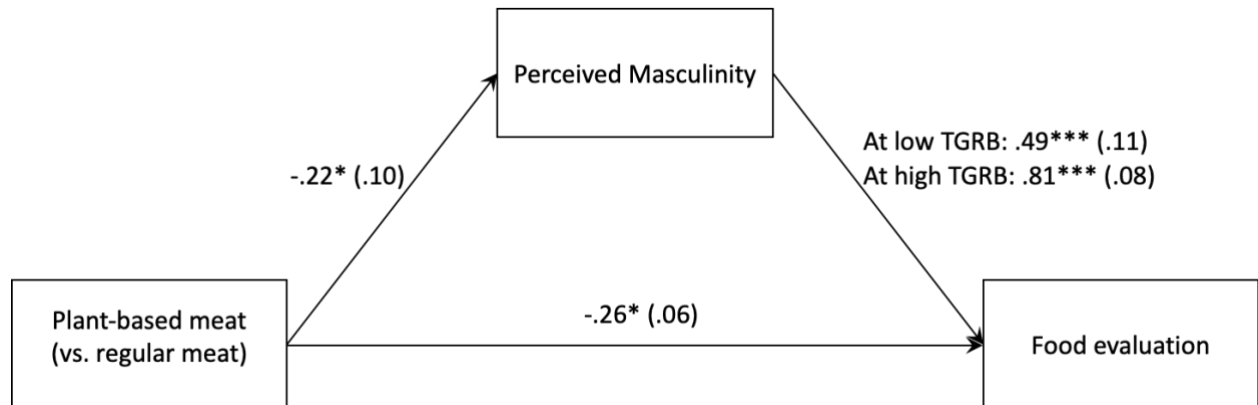
Lower perceived masculinity of the dishes was significantly associated with more negative evaluations, $b = .65$, $s.e. = .07$, $t(263) = 9.39$, $p < .001$, 95% CI = [.514, .787] (Figure 1). As predicted, we found a significant interaction between perceived masculinity and gender role beliefs, $b = .14$, $s.e. = .05$, $t(263) = 2.52$, $p = .012$, 95% CI = [.029, .241]. The association between masculinity and dish evaluation was stronger for participants higher in traditional gender role beliefs, $b = .81$, $s.e. = .08$, $t(263) = 10.13$, $p < .001$, 95% CI = [.656, .972], than for those lower in traditional gender role beliefs, $b = .49$, $s.e. = .11$, $t(263) = 4.51$, $p < .001$, 95% CI = [.274, .699]. Furthermore, dish label had a significant indirect effect on dish evaluation through perceived masculinity, but only for those higher in traditional

GENDER ROLES AND MEAT ALTERNATIVES

gender role beliefs, $b = -.18$, 95% BCI = $[-.362, -.012]$, not for those lower in traditional gender role beliefs, $b = -.106$, 95% BCI = $[-.242, .001]$.³

Figure 1

Results of Moderated Mediation Model in Study 1



Note. TGRB = Traditional gender role beliefs. * $p < .05$, ** $p < .01$, *** $p < .001$.

In sum, participants evaluated dishes as less masculine and more negatively when labelled as plant-based than as regular meat. Furthermore, lower perceived masculinity showed a pronounced association with more negative dish evaluations of plant-based (vs. regular) meat dishes, especially among those higher (vs. lower) in traditional gender role beliefs.

Study 2

The aim of Study 2 was to replicate the results of Study 1 using a within-subjects design. Thus, we tested whether the effects of dish label on masculinity perceptions and evaluations also hold when participants make a direct and likely conscious comparison between regular meat and meat alternatives. Furthermore, we included a third condition to test the competing expectations regarding the evaluations of *cultured meat*.

Method

GENDER ROLES AND MEAT ALTERNATIVES

Participants and Procedure. Participants were 246 UK university students who participated for course credit. Those with restricted diets were removed from the analyses, leaving 216 participants (81.9 % women, 17.6 % men, 0.5% selected “prefer not to say”, age range 17-29, $M = 19.09$, $SD = 1.75$). Sensitivity analysis in G*Power revealed that we had 80% power to detect a small interaction effect ($f^2 = 0.03$). Participants gave informed consent and then evaluated food images, followed by completion of a larger questionnaire that included the measure of gender role beliefs.

Materials and Design. Participants were presented with nine images, including three images of regular meat dishes, three images of plant-based meat dishes, and three images of cultured meat dishes (see online supplement). Critically, to be able to test the effect of dish label (“regular meat” vs. “plant-based meat” vs. “cultured meat”), while controlling for what was actually shown in the photos, the label assigned to each dish varied across participants. Specifically, the dish labels were counterbalanced across participants with each dish presented as regular meat, plant-based meat, or cultured meat to a third of participants, respectively. The descriptions of regular and plant-based meat were identical to Study 1. The description for cultured meat read: *“The food in these pictures is made from clean meat, which is structurally identical to regular meat but cultured in the laboratory.”*

Participants evaluated each dish by completing the same items as in Study 1.⁴ Traditional gender role beliefs ($\alpha = .91$, $M = 3.20$, $SD = 1.02$) were also measured as in Study 1.

Results

To test the effect of dish label, we conducted two repeated-measures ANOVAs with dish label (regular vs. plant-based vs. cultured meat) as the independent within-subjects variable, and perceived masculinity and dish evaluation as the dependent variables, respectively (Table 1 and Figure 2). The first analysis revealed a significant effect of dish

GENDER ROLES AND MEAT ALTERNATIVES

label on perceived masculinity of the dishes, $F(2, 214) = 24.43, p < .001, \eta^2 = .19$.

Specifically, dishes labelled as regular meat were perceived as significantly more masculine than dishes labelled as plant-based meat, $F(1, 215) = 48.39, p < .001, \eta^2 = .18$, and as cultured meat, $F(1, 215) = 8.17, p = .005, \eta^2 = .04$. Furthermore, cultured meat was perceived as significantly more masculine than plant-based meat, $F(1, 215) = 22.61, p < .001, \eta^2 = .10$.

The second analysis revealed a significant effect of dish label on dish evaluation, $F(2, 214) = 27.61, p < .001, \eta^2 = .21$. Participants evaluated the dishes labelled as plant-based meat and as cultured meat significantly more negatively than dishes labelled as regular meat, $F(1, 215) = 46.53, p < .001, \eta^2 = .18$, and $F(1, 215) = 32.98, p < .001, \eta^2 = .13$, respectively. There was no significant difference in the evaluation of cultured meat and plant-based meat, $F(1, 215) = 1.25, p = .265, \eta^2 = .01$.

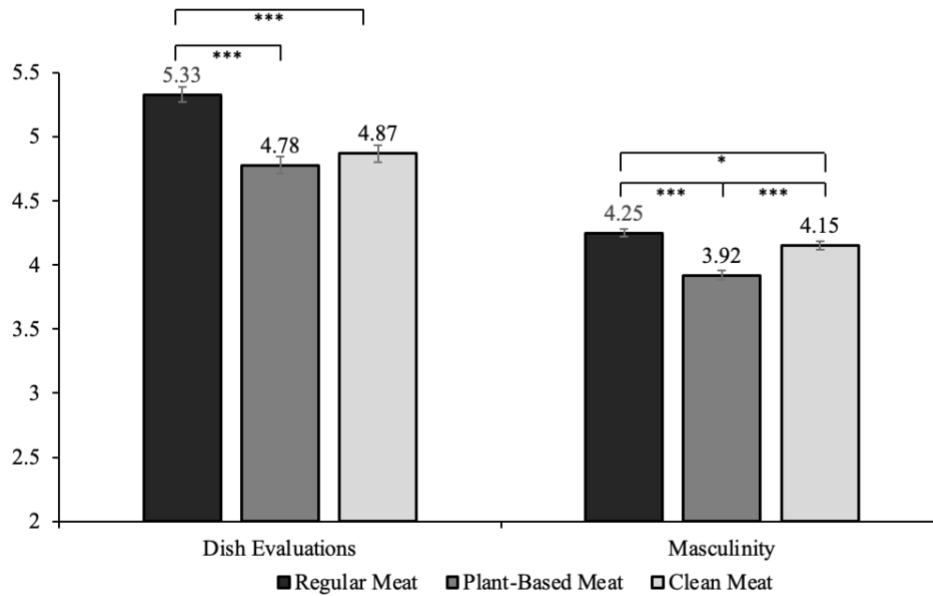
Table 1

Means and Standard Deviations of Dependent Variables for Each Label Condition in Study 2

	Regular meat			Plant-based meat			Cultured meat		
	α	M	SD	α	M	SD	α	M	SD
Dish Evaluations	.87	5.33 ^a	0.95	.88	4.78 ^b	0.99	.89	4.87 ^b	1.04
Masculinity	/	4.25 ^a	0.48	/	3.92 ^b	0.57	/	4.15 ^c	0.53

Note. Means not sharing the same letter are significantly different from each other. Higher scores for dish evaluations indicate more positive evaluations.

GENDER ROLES AND MEAT ALTERNATIVES

Figure 2*Dish Evaluations and Masculinity by Condition in Study 2*

Note. Bars show standard errors. Higher scores for dish evaluations indicate more positive evaluations. * $p < .05$, *** $p < .001$.

Next, we tested whether lower masculinity ratings of plant-based (vs. regular) meat was associated with more negative dish evaluations, yet especially among those scoring higher (vs. lower) on traditional gender role beliefs. We followed the analytic approach for moderation and mediation analysis in within-subjects designs proposed by Montoya (2018; Montoya & Hayes, 2017) in Mplus (Version 8, Muthen & Muthen, 1998-2019). In statistical terms, we entered the perceived masculinity of plant-based vs. regular meat dishes (i.e., the mediator), the centred scores of traditional gender role beliefs (i.e., the moderator), and the interaction term between perceived masculinity and traditional gender role beliefs (i.e., mediator \times moderator interaction) as predictors of evaluations of plant-based vs. regular meat dishes (i.e., the dependent variable). We also controlled for the average of perceived masculinity across both conditions (grand mean centred).

GENDER ROLES AND MEAT ALTERNATIVES

The main effect of perceived masculinity of plant-based (vs. regular) meat dishes was not significantly associated with evaluations of plant-based (vs. regular) meat dishes, $\beta = .02$, $b = .04$, $se = .13$, $p = .77$, 95% CI = [-.217, .293]. More critically, as predicted, we found a significant interaction between traditional gender role beliefs and perceived masculinity on dish evaluations, $\beta = .17$, $b = .25$, $se = .12$, $p = .037$, 95% CI = [.011, .485], such that the association between perceived masculinity and dish evaluations was significant for participants higher in traditional gender role beliefs, $b = .29$, $s.e. = .13$, $p = .027$, 95% CI = [.033, .548], but not for those lower in traditional gender role beliefs, $b = -.21$, $s.e. = .22$, $p = .322$, 95% CI = [-.640, .210]. Furthermore, the indirect effect of label on dish evaluations via perceived masculinity was significant for participants higher in traditional gender role beliefs, $b = .10$, $s.e. = .046$, $p = .035$, 95% CI = [.007, .185], but not for those lower in traditional gender role beliefs, $b = -.07$, $s.e. = .07$, $p = .326$, 95% CI = [-.213, .071].

Finally, we tested similar models to explore the effects of plant-based (vs. cultured) meat and of cultured (vs. regular) meat. The results showed that lower perceived masculinity of plant-based (vs. cultured) meat dishes was associated with more negative evaluations of plant-based (vs. cultured) meat dishes, $b = .35$, $se = .14$, $p = .013$, 95% CI = [.075, .635]. Similarly, lower perceived masculinity of cultured (vs. regular) meat dishes was associated with more negative evaluations of cultured (vs. regular) meat dishes, $b = .35$, $se = .18$, $p = .048$, 95% CI = [.004, .706]. These associations were, however, not significantly moderated by traditional gender role beliefs, $b = -.02$, $se = .12$, $p = .854$, 95% CI = [-.529, .215] and $b = -.35$, $se = .18$, $p = .059$, 95% CI = [-.711, .014], respectively.

In sum, Study 2 replicated the findings of Study 1 by demonstrating that participants rated plant-based meat dishes as less masculine and more negatively than regular meat. Furthermore, perceived masculinity of plant-based (vs. regular) meat was associated with more negative evaluations for those higher, but not those lower, in traditional gender role

GENDER ROLES AND MEAT ALTERNATIVES

beliefs. Extending these findings, cultured meat was rated as less masculine and more negatively than regular meat, and as more masculine, but not significantly more positively, than plant-based meat.

General Discussion

Global meat consumption bears several problems – co-causing climate change, challenges for human health, ethical problems associated with mass-farming and killing of animals, and the likelihood of zoonotic diseases and antimicrobial resistance. Alternatives to regular meat, both plant-based and cultured, could play an integral part in global meat reduction. However, the current findings indicate that such efforts might be hindered by the interplay between the symbolic masculine value attached to meat and a core societal factor outside the food product, namely traditional gender roles.

Participants evaluated identical images of meat dishes more negatively when labelled as plant-based or cultured meat rather than regular meat. That is, participants found these dishes more repulsive, attributed them less positive sensory qualities such as taste and smell, and were less willing to try them. Moreover, participants evaluated dishes labelled as plant-based or cultured meat (vs. regular meat) as significantly less masculine. Lower masculinity perceptions of plant-based (vs. regular) meat were also significantly associated with more negative evaluations of plant-based (vs. regular) meat for participants who endorse traditional gender role beliefs more strongly, whereas this association was weaker (Study 1) or not significant (Study 2) for participants lower on traditional gender role beliefs.

Importantly, we used the same images across label conditions (i.e., counterbalanced design), allowing for a direct test of the labels and ruling out possible confounds of visually appealing cues or what type of meat was actually presented in the images. As such, our findings convincingly highlight the importance of the symbolic masculine value of meat and

GENDER ROLES AND MEAT ALTERNATIVES

the role of traditional gender role beliefs for the perceptions of meat alternatives and evaluation of food dishes.

Perceptions and Evaluations of Plant-based Meat Alternatives

The current findings indicate that plant-based food evokes lower expectations of sensory qualities and lower intentions to try products. This is important considering the crucial role sensory aspects play in the acceptance of plant-based meat alternatives (Hoek et al., 2011). Negative expectations of sensory qualities might thus in part explain why consumers show a low preference for plant-based meat alternatives, even though food technology has allowed them to look and taste highly similar to regular meat (He et al., 2020). However, evaluations of plant-based meat alternatives also appear to be negatively influenced by the societal stigma associated with plant-based diets and veganism (MacInnis & Hodson, 2017), and specifically the association with femininity and weakness.

In Western diets, meat products have long been associated with masculinity, expressing strength and dominance (Adams, 2015; Rozin et al., 2012), which is in part attributed to the fact that meat production requires dominance over and violent acts towards animals (Lupton, 1996). Consistent with this theorizing, our findings suggest that plant-based meat replacements are perceived as less masculine not because they look different from “real” meat dishes, but simply because they are not made from animal flesh, stripping them of their symbolic masculine status. Moreover, as shown by our findings, this lack of symbolic masculine value of plant-based meat alternatives tends to be particularly important for those who strongly value traditional notions of masculinity (i.e., higher on traditional gender role beliefs).

In sum, our findings indicate that developing products that are highly similar to regular meat might not be sufficient to promote meat reduction and plant-based diets. Indeed,

GENDER ROLES AND MEAT ALTERNATIVES

consumers hold negative attitudes towards plant-based diets that go beyond the food itself, linked to social factors that are associated with meat and its consumption.

Perceptions and Evaluations of Cultured Meat

Theoretically, cultured meat drastically reduces the need for the use of animals in meat production (e.g., Hopkins & Dacey, 2008), mitigating the moral problems associated with large-scale factory farming (Bryant & Barnett, 2018; but see Chriki & Hocquette, 2020). Previous research suggests that on average, consumers would be willing to try cultured meat, but would not be inclined to substitute regular meat with it (Bryant & Barnett, 2018).

Moving beyond previous research on product-related barriers to cultured meat acceptance, our findings revealed the role of masculinity perceptions of cultured meat. Specifically, our findings suggest that cultured meat has a social standing in between plant-based and regular meat, retaining some of the subjectively valued qualities of regular meat, but losing others. Yet, despite being perceived more masculine than plant-based meat, evaluations (e.g., expected taste and smell, and willingness to try) of cultured meat did not significantly differ from evaluations of plant-based meat. Therefore, the reasons why cultured meat is evaluated more negatively than regular meat may lie in other factors than why plant-based meat is devalued. For example, common concerns about cultured meat are its perceived safety because of the use of new food technologies (Krings et al., 2022) and its perceived “unnaturalness” (Bryant & Barnett, 2018). Thus, participants in our studies rejected cultured meat to the same extent as plant-based meat, but likely at least partly for different reasons.

Implications

Our results offer insights that can aid the marketing of meat alternatives. Companies already manipulate the *appearance* of the food itself to make it more appealing to consumers. The Impossible Burger™, for example, contains iron heme, which mimics the bloody appearance of a raw beef burger. Our research, however, suggests that simply making plant-

GENDER ROLES AND MEAT ALTERNATIVES

based meat replacers appear more like regular meat might not be sufficient. In our studies, even when the product depicted consisted of regular meat, the mere fact that we labelled it as plant-based meat led participants to rate it as less masculine and less appealing than an identical product labelled as regular meat. Therefore, a possibly effective marketing campaign could be to frame meat alternatives in ways that emphasize male ideals of autonomy and self-reliance, encouraging men to think for themselves rather than following societal expectations (Rothgerber, 2013).

Marketers could also emphasize characteristics of products that likely appeal to men, for instance by highlighting the high protein levels on the packaging. Future studies could investigate the effectiveness of such advertising. However, encouraging men to shift towards meat alternatives by appealing to traditional notions of masculinity might also strengthen gender stereotypes and norms. Promoting more modern and flexible notions of masculinity with increased appreciation of traditionally feminine characteristics seems essential to tackle this problem (de Backer et al., 2020).

Limitations and Directions for Future Research

Before closing, some limitations should be noted. Firstly, we measured perceived masculinity instead of manipulating it. Therefore, we cannot conclude that masculinity has a causal effect on the evaluation of plant-based meat alternatives. Future studies could try to directly manipulate the masculinity of plant-based meat alternatives.

Further, it is possible that participants have tried, and not enjoyed, plant-based meat products in the past. These past negative experiences may have influenced dish evaluations. Future research could take wider range of variables into account, including participants' familiarity with plant-based products, their frequency of meat consumption, and how attached they are to eating meat (Graça et al., 2015). Participants could also taste and evaluate plant-

GENDER ROLES AND MEAT ALTERNATIVES

based meat dishes with randomized labels (plant-based vs. regular meat), which would provide an even more robust test of our hypotheses.

Conclusion

Plant-based products are becoming increasingly socially accepted and thus hold potential to facilitate global meat reduction. However, the belief that “meat is manly”, along with traditional gender role ideals, are complicating efforts to promote meat substitution. Although the availability of meat alternatives is important to promote plant-based diets, the current research highlights the importance of addressing symbolic values (i.e., meat-masculinity link) and social norms (i.e., traditional gender roles).

GENDER ROLES AND MEAT ALTERNATIVES

Notes

- 1) In both studies, we tested for outliers (values more than three standard deviations above or below the mean) on all dependent variables and did not detect any outliers.
- 2) The survey also included a measure of sex roles for exploratory purposes.
- 3) We found no significant interactions with participant gender (see online supplement).
- 4) The measure included an additional item (delicate – bold) which was not or only weakly correlated with the other items and therefore omitted.

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GENDER ROLES AND MEAT ALTERNATIVES

Misogyny on the menu: Gender role beliefs and the evaluation of alternatives to meat**SUPPLEMENT****Gender moderation analyses in Study 1**

- a) Gender was first entered as moderator of the main effect of condition on food evaluation (model 1 in Process; continuous variables that define products were mean-centred). There was no main effect of gender on food evaluation, $b = -.11$, $se = .20$, $t = -.56$, $p = .571$, 95% CIs = [-0.499, 0.276]. There was no significant interaction between gender and condition on food evaluation, $b = .06$, $se = .28$, $t = .21$, $p = .832$, 95% CIs = [-0.492, 0.611].
- b) Gender was then entered as a moderator of the main effect of condition on masculinity perceptions (model 1 in Process; continuous variables that define products were mean-centred). There was no main effect of gender on masculinity perceptions, $b = -.19$, $se = .22$, $t = .30$, $p = .205$, 95% CIs = [-0.493, 0.106]. There was no significant interaction between gender and condition on masculinity perceptions, $b = .07$, $se = .22$, $t = .30$, $p = .761$, 95% CIs = [-0.361, 0.493].

Note: Participant gender was coded as missing if not male or female to allow for the moderation analyses.

GENDER ROLES AND MEAT ALTERNATIVES

Materials Study 1

(1) Food image evaluations

Regular meat:

In the following section, you will be presented with images of food. The food in these pictures is made from **regular meat**.

After viewing each image, you will be asked a few questions. Please answer as accurately and honestly as you can.

Plant-based meat:

In the following section, you will be presented with images of food. The food in these pictures is made from **plant-based meat alternatives**.

After viewing each image, you will be asked a few questions. Please answer as accurately and honestly as you can.

Imagine you had this dish in front of you and please indicate how you feel it would look, smell, taste etc.

Extremely appealing - Extremely repulsive

Smells extremely good – Smells extremely bad

Tastes extremely good – Tastes extremely bad

Extremely masculine – Extremely feminine

Imagine the dish above was offered on a buffet. How likely would you be to eat it?

Extremely likely – Extremely unlikely

(all 7-point scales)

GENDER ROLES AND MEAT ALTERNATIVES

Dish images

Participants saw the six images presented below, with three images depicting regular meat and three images depicting plant-based meat. However, participants were unaware what was actually presented in the photos as the label assigned to all dishes was either “regular meat” or “plant-based meat” depending on the experimental condition.

Regular Meat



Plant-Based Meat



GENDER ROLES AND MEAT ALTERNATIVES



(2) Traditional gender role beliefs

Below is a series of statements concerning men and women and their relationships in contemporary society. Please indicate the degree to which you agree or disagree with each statement.

Strongly disagree – Strongly agree (7-point scale)

- No matter how accomplished he is, a man is not truly complete as a person unless he has the love of a woman.
- In a disaster, women ought not necessarily to be rescued before men.
- People are often truly happy in life without being romantically involved with a member of the other sex.
- Many women have a quality of purity that few men possess.
- Women should be cherished and protected by men.
- Every man ought to have a woman whom he adores.
- Men are incomplete without women.
- A good woman should be set on a pedestal by her man.
- Women, compared to men, tend to have a superior moral sensibility.
- Men should be willing to sacrifice their own well-being in order to provide financially for the women in their lives.
- Women, as compared to men, tend to have a more refined sense of culture and good taste.
- Many women are actually seeking special favours, such as hiring policies that favour them over men, under the guise of asking for "equality".
- Most women interpret innocent remarks or acts as being sexist.

GENDER ROLES AND MEAT ALTERNATIVES

- Women are too easily offended.
- Feminists are NOT seeking for women to have more power than men.
- Most women fail to appreciate fully all that men do for them.
- Women seek to gain power by getting control over men.
- Women exaggerate problems they have at work.
- Once a woman gets a man to commit to her, she usually tries to put him on a tight leash.
- When women lose to men in a fair competition, they typically complain about being discriminated against.
- There are actually very few women who get a kick out of teasing men by seeming sexually available and then refusing male advances.
- Feminists are making entirely reasonable demands of men.

(3) Demographic questions

- What is your gender? (Male, Female, Other, Prefer not to say)
- What is your age?
- How do characterise your political orientation? When it comes to politics do you usually consider yourself to be liberal, conservative or moderate? Choose the whole number that best represents your viewpoint. (Very liberal – very conservative, 7-point scale)
- How would you describe yourself? (Omnivore/meat eater, Semi-vegetarian/Flexitarian, Pescetarian/No Meat, But Consume Fish, Vegetarian, Vegan, Other)

GENDER ROLES AND MEAT ALTERNATIVES

Materials Study 2

(1) Food image evaluations

Regular meat:

In the following section, you will be presented with images of food. The food in these pictures is made from **regular meat**.

After viewing each image, you will be asked a few questions. Please answer as accurately and honestly as you can.

Plant-based meat:

In the following section, you will be presented with images of food. The food in these pictures is made from **plant-based meat alternatives**.

After viewing each image, you will be asked a few questions. Please answer as accurately and honestly as you can.

Cultured meat:

In the following section, you will be presented with images of food. The food in these pictures is made from **clean meat**, which is **structurally identical** to traditional meat but **cultured in the laboratory**.

After viewing each image, you will be asked a few questions. Please answer as accurately and honestly as you can.

Imagine you had this dish in front of you and please indicate how you feel it would look, smell, taste etc.

Extremely appealing - Extremely repulsive

Smells extremely good – Smells extremely bad

Tastes extremely good – Tastes extremely bad

Extremely delicate – Extremely bold

Extremely masculine – Extremely feminine

Imagine the dish above was offered on a buffet. How likely would you be to eat it?

Extremely likely – Extremely unlikely

(all 7-point scales)

Dish images

Participants saw all nine images, with three images depicting regular meat, three images depicting plant-based meat, and three images depicting clean meat. However, participants were unaware what was actually presented in the photos as the labels assigned to the dishes were counterbalanced across images.

Regular Meat



GENDER ROLES AND MEAT ALTERNATIVES



Plant-Based Meat



GENDER ROLES AND MEAT ALTERNATIVES



Cultured Meat



GENDER ROLES AND MEAT ALTERNATIVES

(2) Traditional gender role beliefs

Below is a series of statements concerning men and women and their relationships in contemporary society. Please indicate the degree to which you agree or disagree with each statement.

Strongly disagree – Strongly agree (7-point scale)

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- In a disaster, women ought not necessarily to be rescued before men.
- People are often truly happy in life without being romantically involved with a member of the other sex.
- Many women have a quality of purity that few men possess.
- Women should be cherished and protected by men.
- Every man ought to have a woman whom he adores.
- Men are incomplete without women.
- A good woman should be set on a pedestal by her man.
- Women, compared to men, tend to have a superior moral sensibility.
- Men should be willing to sacrifice their own well-being in order to provide financially for the women in their lives.
- Women, as compared to men, tend to have a more refined sense of culture and good taste.
- Many women are actually seeking special favours, such as hiring policies that favour them over men, under the guise of asking for "equality".
- Most women interpret innocent remarks or acts as being sexist.
- Women are too easily offended.
- Feminists are NOT seeking for women to have more power than men.
- Most women fail to appreciate fully all that men do for them.
- Women seek to gain power by getting control over men.
- Women exaggerate problems they have at work.
- Once a woman gets a man to commit to her, she usually tries to put him on a tight leash.
- When women lose to men in a fair competition, they typically complain about being discriminated against.
- There are actually very few women who get a kick out of teasing men by seeming sexually available and then refusing male advances.
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- How would you describe yourself? (Omnivore/meat eater, Semi-vegetarian/Flexitarian, Pescetarian/No Meat, But Consume Fish, Vegetarian, Vegan, Other)