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Gender differences in meat consumption and openness to vegetarianism

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ABSTRACT

Understanding gender differences in meat consumption can help strengthen efforts to improve the sustainability of eating patterns. Compared to women, men eat more meat and are less open to becoming vegetarian. Simply considering between-gender differences, however, may overlook meaningful within-gender heterogeneity in how masculine and feminine identities associate with eating behavior. Distinguishing between specific types of meat is also important, given that some meats (e.g., beef) pose greater challenges to sustainability than do other meats. Through a highly powered, preregistered study (N = 1706), we investigated the predictive value of traditional gender role conformity and gender identity centrality for meat consumption frequency and openness to becoming vegetarian. Greater conformity to traditional gender roles predicted more frequent consumption of beef and chicken and lower openness to vegetarianism among men but offered no predictive value among women. No effects were observed for pork or fish consumption. Among women, greater traditional gender role conformity and gender identity centrality were associated with openness to becoming vegetarian for health reasons. Among men, lower traditional gender role conformity was associated with openness to becoming vegetarian for environmental reasons. These findings suggest that understanding meat consumption calls for greater distinctions between specific types of meat as well as deeper consideration of within-gender heterogeneity.

Reducing current rates of meat consumption offers one of the most promising strategies for improving environmental sustainability (Wynes & Nicholas, 2017). Widespread transitions toward vegetarian diets would lower greenhouse gas emissions and curtail uses of land, water, and energy (Tilman & Clark, 2014; Willett et al., 2019). Yet the overwhelming majority of people around the world still eat meat. In the United States, for example, vegetarians represent only 5% of the population (Gallup, 2018), with resistance to vegetarianism being higher among men than women (Rosenfeld, 2018). Understanding this gender gap more concretely can support efforts to reduce meat consumption through a psychosocial approach to behavior change.

Convention has it that "real men eat meat." This aphorism illuminates the notion that eating behaviors reflect a core part of one's identity and are intertwined with perceptions of gender. Compared to women, men indeed consume more meat and are less open to becoming a vegetarian (Keller & Siegrist, 2015; Love & Sulikowski, 2018)—gender differences that appear to be reliable effects, replicated across several samples (Rosenfeld, 2018). However, we advance between-gender comparisons of meat consumption oversimplify what gender means to people, and how the nuances of that meaning could inform people's eating behaviors. Our overarching thesis is as follows: When it comes to consuming meat, people's attitudes and behaviors may reflect their self-identification with traditional forms of masculinity/femininity, over and above their gender categorized dichotomously as a man versus woman.

With growing concerns about current meat consumption rates threatening environmental sustainability (Willett et al., 2019), it can be valuable to understand the means by which psychological factors inform people's dietary attitudes and behaviors. Distinguishing between specific types of meat may be particularly important, given that some meats (e.g., beef and pork) are recognized as having far more negative effects on the environment than other meats have (e.g., chicken and fish) (Tilman & Clark, 2014; Willett et al., 2019). Producing a serving of beef, for example, releases more than 6 times the amount of carbon dioxide emissions as does producing a serving of chicken (Tilman & Clark, 2014). Identifying whether gender roles are tied particularly strongly to consuming some types of meat over others may inform optimal strategies for promoting sustainable eating patterns.

Social identity theory, which posits that individuals form collective identities around the groups to which they belong (Tajfel & Turner,

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1985), offers a useful perspective for conceptualizing why gender could affect one's meat consumption behaviors. Gender is a form of social identity grounded in roles related to masculinity and femininity, and violating the roles of one's gender—such that men ought to be masculine, and women to be feminine—may make one susceptible to social rejection and identity threat (Goffman, 1976; West & Zimmerman, 1987). Maintaining a socially permissible gender display may thus call for individuals to engage in impression management (Goffman, 1959), deliberately acting in line with gender norms in order to appease others' expectations of them. Gender operating as a highly visible social identity also may also instigate common group processes, motivating individuals further to behave in ways typical of their gender in order to satisfy needs for in-group distinctiveness (Leonardelli, Pickett, & Brewer, 2010; Tajfel & Turner, 1985). That is, from a social identity theory lens, to act feminine as a man or masculine as a woman may threaten the perceived legitimacy of one's identification with one's gender group, thus undermining one's self-esteem (Oakes, Haslam, & Turner, 1998; Wood, Christensen, Hebl, & Rothgerber, 1997). Threats to one's gender identity may be particularly strong for masculinity among men, given that manhood—but not womanhood—is perceived to be a precarious state (Vandello & Bosson, 2013; Vandello, Bosson, Cohen, Burnaford, & Weaver, 2008). Through eating meat and resisting vegetarianism, men may seek to prove the legitimacy of their masculine identity.

The link between social identity and food choice appears to be notably salient with regards to meat consumption or lack thereof, such that one's decision to become a vegetarian embodies a distinct form of social identification (Chuck, Fernandes, & Hyers, 2016; Rosenfeld & Burrow, 2017, 2018). A social identity approach may help to explain how gender shapes food choice and how people are evaluated for that choice. Meat is strongly associated with masculinity and vegetarianism with femininity (Adams, 1990; Mycek, 2018; Rothgerber, 2012; Sobal, 2005), making it unsurprising that men are judged more negatively for being a vegetarian than women are (MacInnis & Hodson, 2017). Evidence exists to suggest that negative judgments of male vegetarians stems from the perception that being a vegetarian prevents a man from fulfilling a masculine gender role (Timeo & Suitner, 2018). Even controlling for a wide range of factors such as meat consumption frequency and dietary motivation, gender persists as a unique predictor of how open individuals are to becoming a vegetarian (Rosenfeld, Rothgerber, & Tomiyama, 2020a). For men, the belief that eating meat equates to being masculine may pose a barrier to meat reduction (Kildal & Syse, 2017). These findings support the following social identity account of vegetarianism: Seeing oneself as a vegetarian reflects a socially constructed identity (Rosenfeld, Rothgerber, & Tomiyama, 2020b)—one that men may be resistant to adopting publicly (Rosenfeld & Tomiyama, 2021).

Nevertheless, solely noting one's gender as a man or woman offers an oversimplified view of how gender could become intersected with food choice. Rather, within-gender heterogeneity may explain meaningful variance—a premise that existing research on meat consumption has largely overlooked in favor of between-gender binary tests. This premise may be elucidated by two critical notions central to theories of gender roles and social identity. First, individuals vary in the extent to which they identify as traditionally masculine versus feminine, variance captured by conformity to gender roles (Kachel, Steffens, & Niedlich, 2016). Second, individuals vary in the extent to which their gender comprises an important feature of their global sense of identity, variance captured by the construct of gender identity centrality (Cameron, 2001).

Focusing on gender role conformity and identity centrality can foster investigation of theoretically and practically important questions. Namely, are gender differences in meat consumption and openness to vegetarianism a function of men's relationships with their masculinity, or could they reflect women's relationships with their femininity? Moreover, are observed effects uniquely related to individual differences in gender role conformity, or are they accounted for by differences in gender identity centrality?

Ultimately, we propose that differences in people's attitudes and behaviors related to meat consumption may be explained by individual differences in gender role conformity and gender identity centrality, considered in light of the interaction between these factors and categorical gender. By this, we shift focus toward gender as a fluidly constructed self-perception that may be internalized and valued with varying degrees of importance and attributes. If meat is associated with masculinity and vegetarianism with femininity, then individual differences in traditional gender role conformity and gender identity centrality may influence how much meat people eat and how open they are to becoming a vegetarian.

1. Aims and hypotheses

In the current study, we investigated whether traditional gender role conformity and/or gender identity centrality predict current level of meat consumption frequency (across the following four meats: beef, pork, chicken, and fish) and openness to becoming a vegetarian and vegan. Based on the theorizing above, we hypothesized that conformity and centrality's links to meat consumption and openness would be moderated by participant gender. Specifically, we predicted that higher conformity and higher centrality would predict greater meat consumption and lower openness among men whereas the opposite effects would occur among women. As a secondary, exploratory aim of this research, we set to identify whether men and women would prospectively have different reasons (namely, for animals vs. health vs. the environment) for becoming a vegetarian or vegan in the future, if they were to do so, along with differences in gender role conformity and identity centrality by preferred reason.

2. Method

This study's sample size, materials, hypotheses, and analyses were preregistered at https://osf.io/f6jsz/?view_only=3ed8cd6b651842eba5bc1d2faad74d64.

2.1. Participants

Participants were 2000 adults from the United States, recruited via Amazon Mechanical Turk (MTurk). After excluding 142 participants who failed an attention check in the survey, 7 participants who reported a non-binary gender identity status, and 145 participants who indicated that they are vegetarian/vegan, 1706 participants between the ages of 18 and 88 (Mage = 41.28, SD = 13.20) were retained for analyses. Of these participants, 893 (52%) were women and 813 (48%) were men. This sample provided 80% power to detect small effect sizes (r = 0.10) within each gender.

2.2. Materials

Traditional gender role conformity. Conformity to traditional gender roles was assessed by Kachel and colleagues' (2016) traditional masculinity/femininity scale, which is comprised of the following 6 items (α = 0.91): "I consider myself as …" "Ideally, I would like to be …" "Traditionally, my interests would be considered as …" "Traditionally, my attitudes and beliefs would be considered as …" "Traditionally, my behavior would be considered as …" and "Traditionally, my outer appearance would be considered as …" with responses to each of these items ranging from 1 (very feminine) to 7 (very masculine). This variable was reverse-scored for women so that higher scores reflected greater conformity to gender roles for one's own gender for all participants (i.e., higher femininity for women, higher masculinity for men).

Gender identity centrality. Gender identity centrality was assessed by the following 4 items (α = 0.84), adapted from Cameron's (2004) social identity centrality scale template (each item read either "man" or "woman" depending on which participants indicated as their own

gender): "I often think about the fact that I am a man/woman," "Overall, being a man/woman has very little to do with how I feel about myself" (reverse-scored), "In general, being a man/woman is an important part of my self-image," and "The fact that I am a man/woman rarely enters my mind" (reverse-scored). Responses ranged from 1 (strongly disagree) to 7 (strongly agree).

Meat consumption frequencies. Consumption frequency of each meat (beef, pork, chicken, and fish) was assessed by its own question, in the following structure, with "[meat]" serving as a placeholder for each of the four types of meat assessed: "How often do you eat [meat]?" Ten possible responses ranged progressively in frequency from "never" to "3 or more meals per day" and were coded respectively on a scale from 1 to 10.

Openness to becoming a vegetarian. Openness to becoming a vegetarian was assessed by the question, "Do you plan on becoming a vegetarian at any upcoming point in your life?" to which responses included "no," "maybe," and "yes." Pilot data on this question indicated that the rate of "yes" responses was very low (<5%), whereas "maybe" responses were much more common (~35%); accordingly, to provide adequate power for analyses, we decided a priori (see preregistration) to classify participants who responded either "maybe" or "yes" as open to becoming a vegetarian and participants who responded "no" as not open to becoming a vegetarian.

Openness to becoming a vegan. Openness to becoming a vegan was assessed in the same manner as openness to becoming a vegetarian, but with the word "vegan" in place of "vegetarian."

Prospective reason for becoming a vegetarian. Primary prospective reason for becoming a vegetarian was assessed by the question, "If you were to ever become a vegetarian in the future, what would be your main reason for doing so?" to which responses included "for animals," "health reasons," "the environment," "religion," "taste preference," "disgusted by meat," "financial reasons," "my friends/family are vegetarian," "my significant other is vegetarian," and "other (please specify)."

Prospective reason for becoming a vegan. Primary prospective reason for becoming a vegan was assessed in the same manner as prospective reason for becoming a vegetarian, but with the word "vegan" in place of "vegetarian," and "meat/animal products" in place of "meat."

2.3. Procedure

First, participants consented to take part in this research. Then, participants indicated their gender. Next, participants completed the measures of traditional gender role conformity and gender identity centrality in a randomized order. Then, participants indicated their meat consumption frequencies. Next, participants indicated their openness to becoming a vegetarian and vegan and prospective reason for each. Lastly, participants completed demographic questions. This study protocol received Institutional Review Board approval, and informed consent was obtained from all study participants.

3. Results

Data and analysis scripts are available at https://osf.io/hbpvj/?view_only=64eef2fe04f64b159fce19e9a364de9a.

Table 1 displays intercorrelations and descriptive statistics for all variables.

3.1. Meat consumption frequency

3.1.1. Preregistered analyses

We conducted a series of ordinary least squares (OLS) multiple regressions—one for each type of meat: beef, pork, chicken, and fish—to test our hypotheses that higher traditional gender role conformity and higher gender identity centrality would predict more frequent consumption of meat among men and less frequency consumption among women. In order to isolate any unique moderating value of either conformity or centrality over and above the other factor, we tested for interactions between gender and conformity and between gender and centrality within the same model for each type of meat. Specifically, within each model, we regressed meat consumption frequency on gender, traditional gender role conformity, gender identity centrality, the interaction term for gender and gender role conformity, and the interaction term for gender and gender identity centrality. All interaction effects remained significant or null as reported below when accounting for demographic variables (age, race, income, educational attainment, political ideology, and urban/suburban/rural residence). Model R^2 values were 0.04 for predicting consumption of beef, 0.02 for pork, 0.02 for chicken, and 0.01 for fish.

We found partial support for our traditional gender conformity hypotheses for beef (see Fig. 1) and chicken (see Fig. 2), but not for pork or fish. As predicted, a significant interaction effect emerged between gender and gender role conformity on beef consumption frequency, $b = -0.18$, SE = 0.08, 95% CI [-0.33, −0.02], $\beta = -0.15$, $t(1700) = 2.19$, $p = .029$, such that higher conformity predicted more frequent beef consumption among men, $b = 0.20$, SE = 0.06, 95% CI [0.09, 0.32], $\beta = 0.12$, $t(811) = 3.52$, $p < .001$, but offered no predictive value among women, $b = 0.03$, SE = 0.05, 95% CI [-0.07, 0.13], $\beta = 0.02$, $t(891) = 0.62$, $p = .533$. Likewise, as predicted, a significant interaction effect emerged between gender and gender role conformity on chicken consumption frequency, $b = -0.14$, SE = 0.07, 95% CI [-0.27, −0.01], $\beta = -0.14$, $t(1700) = 2.09$, $p = .037$, such that higher conformity predicted more frequent chicken consumption among men, $b = 0.14$, SE = 0.05, 95% CI [0.04, 0.23], $\beta = 0.10$, $t(811) = 2.81$, $p = .005$, but offered no predictive value among women, $b = 0.00$, SE = 0.04, 95% CI [-0.08, 0.08], $\beta = 0.00$, $t(891) = 0.05$, $p = .962$. The hypothesized interaction

Table 1
Intercorrelations and descriptive statistics for all variables. Point-biserial correlation coefficients were conducted for correlations involving openness to becoming a vegetarian and vegan, as these variables were dichotomous.

	Conform.	Centrality	Beef	Pork	Chicken	Fish	Vg. Open	Vn. Open
Intercorrelations								
Traditional Gender Role Conformity	–							
Gender Identity Centrality	.29***	–						
Beef Consumption	.09***	.00	–					
Pork Consumption	.01	-.02	.43***	–				
Chicken Consumption	.05*	.07**	.34***	.27***	–			
Fish Consumption	.05	.06*	.00	.06*	.11***	–		
Open to Vegetarian (Vg.)	-.12***	.03	-.26***	-.22***	-.12***	.07**	–	
Open to Vegan (Vn.)	-.02	.01	-.15***	-.12***	-.11***	.05*	.55***	–
Descriptive Statistics								
Mean	5.29	4.60	4.99	3.74	5.61	3.68	–	–
Standard Deviation	1.00	1.32	1.56	1.57	1.29	1.59	–	–
% Open	–	–	–	–	–	–	34%	18%

*p < .05; **p < .01; ***p < .001.

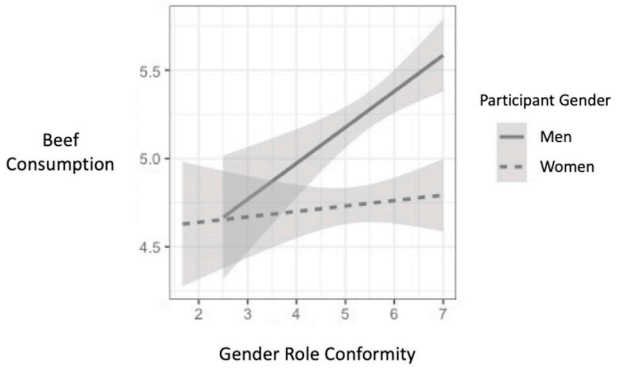

Fig. 1. The relationship between traditional gender role conformity and beef consumption frequency among men vs. women.

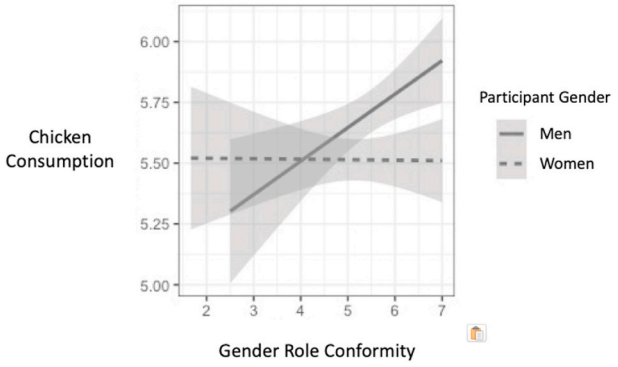

Fig. 2. The relationship between traditional gender role conformity and chicken consumption frequency among men vs. women.

effects between gender and gender role conformity on consumption frequency were not significant for pork, b = −0.04, SE = 0.08, 95% CI [-0.20, 0.12], β = −0.04, t(1699) = 0.53, p = .597, or fish, b = 0.00, SE = 0.08, 95% CI [-0.16, 0.17], β = 0.00, t(1700) = 0.06, p = .952.

We did not find support for distinct predictive value of gender identity centrality for any of the four types of meat tested: The interaction effects between gender and gender identity centrality on consumption frequency were not significant for beef, b = 0.01, SE = 0.06, 95% CI [-0.11, 0.12], β = 0.00, t(1700) = 0.12, p = .908, pork, b = 0.03, SE = 0.06, 95% CI [-0.09, 0.15], β = 0.01, t(1699) = 0.48, p = .629, chicken, b = 0.01, SE = 0.05, 95% CI [-0.09, 0.11], β = 0.00, t(1700) = 0.23, p = .819, or fish, b = −0.03, SE = 0.06, 95% CI [-0.15, 0.09], β = −0.01, t(1700) = 0.42, p = .676.

3.1.2. Group-level differences between men and women (post hoc analyses)

Results of the preregistered analyses reviewed above indicate that greater conformity to traditional gender roles predicted more frequent consumption of beef and chicken among men but offered no predictive value for any meat consumption among women. To contextualize these within-gender effects within the broader context of a gender binary without consideration of conformity or centrality variances, we compared consumption frequency of each meat between men and women post hoc through independent samples t-tests. Levene's tests indicated homogeneity of variances between men and women for beef, pork, chicken, and fish (all ps > .05). Significant gender differences emerged for all four types of meat, with men reporting more frequent consumption than women: Compared to women, men more frequently consumed beef by a difference of d = 0.34 (t = 7.12, p < .001), pork by d = 0.26 (t = 5.31, p < .001), chicken by d = 0.16 (t = 3.09, p = .002), and fish by d = 0.17 (t = 3.48, p < .001).

3.2. Openness to becoming a vegetarian/vegan

Among all participants, 3% responded, "yes," they plan on becoming a vegetarian at some upcoming point in their life; 31% responded, "maybe"; and 66% responded "no." With regards to their plans to become a vegan, 1% responded, "yes"; 17% responded, "maybe"; and 82% responded "no." As specified in our preregistration plan, for each of these two variables, we classified "maybe" and "yes" together as open to becoming a vegetarian/vegan and "no" responses as not open.

3.2.1. Preregistered analyses

We conducted two separate logistic multiple regressions—one for openness to becoming a vegetarian, one for openness to becoming a vegan—to test our hypotheses that higher traditional gender role conformity and higher gender identity centrality would predict lower openness to becoming a vegetarian and vegan among men and greater openness among women. Within each model, we regressed openness on gender, gender role conformity, gender identity centrality, the interaction term for gender and gender role conformity, and the interaction term for gender and gender identity centrality. All interaction effects remained significant or null as reported below when accounting for demographic variables (age, race, income, educational attainment, political ideology, and urban/suburban/rural residence). Model R^2 values were 0.02 for predicting openness to becoming a vegetarian and 0.00 for openness to becoming a vegan.

We found partial support for our gender conformity hypotheses for openness to becoming a vegetarian, but not for openness to becoming a vegan. As predicted, a significant interaction effect emerged between gender and gender role conformity on openness to becoming a vegetarian, b = 0.33, SE = 0.11, 95% CI [0.11, 0.56], OR = 1.39, z(1700) = 2.90, p = .004, such that higher conformity predicted lower openness among men, b = −0.48, SE = 0.09, 95% CI [-0.65, −0.31], OR = 0.62, z(811) = 5.57, p < .001, but offered no predictive value among women, b = −0.10, SE = 0.07, 95% CI [-0.23, 0.03], OR = 0.91, z(891) = 1.45, p = .147. The hypothesized interaction effect between gender and gender role conformity on openness to becoming a vegan was not significant, b = 0.15, SE = 0.14, 95% CI [-0.12, 0.42], OR = 1.17, z(1700) = 1.12, p = .262.

We did not find support for distinct predictive value of gender identity centrality for openness to becoming a vegetarian or vegan: The interaction effects between gender and gender identity centrality on openness were not significant for openness to becoming a vegetarian, b = 0.14, SE = 0.09, 95% CI [-0.03, 0.30], OR = 1.14, z(1700) = 1.59, p = .113, or openness to becoming a vegan, b = 0.15, SE = 0.10, 95% CI [-0.05, 0.35], OR = 1.16, z(1700) = 1.45, p = .146.

3.2.2. Group-level differences between men and women (post hoc analyses)

Results of the preregistered analyses reviewed above indicate that greater conformity to traditional gender roles predicted lower openness to becoming a vegetarian among men but offered no predictive value among women. Moreover, gender role conformity did not predict openness to becoming a vegan among either men or women. As done for meat consumption, in order to contextualize these findings within the broader context of a gender binary without consideration of conformity or centrality variances, we compared openness to becoming a vegetarian and vegan between men and women post hoc. The rate of openness to becoming a vegetarian among women (37% open) was relatively 23% higher than the rate among men (30% open), $\chi 2(1) = 9.10$, p = .003, 95% CI [0.02, 0.11]. Rates of openness to becoming a vegan, however, did not differ between men (17%) and women (18%), $\chi 2(1) = 0.32$, p = .572, 95% CI [-0.05, 0.03].

3.3. Prospective Reason for Becoming a vegetarian/Vegan (preregistered analyses)

Women were more likely than were men to report that they would

adopt a vegetarian diet primarily out of concern for animals, whereas men were more likely than were women to report that they would adopt a vegetarian diet primarily for health reasons (see Table 2). Moreover, women were more likely than were men to report that they would adopt a vegan diet primarily out of concern for animals. There were no significant differences in the likelihoods of men versus women reporting that they would become a vegetarian primarily for environmental reasons or become a vegan for either health or environmental reasons.

3.3.1. Analyses among men

Gender identity centrality. One-way analyses of variance (ANOVAs) focusing on centrality indicated that there was no significant relationship between men's levels of gender identity centrality and their prospective reason for becoming a vegetarian, $F(2, 687) = 1.34$, $p = .262$, $\eta p2 = 0.00$, or vegan, $F(2, 660) = 0.02$, $p = .980$, $\eta p2 = 0.00$.

Traditional gender role conformity. A one-way ANOVA focusing on conformity, on the other hand, indicated that level of gender role conformity differed significantly between men who would become a vegetarian primarily for animals ($M = 5.42$, $SD = 0.93$), health ($M = 5.51$, $SD = 0.88$), and the environment ($M = 5.15$, $SD = 0.84$), $F(2, 687) = 8.23$, $p < .001$, $\eta p2 = 0.02$. As preregistered, we followed up this significant omnibus effect with pairwise comparisons, evaluated at a Bonferroni-adjusted significance threshold of $p = .017$. Men who reported that they would become a vegetarian primarily for the environment were less gender conforming than were men who would become a vegetarian primarily for either animals, $t(687) = 2.44$, $p = .015$, $d = 0.30$, 95% CI [0.05, 0.50], or health, $t(687) = 4.05$, $p < .001$, $d = 0.42$, 95% CI [0.19, 0.55]. There was no significant difference in gender role conformity between men who would become a vegetarian primarily for animals versus health, $t(687) = 1.03$, $p = .303$, $d = 0.10$, 95% CI [-0.27, 0.08].

Effects for gender role conformity and openness to veganism were slightly different from those for vegetarianism. A one-way ANOVA indicated that gender role conformity differed significantly between men who would become a vegan primarily for animals ($M = 5.41$, $SD = 0.87$), health ($M = 5.54$, $SD = 0.88$), and the environment ($M = 5.22$, $SD = 0.90$), $F(2, 660) = 6.49$, $p = .002$, $\eta p2 = 0.02$. As preregistered, we followed up this significant omnibus effect with pairwise comparisons, evaluated at a Bonferroni-adjusted significance threshold of $p = .017$. Like the case for vegetarianism, men who reported that they would become a vegan primarily for the environment were less gender conforming than were men who would become a vegan primarily for health, $t(660) = 3.54$, $p < .001$, $d = 0.36$, 95% CI [-0.51, −0.15]. There were no significant differences in gender role conformity between men who would become a vegan primarily for animals versus health (as was the case for vegetarianism), $t(660) = 1.50$, $p = .134$, $d = 0.15$, 95% CI [-0.30, 0.04], or animals versus the environment (unlike the case for vegetarianism), $t(660) = 1.78$, $p = .076$, $d = 0.21$, 95% CI [-0.02, 0.41].

3.3.2. Analyses among women

Gender identity centrality. A one-way ANOVA indicated that level of gender identity centrality differed significantly between women who would become a vegetarian primarily for animals ($M = 4.08$, $SD = 0.50$), health ($M = 4.18$, $SD = 0.60$), and the environment ($M = 3.98$, $SD = 0.53$), $F(2, 789) = 6.38$, $p = .002$, $\eta p2 = 0.02$. As preregistered, we followed up this significant omnibus effect with pairwise comparisons, evaluated at a Bonferroni-adjusted significance threshold of $p = .017$. Women who reported that they would become a vegetarian primarily for health were higher in gender identity centrality than were women who would become a vegetarian primarily for the environment, $t(789) = 3.29$, $p = .001$, $d = 0.35$, 95% CI [0.08, 0.31]. There were no significant differences in gender identity centrality between women who would become a vegetarian primarily for animals versus health, $t(789) = 2.21$, $p = .028$, $d = 0.18$, 95% CI [-0.19, −0.01], or animals versus the environment, $t(789) = 1.49$, $p = .137$, $d = 0.19$, 95% CI [-0.03, 0.22].

Effects were different for openness to veganism. A one-way ANOVA indicated that level of gender identity centrality differed significantly between women who would become a vegan primarily for animals ($M = 4.06$, $SD = 0.50$), health ($M = 4.17$, $SD = 0.59$), and the environment ($M = 4.04$, $SD = 0.53$), $F(2, 776) = 4.28$, $p = .014$, $\eta p2 = 0.01$. Pairwise comparisons were then evaluated at a Bonferroni-adjusted significance threshold of $p = .017$. Women who reported that they would become a vegan primarily for health were higher in gender identity centrality than were women who would become a vegan primarily for animals, $t(776) = 2.44$, $p = .015$, $d = 0.20$, 95% CI [0.02, 0.20]. There were no significant differences in gender identity centrality between women who would become a vegan primarily for health versus the environment, $t(776) = 2.18$, $p = .029$, $d = 0.23$, 95% CI [0.01, 0.25], or animals versus the environment, $t(776) = 0.34$, $p = .731$, $d = 0.04$, 95% CI [-0.11, 0.15].

Traditional gender role conformity. A one-way ANOVA focusing on conformity indicated that level of gender role conformity differed significantly between women who would become a vegetarian primarily for animals ($M = 5.04$, $SD = 1.05$), health ($M = 5.29$, $SD = 1.08$), and the environment ($M = 4.90$, $SD = 0.82$), $F(2, 789) = 8.62$, $p < .001$, $\eta p2 = 0.02$. Pairwise comparisons were then evaluated at a Bonferroni-adjusted significance threshold of $p = .017$. Women who reported that they would become a vegetarian primarily for health were more gender conforming than were women who would become a vegetarian primarily for either animals, $t(789) = 3.05$, $p = .002$, $d = 0.23$, 95% CI [0.09, 0.42], or the environment, $t(789) = 3.52$, $p < .001$, $d = 0.41$, 95% CI [0.17, 0.60]. There was no significant difference in gender role conformity between women who would become a vegetarian primarily for animals versus the environment, $t(789) = 1.11$, $p = .266$, $d = 0.15$, 95% CI [-0.10, 0.37].

Effects for gender role conformity and openness to veganism resembled those for vegetarianism. A one-way ANOVA indicated that level of gender role conformity differed significantly between women who would become a vegan primarily for animals ($M = 5.01$, $SD = 1.02$), health ($M = 5.31$, $SD = 1.07$), and the environment ($M = 4.99$, $SD = 0.99$), $F(2, 776) = 8.14$, $p < .001$, $\eta p2 = 0.02$. Pairwise comparisons were then evaluated at a Bonferroni-adjusted significance threshold of $p = .017$. Women who reported that they would become a vegan primarily for health were more gender conforming than were women who would become a vegan primarily for either animals, $t(776) = 3.48$, $p < .001$, $d = 0.29$, 95% CI [0.13, 0.46], or the environment, $t(776) = 2.86$, $p = .004$, $d = 0.31$, 95% CI [0.10, 0.55]. There was no significant difference in gender role conformity between women who would become a vegan primarily for animals versus the environment, $t(776) = 0.26$, $p = .797$, $d = 0.02$, 95% CI [-0.21, 0.28].

Table 2
Comparing the proportions of men and women who reported that, if they were to become a vegetarian or vegan, their main reason for doing so would be out of concern for animals, their health, or the environment.

Prospective Reason for Becoming:	Men	Women	$\chi2$	p
Vegetarian				
Concern for animals	15%	26%	31.92***	<.001
Health reasons	55%	50%	4.31*	.038
Environmental reasons	15%	12%	1.97	.160
Vegan				
Concern for animals	17%	26%	19.40***	<.001
Health reasons	50%	50%	0.00	.961
Environmental reasons	15%	12%	3.35	.067

4. Discussion

Persuading consumers to transition toward vegetarian diets can be an effective strategy for improving environmental sustainability (Tilman & Clark, 2014; Willett et al., 2019; Wynes & Nicholas, 2017). Our data highlight not only that men and women differ in their attitudes and behaviors related to meat consumption and vegetarianism, but also that

self-ascribed levels of masculinity/femininity explain unique variance over and above gender-binary comparisons, suggesting that a deeper understanding of gender roles might support meat-reduction efforts.

Specifically, our study yielded five main novel findings. First, compared to women, men reported that they eat all types of meat more frequently, including beef, pork, fish, and chicken, with the effect sizes of these differences descending in that order. Second, greater conformity to traditional gender roles predicted more frequent consumption of beef and chicken among men but did not offer predictive value for any meat consumption among women. Third, greater traditional gender role conformity predicted lower openness to becoming a vegetarian among men but did not offer predictive value for openness among women. Fourth, women were more likely to report that they would become a vegetarian/vegan out of a concern for animals than were men, and men were more likely to report openness to becoming a vegetarian for health reasons than were women; nevertheless, among both men and women, health was the most common factor. Fifth, greater gender role conformity and gender identity centrality were associated with openness to becoming a vegetarian/vegan for health reasons among women, and lower gender role conformity was associated with openness to becoming a vegetarian/vegan for environmental reasons among men.

These findings suggest that gender differences in attitudes and behaviors regarding meat consumption are related to individual differences in conformity to traditional gender roles but generally less related to the centrality of gender to one's overall sense of identity. Moving forward, the study of meat consumption can benefit from giving greater attention to gender role conformity as a continuum of masculinity and femininity, beyond looking at binary differences between men and women. Moreover, it seems probable that, with respect to gender role conformity, gender differences in meat consumption attitudes and behaviors are more likely driven by men's relationships with masculinity, rather than by women's relationships with femininity. This inference aligns with theorizing of precarious manhood, such that one's authentic status as a man—but not as a woman—is fragile and needs to be proven behaviorally (Vandello et al., 2008).

As such, we speculate that if causal mechanisms do indeed underlie the currently observed data, then it is plausible that men engage in more frequent consumption of meat than women do in order to enact and affirm masculine identity. As scholars have theorized previously (e.g., Adams, 1990; Nath, 2011; Rogers, 2008; Rosenfeld, 2020; Sobal, 2005), abstaining from meat consumption by becoming a vegetarian may threaten a man's sense of masculinity, undermine his ability to satisfy gender roles, and make him susceptible to being characterized as feminine and thus less of a "true" man in the traditional sense. Our data provide novel quantitative support for this notion, providing key insights into psychological and anthropological views on meat consumption. Our data can also inspire practical solutions to reducing currently unsustainable meat consumption rates among men. Given our null findings for gender identity centrality across all tests, it appears that any efforts to make gender less central to men's global senses of identity are unlikely to impart any effect on dietary attitudes or behaviors. Accordingly, men's meat consumption may not reflect motives to achieve gender in-group distinctiveness, as social identity theory may suggest (Leonardelli et al., 2010; Tajfel & Turner, 1985); rather, gender-based motives for meat consumption are more likely tied to men's personal desires to feel masculine.

Thus far, to our knowledge, only one other study has tested within-gender heterogeneity in the context of meat consumption, finding that men who identify with new forms of masculinity—more individual, emotional forms of masculinity that question social norms—eat less meat and are more open to reducing their meat intake (De Backer et al., 2020). The current study, unlike that of De Backer et al. (2020), focused on traditional forms of masculinity and expanded further by considering within-group differences among women in addition to men. Both of these have remained critical knowledge gaps in the literature. We also advance the existing literature by demonstrating that the predictive value of conformity to traditional gender roles holds over and above the effects of gender identity centrality. With this, we highlight that individual differences among men are directly attributable to how individuals express traditional masculinity, over and above the centrality of gender to one's overall identity.

Combining our results with those of De Backer et al. (2020), we suspect that shifting men's perceptions of their ideal gender roles away from traditional masculinity, and toward new masculinity, could lead toward reduced meat consumption and increased openness to becoming a vegetarian. These effects are most promising for reducing men's consumptions of beef and chicken, with beef being of particular attention for its demonstrable threats to human health and its enormous strains on environmental resources (Tilman & Clark, 2014; Willett et al., 2019). Questions remain open regarding how interventions might consider gender roles in order to strategically motivate men to reduce their meat intake. Additional research is needed to identify whether vegetarian messaging can be framed in ways that positively capitalize on notions of masculinity among men. Moreover, it would be valuable to consider the relevance of gender roles for consumption and reduction of other animal products, such as dairy and eggs. A starting point could be to test whether traditional gender role conformity and/or gender identity centrality predict dairy and/or egg consumption as well as willingness to replace these products with plant-based alternatives. Such efforts may be especially fruitful when coupled with a developmental approach, so as to identify when and how foods become socialized as gender-relevant (Graziani, Guidetti, & Cavazza, 2020).

An important avenue for future research is to understand more empirically why meat consumption is associated with traditionally masculine identity and how to disentangle shared perceptions people hold of these two notions (conceptual accounts of this matter are already rich: e.g., Adams, 1990; De Backer et al., 2020; Mycek, 2018; Rothgerber, 2012; Rozin, Hormes, Faith, & Wansink, 2012; Sobal, 2005). Although encouraging a shift towards new forms of masculinity is one potential way to reduce men's meat consumption, this approach may be ineffective for changing dietary attitudes or behavior among those who identify strongly with, and are committed to maintaining, traditional masculinity. Identifying shared perceptions between traditional masculinity and meat consumption, and finding ways to reframe plant-based food consumption as aligned with such perceptions, may yield strategies for reducing meat consumption and increasing receptivity to vegetarianism among men for whom a strongly traditional masculine identity is central. For example, theorizing behind meat-masculinity links (e.g., Adams, 1990; Rothgerber, 2012; Rozin et al., 2012; Sobal, 2005) suggests that messaging campaigns could emphasize notions of power and dominance when advertising plant-based products to men while emphasizing evidence that plant-based products can provide the protein needed for building muscle. Our study's finding that men were less likely to report that they would become a vegetarian primarily out of concerns for animals suggests that campaigns might benefit from avoiding a focus on animal rights/welfare when appealing to men. These hypotheses are tentative, we emphasize, and could be tested formally in future research. Another perception linking traditional masculinity and meat—specifically among heterosexual men—might be the belief that women are not attracted to vegetarian men (Timeo & Suitner, 2018), and consideration of gender roles in the context of romantic and sexual pursuits may be valuable for understanding eating behavior.

As researchers and advocates contemplate appealing to traditional masculinity as a vehicle for behavior change, it would be worth evaluating potential disadvantages of this approach. Traditionally masculine gender roles entail social dominance, aggression, and emotional suppression (Bem, 1974; Brody, 2000), which may beget unfavorable outcomes. For example, having a strong social dominance orientation may underlie animal mistreatment and environmentally unsustainable behavior (Graça, Calheiros, Oliveira, & Milfont, 2018; Dhont, Hodson, Costello, & MacInnis, 2014; Milfont et al., 2018; Milfont & Sibley, 2014). Thus, even if effective at reducing men's meat consumption,

validating traditional masculinity in advocating for plant-based food consumption may have other downsides for human-animal relations and environmental well-being. Moreover, given that vegetarians tend to be more socially liberal compared to meat-eaters (Ruby, 2012) and thus likely identify less with traditional masculinity, it is possible that promoting a traditionally masculine image of vegetarianism could alienate people who already eat a plant-based diet. In contrast to these potential effects, promoting a shift towards new forms of masculinity that incorporate empathic values, such as caring for animals and the environment, may avoid these downsides and even yield positive spillover effects. Individual differences in attachment to traditional masculinity among men might moderate effects of gendered messaging, and understanding these probable interaction effects could clarify when and for whom appeals to traditional vs. new masculinity are optimal.

In promoting meat reduction—particularly with an eye toward gender differences—it would be useful to consider the potentially different effects of emphasizing the health, animal rights/welfare, or environmental sustainability benefits of vegetarianism. Our data suggest that among both men and women, viewing health as a primary reason for potentially becoming a vegetarian is more common than viewing either animal or environmental concerns as a primary reason. Moreover, if messages are focused on the implications of meat consumption for animal rights/welfare, then they may appeal more strongly to women's primary concerns than men's primary concerns. Openness to vegetarianism for environmental reasons, meanwhile, seems to resonate as a primary concern with men and women to similar degrees. Beyond these between-gender differences, future research should consider traditional gender role conformity (but not necessarily centrality) differences in determining what strategies may be most effective for stimulating dietary changes. Our data highlight, for example, that men who view the environment as a primary prospective reason for becoming a vegetarian tend to identify with traditional masculinity less strongly than do men who primarily indicate animal concerns or health reasons as prospective motives. A potential implication of this finding, ripe for testing in future research, is that highly traditionally masculine men may be more receptive to curtailing their meat intake in response to animal-rights/welfare or health-focused messages than to environmentally focused messages.

4.1. Strengths and limitations

The main strengths and novelties of the current research are its consideration of within-gender heterogeneity, its nuanced consideration of both gender role conformity and gender identity centrality, and its clear distinctions between different types of meat. Distinguishing between different types of meat is notably relevant to environmental concerns, given the drastic differences in resources consumed depending of the type of meat (Tilman & Clark, 2014). Two methodological strengths of the current study are its use of preregistration and its highly powered large sample, which collectively reduce its false positive and false negative error rates.

One limitation of this research is its use of cross-sectionally self-reported dietary intentions and behaviors, which future research could extend through experimental designs, ecological momentary assessment techniques, or longitudinal methodology. A second limitation is that distances between anchors on this study's meat consumption frequencies scale were not equal, making their findings less clearly interpretable. A third limitation is that our assessment of gender role conformity conceptualized masculinity and femininity along a single dimension. While previous psychometric findings support the use of this single-dimension assessment (Kachel et al., 2016), this method nevertheless precludes participants from identifying as either high or low on both masculinity and femininity simultaneously. A fourth limitation is that we did not gauge participants' openness to reducing their meat intake partially (i.e., adopting a flexitarian diet), instead assessing only their openness to giving up meat entirely via becoming a vegetarian or vegan. It would be useful to know whether gender-related phenomena predict openness to full vs. partial meat avoidance to different degrees. A fifth limitation is that in our assessment of prospective reason for becoming a vegetarian/vegan, participants could select only one response (their main prospective reason), even though many people in reality have multiple reasons for being a vegetarian/vegan (Janssen, Busch, Rödiger, & Hamm, 2016; Rothgerber, 2014). Thus, participants' responses to this measure likely failed to capture other reasons that they may have found similarly compelling. Future research might benefit from assessing prospective reasons via separate continuous scales. A sixth limitation is that the inferences drawn from these data may not be generalizable beyond the United States, given that cultural differences in gender roles may moderate effects. Relatedly, while we sought to improve data quality by excluding participants who failed attention checks, generalizability may be limited by potential pitfalls of MTurk response reliability (Chmielewski & Kucker, 2020).

5. Conclusion

A plausible reason as to why men favor meat consumption over vegetarianism is that, in a sense of traditional gender roles, eating meat makes them feel like "real" men. Men tend to eat more meat and express more resistance to becoming a vegetarian than women do, and within-gender differences in self-ascribed masculinity/femininity among men offer insights into these phenomena. A deeper understanding of gender roles may be useful to reducing public meat consumption for improved human health and environmental sustainability.

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Ethical approval

This study protocol received Institutional Review Board approval (IRB#19–001508) from the University of California, Los Angeles, and informed consent was obtained from all study participants.

Declaration of competing interest

None.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.appet.2021.105475.

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