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IT'S NOT JUST MEAT, MATE! THE IMPORTANCE OF GENDER DIFFERENCES IN MEAT CONSUMPTION

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It's not just meat, mate! The importance of gender differences in meat consumption

Abstract

Most meat-related research focuses on binary differences between men and women, ignoring differences within both genders. Through an online survey ($N = 870$), we investigate meat consumption behavior and how this is related to gender identity and new masculinity norms. The results confirm differences in meat consumption behavior between men and women, but also disclose more complicated differences within both groups, related to gender identity and agreement with masculinity norms. The findings also highlight the link between masculinity and red meat in particular, compared to white meat. The implications of this study for improving personal and environmental health are discussed.

Keywords

Meat consumption, gender, masculinity

Word count

9984

Introduction

Throughout human history, meat has been associated with strength and masculinity (Hart 2018; Kildal and Syse 2017). This can be observed in different attitudes men and women have towards meat (Love and Sulikowski 2018), the fact that men are more attached to meat than women (Dowsett et al. 2018), and the high rates of meat consumption in men (Pfeiler and Egloff 2018b). Although existing research talks about the ways meat is associated with masculinity (Oleschuk, Johnston, and Baumann 2019), many of these studies on meat and plant-based diets do not make a clear distinction between sex and gender, or do not clearly state whether they are discussing the concept of sex or gender (e.g., Gossard and York 2003; Haverstock and Forgays 2012; Verbeke and Vackier 2004). This study aims to fill in this gap by examining between- and within- gender differences in meat consumption and meat attachment.

Previous research indicated that a more fine-grained measurement is necessary, proving that meat consumption among men varied in relation to their identification with certain masculinity norms (De Backer et al. 2020). Other authors also found differences in meat consumption related to gender identity differences (Rosenfeld and Tomiyama 2021). It becomes even more complex because the concepts of sex and gender are very often used interchangeably, despite their different meanings. The current study wants to look beyond binary sex differences and considers a broader range of gender norms. The use of different scales ensures a more diverse interpretation of gender. In this manuscript, we want to explicitly differentiate between sex and gender by using the concept 'sex' to refer to the biological sex assignment, thus referring to the distinction between men and women based on biological differences (Fisher and Burch 2021), while 'gender' will be used to refer to the social and cultural meaning attached to the biological sexes of men and women (Richardson 2015). However, in this paper we do try to distinguish between sex and gender, following the explanation given above. By distinguishing between both terms, and working with different scales, we add a more nuanced measurement of two

intertwined concepts, since men and women may have very different ideas about their gender, masculinity, and femininity.

Another weakness of previous research is the lack of attention paid to the different types of meat being consumed (De Backer et al. 2020; Lentz et al. 2018; Timeo & Suitner 2018). The current study distinguishes between red and white meat, as it is known that sex differences in meat consumption apply mainly to red meat, men eating more red meat than women (Nath 2011; Sobal 2005) and red meat provoking more and stronger associations with masculinity (Kildal and Syse 2017).

This paper begins with a review of sex and gender differences in meat consumption, the connection between meat and masculinity, and an exploration of alternative masculinities. Based on this, we formulate hypotheses and research questions that will be tested by means of a survey design. The questionnaire was based on the research of Lentz and colleagues (2018), to which we added additional variables regarding masculinity and gender. The implications of this research for personal and environmental health are discussed at the end of the manuscript.

Literature

On Men, Women, and Meat

Sex seems to be an important influence regarding meat consumption (Gossard and York 2003). This idea is supported by figures about meat consumption: men eat significantly more meat than women (Fessler et al. 2003; Pfeiler and Egloff 2018a) and women are more inclined to follow a plant-based or meat-reduced diet (Haverstock and Forrays 2012; Hayley, Zinkiewicz, and Hardiman 2015). However, a recent study stated that women may underreport their meat consumption as a form of self-justification for eating meat (Rothgerber 2019).

The association between men and meat is also omnipresent in our culture, through advertisements, literature, art, and other forms of popular culture (Jansen 2016; Nath 2011; Rogers 2008). Heinz and Lee (1998) discovered six associational clusters for meat, stating that besides being seen as a product, food, part of a meal, tradition, or part of a healthy diet, meat is also strongly associated with masculinity. This was later confirmed by other researchers (Kildal and Syse 2017; Rozin et al. 2012), with studies suggesting that the link between meat and masculinity can be found in almost every human culture (Adams 1998; Cavazza, Guidetti, and Butera 2015; Hart 2018; Love and Sulikowski 2018). However, there is little to no evidence that suggests that, when controlling for height and body weight, men biologically need to consume more meat than women (Gossard and York 2003). Not all associations with meat are positive or linked with masculinity. In addition to being associated with strength or musculature, meat is also associated with fatness and disease (Johnston, Baumann, and Oleschuk 2021).

A possible explanation for men's high meat consumption can be found in a study by Rothgerber (2013), who states that differences between men and women regarding meat consumption may be explained by differences in attitudes toward eating meat. This is a confirmation of earlier research and has been affirmed in more recent studies. For example, men identify themselves more as straightforward meat lovers (Verbeke and Vackier 2004) and are more likely to support the statement that a proper meal must contain meat (Sobal 2005; Vandermoere et al. 2019). Furthermore, men and women differ in their emotional attachment to meat (Graça, Calheiros, and Oliveira 2015), which acts as a driver for meat consumption. People who feel attached to meat and meat consumption are less likely to reduce their meat intake than people who do not feel this attachment (Lentz et al. 2018). Generally speaking, men are more attached to meat compared to women (Dowsett et al. 2018), and therefore are also less likely to reduce their meat intake. A recent study also shows that men are more defensive about their meat consumption

behavior (Hinrichs et al. 2022), something which may be shaped by the association with masculinity.

Not only do we attribute values to specific kinds of food, but we also attribute values to the people eating these foods, or meat in this case. According to Thomas (2016), the food you consume is an important factor in determining how masculine or feminine you appear to others. Timeo and Suitner (2018) explain this in more detail in a study investigating mate preferences among men and women. They found that women preferred omnivores as potential mates over vegetarians, although both men and women had positive attitudes toward vegetarians. More importantly, vegetarian men in the study were devalued because they were perceived as less masculine, rather than as part of a minority (Timeo and Suitner 2018). In short, men who eat meat tend to appear more appealing to women.

The above suggests that there is more to food and meat than purely the nutritional aspect: food is also about identity (Oleschuk, Johnston, and Baumann 2019; Sobal 2005), and in this case more specifically about masculinity (Sobal 2005). Since the direct and indirect associations mentioned above are found in different cultures, and since research suggests that biological factors do not fully explain sex differences in meat consumption, we need to consider gender norms.

Gender Differences Within Men

The strong relationship between meat and masculinity stems from the hegemonic ideals of masculinity (Hart 2018). Connell (2005) theorized that there are multiple masculinities, which vary through time and between cultures. However, at any given time, there is one type of masculinity which is considered the ideal form: hegemonic masculinity (Connell and Messerschmidt 2005). As masculinity is determined not only by biological factors, but also by presentation factors (Bogueva and Marinova 2018; Fleming and Agnew-Brune 2015), eating

meat can become a means through which men can show their masculinity and earn manhood (Ruby and Heine 2011). For example, Nakagawa and Hart (2019) found that men's concern for their masculinity plays a role in the sex differences in meat consumption as mentioned above. The researchers indicated that in response to masculinity threats, men tend to adopt stronger pro-meat attitudes (Nakagawa and Hart 2019). As the current form of hegemonic masculinity promotes meat consumption (Newcombe et al. 2012; Rogers 2008), eating meat is considered essential for the strength a man needs for typical masculine activities (Hart 2018). This link between meat and (hegemonic) masculinity was already theorized by Adams in 1990. She draws parallels between meat consumption, conceived as a form of oppression, and patriarchy, in which women are oppressed by men (Adams, 2015 as cited in De Backer et al. 2020).

Although the concept of hegemonic masculinity is widely used in academic research (Mycek 2018; Newcombe et al. 2012), not all men identify with this form of masculinity. Different types of alternative masculinity have been identified (Sobal 2005), such as metrosexuality (an "urbane, successful, sophisticated and well-groomed modern heterosexual man"; Shugart, 2008), hybrid masculinity (which focuses on "the ways that men actively challenge and reinforce hegemonic ideas of manhood"; Greenebaum & Dexter, 2018) or caring masculinity (which rejects domination and integrates values of care; Elliott, 2016). These types of alternative masculinity often combine parts of hegemonic masculinity with elements of subordinate masculinities and even femininities (Elliott 2016; Shugart 2008). Certain types of alternative masculinity even center on the topic of meat avoidance. Renaissance masculinity (a concept with "theoretical potential to elaborate the cultural processes that maintain the dominance of hegemonic masculinity"; Brady and Ventresca 2014), for example, was only developed when a pro football player declared himself a vegan.

Even though we know that the current, Western form of hegemonic masculinity promotes meat consumption (Newcombe et al. 2012; Rogers 2008), research has yet to examine how these

alternative norms of masculinity are associated with meat consumption, reduction, and attachment. Since more men trade the hegemonic form of masculinity and its meat-eating norms with these alternative types of masculinity (Bridges and Pascoe 2014; Connell 2005), it is important to consider these new forms as well. Sobal (2005) already demonstrated the use of multiple masculinities and its advantages, in both research and society. Contrary to the use of a single masculinity model, which does not fit everyday reality, the usage of multiple masculinities incorporates different models, recognizing one form as the hegemonic, dominant form, while also distinguishing other models. The importance of gender norms as a driver for health behavior (Fleming and Agnew-Brune 2015), together with first exploratory results on this subject (De Backer et al., 2020), further motivates the decision to include these norms in our research as well.

Despite the variety of alternative masculinities and the growing interest in this topic, little research has quantitatively operationalized and measured these concepts. In 2017, Kaplan and colleagues constructed the New Masculinity Inventory (NMI) in response to the lack of quantitative measures of alternative masculinities. Still, this inventory does not differentiate between the separate forms of new masculinity. It measures agreement with nontraditional masculinity, a more comprehensive term, which all the former listed alternative masculinities could be classified under. To further examine the connection between masculinity and meat consumption, we also integrate the Traditional Masculinity Femininity scale (Kachel, Steffens, and Niedlich 2016) into our research. This scale assesses a person's overall masculinity or femininity, thus giving more insight into how individuals perceive their own gender identity in different areas. The TMF scale offers a more fine-grained measurement of gender than the classical male-female categorization (Kachel, Steffens, and Niedlich 2016). Using these two scales enables us to better encapsulate gender in quantitative research such as this. These two scales (TMF and NMI) may bring more nuance to the concept of gender, since they not only

rely on male-female dichotomy, which is often used in research. Not only do more societal challenges arise in which the binary distinction between men and women is not sufficient, psychological research also shows that dividing people into only two categories is restricting (Hyde et al. 2019). This has also been confirmed in a recent study on meat consumption, in which the authors called for more consideration regarding the differences within men and women (Rosenfeld and Tomiyama 2021).

Combining the New Masculinity Inventory (as used in research by De Backer et al. 2020) and the Traditional Masculinity-Femininity scale (as used by Rosenfeld and Tomiyama 2021) gives us a better understanding of the individual differences in masculinity. Additionally, while previous research on meat and gender focused primarily on men (De Backer et al., 2020; Greenebaum & Dexter, 2018; Mycek, 2018), this study also includes women to get a clearer sense of both sex differences between men and women and gender differences within the group of men and women.

Hypotheses and Research Questions

The core aim of this paper is to examine the relationship between meat consumption, meat attachment, and meat reduction on the one hand, and both sex and gender (as measured using TMF and NMI) on the other. Based on previous findings, we try to replicate some of the hypotheses of earlier works as mentioned below. Additionally, we formulate different sets of research questions to complement the hypotheses.

Based on earlier research by Fessler and colleagues (2003), Rosenfeld and Tomiyama (2021) and De Backer and colleagues (2020), we formulated the first set of hypotheses considering meat consumption.

H1a Men consume more meat than women.

H1b Men who consider themselves more masculine consume more meat compared to men who consider themselves less masculine.

H1c Men who do not agree with new masculinity norms consume more meat compared to men who agree more with these norms.

Research by Dowsett and colleagues (2018) and De Backer and colleagues (2020) focused on meat attachment. Based on this research, we formulate a second set of hypotheses.

H2a Men are more attached to meat compared to women.

H2b Men who do not agree with new masculinity norms are more attached to meat compared to men who agree more with these norms.

The article by De Backer and colleagues (2020) complements the research of Haverstock and Forgays (2012) on the willingness to reduce meat consumption. Based on these two papers, we formulate the last set of hypotheses.

H3a Men are less willing to reduce meat consumption compared to women.

H3b Men who do not agree with new masculinity norms are less willing to reduce meat consumption compared to men who agree more with these norms.

We further formulate research questions on relations that have not been studied to date. The first set of research questions examines how gender identity (TMF) and agreement with new masculinity norms (NMI) are linked with meat consumption in women.

RQ1a What is the relationship between TMF and meat consumption in women?

RQ1b What is the relationship between NMI and meat consumption in women?

RQ1c What is the interaction effect between TMF and sex and between NMI and sex regarding meat consumption?

The second set of research questions further explores the relationship between gender (TMF and NMI) and meat attachment in men and women.

RQ2a What is the relationship between TMF and meat attachment in both men and women?

RQ2b What is the relationship between NMI and meat attachment in women?

RQ2c What is the interaction effect between TMF / NMI and sex regarding meat attachment?

In addition to these questions, we also want to take a closer look at the possible interaction effects between TMF and NMI, and sex. From previous research, it is known that men and women score differently on the TMF scale (Kaplan, Rosenmann, and Shuhendler 2017). Since the New Masculinity Inventory operationalizes new masculinity norms, these questions have different implications for male and female participants. For male participants, these questions are about social norms that they should or should not adhere to, thus having direct implications regarding their own behavior. For female participants, these questions are not about their own behavior, but rather that of the opposite gender and thus have little to no direct implications for them. Taking this into account, we decided to add additional research questions to examine the relationship between gender (TMF and NMI) and meat reduction.

RQ3a What is the relationship between TMF and meat reduction in both men and women?

RQ3b What is the relationship between NMI and meat reduction in women?

RQ3c What is the interaction effect between TMF / NMI and sex regarding meat reduction?

Since research suggests that there are various health related (Abete et al. 2014), environmental (Bohm et al. 2015; Machovina, Feeley, and Ripple 2015), and cultural differences (Kildal and Syse 2017; Kubberød et al. 2002) between red and white meat, we will examine all hypotheses and research questions for both types of meat, thus also remedying limitations of earlier research (De Backer et al., 2020; Rosenfeld & Tomiyama, 2021). We expect the relations to be stronger for red meat compared to white meat, since red meat is more associated with masculinity than white meat, and men eat more red meat than women (Sobal 2005; Kildal and Syse 2017). Note that this study will not allow to establish causal links between sex / gender and meat consumption / reduction / attachment, since this research is based on cross-sectional survey results.

Materials and Methods

Sample and Procedure

A convenience sample of $N = 888$ adults was recruited in the United Kingdom and the United States using Prolific, an online platform for participant recruitment (Palan and Schitter 2018). The responses of $n = 9$ participants were omitted from the study, as they did not complete the entire questionnaire. After first descriptive analyses, we decided not to include the participants who did not consider themselves male or female, since the group was too small to run statistic tests ($n = 9$). Thus, we continued the analyses with a sample of $N = 870$, of which $n = 615$ identified as female, and $n = 255$ identified as male. Most of the participants were residents of the U.K. ($n = 787$), and $n = 64$ participants lived in the U.S. $N = 19$ participants did not disclose their country. This sample is biased in terms of ethnicity. $N = 732$ participants were white, $n = 81$ were black, and $n = 27$ were black. $N = 28$ participants stated that their ethnicity was mixed and $n = 11$ participants did not want to disclose their ethnicity. More demographic information can be found in Table 1. The study was approved (reference SHW 20_82) by the Ethics Committee for the Social Sciences and Humanities of the University of (blinded for review). All participants provided their informed consent and were debriefed at the end of the survey.

[Table 1 near here]

Materials

The questionnaire was based on earlier research by Lentz and colleagues (2018), who examined meat consumption and drivers for its reduction. We used the entire questionnaire of Lentz and colleagues as a starting point, but added questions regarding gender identity (i.e. TMF) and agreement with new masculinity norms (i.e. NMI). The survey was pre-tested among a convenience sample ($N = 103$; Age $M = 26.86$, $SD = 9.531$).

We used the Traditional Femininity-Masculinity scale (TMF; Kachel, Steffens, and Niedlich 2016) to assess a person's overall adherence to masculinity and femininity norms. This scale offers a more fine-grained measurement of gender than the classical male-female categorization by situating gender identity on six continuous items, thus addressing criticisms of binary gender identity measurements (Fisher and Burch 2021; Richardson 2015). Rosenfeld and Tomiyama (2021) also used this scale in their research about gender differences in meat consumption. A higher score on this scale indicates a more feminine gender identity, while a lower score indicates a more masculine gender identity. The TMF scale consists of six items rated on a 7-point Likert scale, ranging from 1 (totally masculine) to 7 (totally feminine), such as "Traditionally, my interests would be considered as..." and "Ideally, I would like to be...". (Cronbach's $\alpha = .96$).

Additionally, we used the New Masculinity Inventory (NMI; Kaplan et al. 2017) to assess the participants' self-reported agreement with new masculinity norms. The NMI consists of seventeen items rated on a 6-point Likert scale, ranging from 1 (completely disagree) to 7 (completely agree). The scale consists of five subscales: holistic attentiveness (e.g., "A man should come to know himself through paying attention to his body and its needs."), questioning definitions of masculinity (e.g., "Society's definition of masculinity is partial and too restrictive."), authenticity (e.g., "Men should be able to express their feelings at work the same way they do at home or with friends."), domesticity and nurturing (e.g., "Helping one's children develop their true selves is a more important part of fatherhood than focusing on their financial well-being.") and sensitivity to men's privilege (e.g., "The distinction between masculine and feminine characteristics and roles is damaging for both men and women"). (Cronbach's $\alpha = .89$).

We measured participants' attitude towards eating meat using the Meat Attachment Questionnaire (MAQ; Graça et al. 2015). A higher score indicates a more positive attitude

towards meat consumption. The MAQ consists of sixteen items, rated on a 7-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree). The scale also consists of four subscales (hedonism, affinity, entitlement, and dependence). To come to the total score on the MAQ, results on the subscales were added (Cronbach's $\alpha = .95$).

The meat intake of the participants was measured by a single question: "On average, how often do you consume meat or products that include meat?", as questioned in the original study by Lentz and colleagues (2018). The answers were placed on a scale of 0 (never) to 5 (several times a day) scale. This question was asked separately for red and white meat.

To measure meat reduction, we first asked participants which types of meat they avoid, if any. Types of meat included chicken, turkey, beef, pork, lamb, goat and other, where participants could indicate any other types of meat they avoid. Next, we asked the participants if they already try or have tried to limit their meat consumption. Participants answered this question with "yes" or "no". This question was asked separately for red and white meat.

Willingness to reduce meat intake was measured using two questions: "On a scale from 1 to 7, how willing would you be to consider reducing your meat consumption sometime in the near future?", with 1 being "not at all willing" and 7 being "extremely willing, and "Specifically, in the next six months do you intend to reduce your meat consumption?", with 1 being "do not intend at all" and 7 being "fully intend". The answers to these two questions were summed up to obtain a final score measuring 'willingness to reduce meat intake'. These questions were also asked separately for red and white meat, and were directly taken from the original survey of Lentz and colleagues (2018).

Analyses

The hypotheses and the analytical plan were specified before the data was collected. Descriptive statistics, compare means, multiple hierarchical regressions and ANCOVA analyses were

performed in SPSS 27 to test the hypotheses and research questions regarding meat consumption, meat attachment and meat reduction. Based on GPower calculations for ANCOVA analyses, a sample of at least $N = 400$ was required. We used a medium effect size ($d=.25$) and an alpha of .05 with 95% power. This condition was met, since the final sample consisted of $N = 870$. First, we ran different descriptive statistics and compare means analyses. Second, we ran multiple hierarchical regressions. These regressions had age, sex, education, and socioeconomic status (SES) as control variables, based on earlier research (De Backer et al., 2020). We used either one or two blocks for multiple regressions. The first block had control variables as mentioned before and the variable measuring sex. This block was used to test the effect of sex, or to act as control variables when testing TMF or NMI. We want to examine the effect of TMF or NMI within sex, which is why sex will act as a control variable. By doing so, the multiple regression outcome will show the variance TMF or NMI account for, with the variance of the control variable (sex) already accounted for (Hunter 2015). The second block was used to add TMF or NMI and thus test the effect of TMF or NMI. When testing the effects of TMF or NMI, we also performed ANCOVA analyses to explore interaction effects with sex.

Results

A detailed and complete overview of all correlations can be found in Table 2.

[Table 2 near here]

Meat consumption in relation to masculinity (H1a, H1b, H1c, RQ1a, RQ1b, RQ1c)

The descriptive results show that the participants frequently eat red meat ($M = 2.34$; $SD = .778$) and white meat ($M = 2.68$; $SD = .829$). Participants consume more white meat than red meat ($t(869)=15.019$, $p<.001$). When observing sex differences, the results show that men consume more red ($F(1,868)=42.35$, $p<.001$) and white meat ($F(1,868)=18.61$, $p<.001$) than women (see Table 3).

[Table 3 near here]

Multiple regression analyses were performed to analyze the relationship between masculinity and both red and white meat consumption (see Table 4 and Table 5 respectively). The results of these analyses indicated that for both red and white meat, the model was statistically significant, as was the effect of sex. The model testing TMF was also statistically significant for both red and white meat. However, in both cases, the effect of TMF itself was not significant. An extra ANCOVA test showed a significant interaction effect between gender and TMF for both types of meat (Red meat: $F(1,866)=7.48$, $p=.006$, see Figure 1a; White meat: $F(1,866)=16.98$, $p<.001$, see Figure 1b). A low score on the TMF scale, thus a more masculine identity, is associated with more red and white consumption for men, whereas the same score for women is associated with less red and white meat consumption. The next multiple regressions added NMI to the second block while excluding TMF. For both red and white meat, the models were statistically significant, as were the effects of NMI. Extra ANCOVA tests did not indicate interaction effects between sex and NMI (Red meat: $F(1,866)=.03$, $p=.86$; White meat: $F(1,866)=2.44$, $p=.12$). Considering the difference between red and white meat, we

observed a small negative effect of education and age on white meat consumption, which was not found when analyzing red meat consumption.

[Table 4 near here]

[Table 5 near here]

Meat attachment in relation to masculinity (H2a, H2b, RQ2a, RQ2b, RQ2c)

The mean score regarding meat attachment was $M = 4.20$ ($SD = 1.44$). Men scored significantly higher than women ($F(1,868)=49.50, p<.001$; see Table 3). To test the second set of hypotheses and research questions, we ran three multiple regressions (see Table 6). The first model only had one block with control variables and sex. The results showed that the model was statistically significant, as was the effect of sex. The multiple regression model testing TMF was statistically significant, but TMF did not add to the explained variance (see Table 6). However, an ANCOVA analysis showed an interaction effect between sex and TMF ($F(1,866)=33.79, p<.001$; See Figure 1c). A low score on the TMF scale, thus a more masculine identity, was associated with more meat attachment for men, whereas the same score for women relates to less meat attachment. The regression model testing NMI was also statistically significant. NMI itself was a significant predictor. Further ANCOVA analyses did not show interaction between sex and NMI ($F(1,866)=.81, p=.37$).

[Table 6 near here]

Meat reduction in relation to masculinity (H3a, H3b, RQ3a, RQ3b, RQ3c)

Half of the participants indicated that they ever made or are currently making efforts to reduce their red meat intake ($n = 440$). This number was higher compared to white meat, where only $n = 262$ participants ever made or are currently making efforts to reduce white meat consumption. Participants in the study were somewhat willing to reduce their red meat consumption ($M =$

4.54; $SD = 1.90$), but not to reduce their white meat consumption ($M = 3.67$; $SD = 1.829$). Men were less willing to reduce both their red meat intake ($\chi^2(1)=19.622$, $p<.001$) and their white meat intake ($\chi^2(1)=15.27$, $p<.001$) compared to women. Although the participants were somewhat willing to reduce their meat intake, the intentions were not quite high: $M = 3.66$ ($SD = 2.154$) for red meat and $M = 2.84$ ($SD = 1.915$) for white meat. Again, men had less intentions to reduce both their red meat ($\chi^2(1)=18.52$, $p<.001$) and white meat ($\chi^2(1)=12.80$, $p<.001$) consumption compared to women (see Table 3).

Regarding willingness and intentions to reduce meat intake, the multiple regression models were significant for both red and white meat (see Table 7 and Table 8 respectively). The regression models testing TMF were statistically significant in both cases. The effect of TMF, however, was not. Further ANCOVA analyses showed interaction effects between sex and TMF for both red meat ($F(1,727)=4.69$, $p=.031$; see Figure 1d) and white meat ($F(1,745)=9.61$, $p=.002$; see Figure 1e). A low score on the TMF scale, thus a more masculine identity, is positively related to the consumption of red and white meat for men, whereas the same score for women was associated with a greater reduction of red and white meat. Regression models that tested NMI were statistically significant for both types of meat, as was the effect of NMI itself. ANCOVA analyses did not show interaction effects between sex and NMI, neither in the case of red meat ($F(1,727)=.00$, $p=.99$), nor in the case of white meat ($F(1,745)=.36$, $p=.550$). Further considering the difference between red and white meat, we found a small negative effect of age on white meat reduction, and a small positive effect of SES on red meat consumption.

[Table 7 near here]

[Table 8 near here]

[Figure 1 near here]

Discussion

Research showed that there are significant sex differences between men and women when it comes to meat consumption (Gossard and York 2003; Hayley, Zinkiewicz, and Hardiman 2015; Pfeiler and Egloff 2018b). However, the binary distinction that is often used in meat related research does not do justice to gender diversity that can be found in men and women. The primary objective of this study was to investigate these gender differences in red and white meat consumption by means of gender identity and agreement with new masculinity norms.

Our results confirm the importance of sex differences in meat consumption behavior and attitudes. Men consume more meat than women (H1a), are more attached to meat (H2a), and are less willing to reduce their meat intake (H3a). However, we found that gender identity, as well as agreement with new masculinity norms, are additional factors that should not be overlooked. Including gender identity (TMF) in our study revealed that men who consider themselves to be more (versus less) masculine, consumed more meat (H2), showed more meat attachment (RQ2a), and were less willing to reduce their meat intake (RQ3a). Compared to women who consider themselves to be less feminine, women who consider themselves more feminine consumed more meat (RQ1a), showed more meat attachment (RQ2a), and were less willing to reduce their meat intake (RQ3a). A possible explanation for this interaction effect could be the effect of conservatism. A more conservative mindset has already been linked with more meat consumption (Pfeiler and Egloff 2018b). Other authors also found a positive association between political conservatism and opposition to sexual and gender minority rights (Todd et al. 2020). The link between conservatism, gender identity and meat consumption, thus linking the three variables together, has yet to be examined.

Moreover, our results show that agreement with new masculinity norms (NMI) plays an important role as well. For both men and women, higher agreement with new masculinity norms corresponded to lower meat intake (H1c, RQ1b), lower meat attachment (H2b, RQ2b), and a

greater willingness to reduce meat consumption (H3b, RQ3b). The absence of interaction effects between sex and NMI shows that, regardless of sex, a more traditional view of masculinity relates to higher meat consumption, stronger meat attachment, and less meat reduction (RQ1c, RQ2c, RQ3c).

The interaction effects between TMF and sex show that men and women do score differently on the TMF scale in relation to meat consumption behavior. A certain score on the scale correlated with different consumption behaviors when comparing men and women (RQ1c, RQ2c, RQ3c). For example, considering oneself very masculine results in different behaviors for men and women. Men who consider themselves very masculine consume more meat, while women who consider themselves very masculine consume less meat (RQ1c).

All results were similar for both red and white meat, but were more pronounced for red meat. This is in line with earlier findings about the association between the notion of masculinity and red meat in particular (Kubberød et al. 2002; Nath 2011). Whereas previous research mostly studied sex differences in relation to red meat, our inclusion of gender identities and norms is novel in the field, although it does confirm the association between red meat, norms of masculinity (Rozin et al. 2012) and the role of red meat in enabling masculinity.

Our findings contribute to the field of food and cultural studies by showing that there is more to meat consumption behavior and attitudes than just a binary distinction between men and women. These results confirm the stereotypical idea that “real men eat meat” (Rothgerber 2013), at least within men. The affirmation and implementation of a masculine identity could explain the findings regarding the male study participants. In their case, consuming more meat, and specifically red meat, could be a way of conveying a strong and authentic image of masculinity. This is supported by earlier research, which states that men’s concern about masculinity partly explains sex differences regarding meat consumption (Nakagawa and Hart 2019; Sobal 2005).

Furthermore, the importance of gender identity in women is interesting and differs from the results of Rosenfeld and Tomiyama (2021). Although they did not find significant results, our study shows that women who consider themselves very feminine and therefore conform to traditional gender norms (Kachel, Steffens, and Niedlich 2016), consume more meat, are more attached to meat and are less willing to reduce their meat intake, which challenges the notion that meat is masculine. Taking the results regarding agreement with new masculinity into account, a possible explanation is that a more traditional mindset could be a driver of meat attachment and increased meat consumption. Earlier research suggests that political conservatism is related to increased meat consumption, regardless of sex (Pfeiler and Egloff 2018a), which implies that more modern minded individuals may conform less to their traditional gender roles, and thus consume less meat. The interaction between gender identity and sex, and the lack of interaction effect between new masculinity agreement and sex seem to support this idea, but needs to be further explored. These results are particularly interesting, as they demonstrate that there is a fairly large group of avid female meat eaters, which could be targeted in health campaigns. These findings also challenge the association between femininity and plant-based diets, as earlier research demonstrated (Ruby and Heine 2011).

Future research directions

The results of this study bring more nuance to the stereotype of men eating meat. Future research on this topic will benefit from a more fine-grained approach to gender, without focusing on a binary distinction between men and women, but accounting for all gender identities between and outside these two opposites. This can be done by incorporating gender-related scales, for example the TMF scale and NMI. However, further research should also focus on developing more specialized scales concerning alternative types of masculinity. So far, the NMI is the only existing scale that combines all kinds of alternative masculinities but it does not distinguish them from each other. Moreover, no research has yet focused on hegemonic

femininity or alternative types of femininity. This would be an interesting direction to explore, parallel with hegemonic masculinity and alternative masculinities. Since this research is based on survey results, it did not generate causal links. However, future research could use experiments to further examine the causal nature of these relationships. More research on the topic of meat consumption behavior should make a distinction between red and white meat. Since we found some differences in significance for certain control variables (i.e. age, education, and SES), this could indicate a difference in relationship with these two types of meat. Another interesting dimension that could add a new layer of significance is the addition of sexism scales, as seen in a paper by MacInnis and Hodson (2017).

One limitation of this paper is the assessment of gender identity. We measured gender identity using the TMF scale, which only has one dimension, with masculinity and femininity on either side of it. It is not entirely clear where people who consider themselves both masculine and feminine, and people who consider themselves as neither of them, should place themselves on the scale. An update of the TMF scale would be in place, to further accommodate this issue and to include people who do not consider themselves masculine or feminine, such as nonbinary people.

A second limitation is the NMI scale, which does not differentiate between the many emerging norms of masculinity (Kaplan, Rosenmann, and Shuhendler 2017). More quantitative research could contribute to a scale that is more effective in distinguishing new masculinities. Moreover, the NMI only focuses on alternative masculinities, leaving possible new femininities and their social norms underexposed. As no such scale exists regarding new or hegemonic femininities, we could not incorporate possible emerging new femininities.

A third limitation of this study is the bias in participants. Most of the participants were women (n = 615 female participants to n = 255 male participants), UK (n = 787 or 90,5% of the sample) and of white ethnicity (n = 732 or 83,3% of the sample). Despite the statistical measures taken

to accommodate this situation, the ratios above do not reflect the ~~male-female~~ ratios as found in society. Previous research highlights the importance of ethnicity as a factor of influence on meat consumption (Schösler et al. 2015; Khara, Riedy and Ruby 2021), and should be incorporated into future research.

A fourth limitation is the self-report nature of this study. Women are known to under-report their meat consumption to fit within the social context of women eating less meat than men (Rothgerber 2019). This should be taken into account when interpreting the survey results.

A last limitation is the validity of some of the scales used for meat consumption and meat reduction, as these scales are not yet validated. Research on meat consumption could benefit from additional work on constructing and validating a scale to accurately measure meat consumption and willingness to reduce meat consumption.

Research implications

The findings of this study could be helpful for health organizations, health care professionals, marketers, and other institutions. We focus on health organizations and marketers in particular, since we feel that these groups could use this study the best to address the most important implications that come with (over)consumption of meat (personal health risks, environmental risks, animal welfare concerns), and to better facilitate dietary transitions. Although meat can be part of a healthy diet (Willett et al. 2019), personal health consequences, such as increased risk of cardiovascular disease, diabetes, and certain types of cancer (McAfee et al. 2010), should be taken into account. The current study shows that meat consumption is not only about men and their sex, but also about gender identity and new masculinity norms. Thus, health professionals and marketers could react to this new information by trying to question the link between meat (consumption) and masculinity. The message that it is not unmanly to reduce meat intake could help improve personal and environmental health. The current research also

shows that there is a group of avid female meat eaters, who are often overlooked. It would be interesting to see more health campaigns targeted at this group of consumers as well. Marketeers could also use the results of this study to show more diversity in their campaigns on meat consumption, meat reduction, and vegetarianism. By showing more diverse people eating plant-based alternatives, marketers could play a role in changing norms connected with hegemonic and alternative masculinity. By increasing the number of men who consume a vegetarian dish in advertisements, men could feel less pressure to eat meat to show their masculinity, compared to how meat is used to convey masculinity now (Bogueva, Marinova, and Raphaely 2017). Lastly, by limiting the consumption of meat, various animal welfare concerns could be addressed, as well as the guilty feeling many have when eating animal derived products (Holm and Mohl 2000).

Conclusion

Our study confirms traditional sex differences in meat consumption. However, this research also demonstrates the importance of measuring more than sex: gender differences within sexes are just as valuable. Men who have a more traditional view on masculinity (i.e. strong identification as masculine, and traditional views on masculinity norms) consume more meat and are less open to reduce this intake compared to their less traditional counterparts. The same can be seen in women: women with a traditional view on gender (i.e. strong identification as feminine, and traditional views on masculinity norm) are more attached to their meat consumption. The link between meat and masculinity is certainly present, but more research on meat and femininity is needed. However, the results of this study are useful in improving personal and environmental health and can be used by different stakeholders, such as healthcare professionals and marketers.

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Declaration of interest statement

The authors report there are no competing interests to declare.

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Table(s) with captions on individual pages

Table 1: Demographic information

	n	%
Sex		
Female	615	70.0
Male	255	29.0
Gender diverse	9	1.0
Age		
18-30	386	43.9
31-40	200	22.8
41-50	143	16.3
51-60	102	11.6
61-70	41	4.7
70+	7	0.8
Ethnicity		
White	732	83.3
Black	27	3.1
Asian	81	9.2
Mixed	28	3.2
Do not want to disclose	11	1.3
Country		
United Kingdom	787	90.5
United States	64	7.4
Other	19	2.2
SES		
1	4	0.5
2	17	1.9
3	72	8.2
4	120	13.7
5	162	18.4
6	212	24.1
7	194	22.1
8	80	9.1
9	9	1.0
10	3	0.3
Missing	6	0.7
Education		
No diploma	20	2.3
High school	305	34.7
Bachelor	406	46.2
Master	136	15.5
Doctorate	12	1.4

Note. Socio-economical status (SES) was measured using a 10-point item. Participants were shown a picture of a ladder, with the following description: “Think of this ladder as representing people where they stand in their communities. At the top of the ladder are the people who have the highest standing in their community. At the bottom of the ladder are the people who have the lowest standing in their community. Where would you place yourself on the ladder?”. 1 being ‘worst off’ and 10 being ‘best off’

Table 1 Alt Text: A table showing the demographic information of all participants, in both absolute numbers and percentages. The demographic information includes sex, age, ethnicity, country, socio-economical status and education.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Sex	-													
Age	.005	-												
Ethnicity	.010	-	-											
		.227**												
		*												
Country	-.073*	.028	.102*	-										
			*											
SES	.002	.075*	-.064	.020	-									
Education	-.041	.074*	-.014	.017	.213**	-								
					*									
TMF	.816**	.025	-.004	-.069*	.018	-.062	-							
	*													
NMI	.172**	-	.068*	.028	-.023	.076*	.116**	-						
	*	.193**					*							
		*												
Red meat consumption	-	.043	.015	.041	.001	-.051	-	-.149**	-					
	.216**						.138**							
	*						*							
White meat consumption	-	-.059	.074*	.028	.028	-.079*	-.078*	-	.649**	-				
	.145**							.136**	*					
	*							*						
Meat attachment	-	.022	.080*	.038	.002	-	-	-	.686**	.666**	-			
	.232**					.113**	.177**	.196**	*	*				
	*					*	*	*						
Willingness to reduce red meat	.163**	-.087	.023	.041	.048	.068	.140**	.227**	.370**	-	-	-		
	*						*	*	*	.149**	.646**			
										*	*			
Willingness to reduce white meat	.141**	-.114**	.059	.027	.038	.126**	.108**	.164**	-	-	-	.721**	-	
	*					*		*	.188**	.296**	.601**	*		
									*	*	*			

Intention to reduce red meat	.158** *	-.024	.081* *	.074*	.110**	.100**	.132** *	.176** *	- .337** *	- .145** *	- .573** *	.805** *	.620** *	-	
Intention to reduce white meat	.115**	-.077*	.106* *	.064	.082*	.138** *	.095**	.104**	- .213** *	- .257** *	- .547** *	.604** *	.794** *	.735** *	-

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

Table 2 Alt Text: A table showing the correlations between all independent and dependent variables used in the analyses. The independent variables consist of sex, age, ethnicity, country, socio-economic status, education, TMF and NMI. The dependent variables consist of red and white meat consumption, meat attachment, willingness to reduce red and white meat consumption and intention to reduce red and white meat consumption

Table 3: Descriptive information regarding meat consumption behaviour

		All groups		Men		Women		Min	Max
		M	SD	M	SD	M	SD		
Meat consumption	Red	2.34	.78	2.60	.70	2.23	.78	1	5
	White	2.68	.83	2.87	.70	2.61	.86	1	5
Meat attachment		4.20	1.44	4.72	1.27	3.99	1.45	1	7
Willingness to reduce	Red	4.54	1.90	4.09	1.92	4.75	1.86	1	7
	White	3.68	1.83	3.30	1.79	3.85	1.82	1	7
Intention to reduce	Red	3.65	2.16	3.17	2.15	3.90	2.12	1	7
	White	2.83	1.91	2.52	1.88	2.99	1.92	1	7

Note. Meat consumption was measured using a 5-point Likert scale, with 1 being “never” and five being “several times a day”. Willingness to reduce was measured using a 7-point Likert scale, with 1 being “not at all willing” and 7 being “extremely willing”. Intention to reduce was measured using a 7-point Likert scale, with 1 being “do not intend at all” and 7 being “fully intend”.

Table 3 Alt Text: A table showing the mean, standard deviation, and minimum and maximum values of red and white meat consumption, meat attachment, willingness to reduce red and white meat consumption and intention to reduce red and white meat consumption. All means and standard deviations are reported for the entire sample, for all male participants and for all female participants.

Table 4: Multiple regressions regarding red meat consumption in relation to masculinity

Variable	Model 1			Model 2			Model 3		
	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β
(Constant)	2.637	.128		2.537	.142		3.192	.230	
Age	.003	.002	.048	.003	.002	.046	.002	.002	.028
Education	-.064	.034	-.065	-.061	.034	-.062	-.054	.034	-.054
SES	-.003	.017	-.006	-.004	.017	-.008	-.004	.017	-.008
Sex	-.372	.057	-.217***	-.501	.098	-.293***	-.341	.058	-.199***
TMF				.043	.027	.093			
NMI							-.113	.039	-.100***
R^2	.052			.055			.062		
<i>F</i> for change in R^2	11.848***			10.014***			11.247***		

Note. * $p < .05$; ** $p < .01$; *** $p < .001$; “Sex” was coded as follows: 0 = male, 1 = female ; All assumptions regarding multiple regressions were met. VIF values were below 10.

Table 4 Alt Text: A table showing multiple regressions analysing red meat consumption in relation to masculinity. The table depicts three different models, with the first model only containing control variables (age, education, socio-economic status and sex). The second model contains all control variables and adds TMF. The third model contains all control variables and adds NMI into the regression.

Table 5: Multiple regressions regarding white meat consumption in relation to masculinity

Variable	Model 1			Model 2			Model 3		
	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β
(Constant)	3.079	.137		2.966	.153		3.768	.246	
Age	-.004	.002	-.059	-.004	.002	-.061	-.005	.002	-.082*
Education	-.097	.036	-.092***	-.094	.036	-.089**	-.084	.036	-.080*
SES	.017	.018	.033	.016	.018	.031	.016	.018	.030
Sex	-.266	.061	-.146***	-.411	.106	-.226***	-.227	.062	-.125***
TMF				.049	.029	.098			
NMI							-.140	.042	-.117***
R^2	.033			.036			.045		
F for change in R^2	7.234***			6.367***			8.120***		

Note. * $p < .05$; ** $p < .01$; *** $p < .001$; “Sex” was coded as follows: 0 = male, 1 = female ; All assumptions regarding multiple regressions were met. VIF values were below 10.

Table 5 Alt Text: A table showing multiple regressions analysing white meat consumption in relation to masculinity. The table depicts three different models, with the first model only containing control variables (age, education, socio-economic status and sex). The second model contains all control variables and adds TMF. The third model contains all control variables and adds NMI into the regression.

Table 6: Multiple regressions regarding meat attachment in relation to masculinity

Variable	Model 1			Model 2			Model 3		
	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β
(Constant)	4.964	.235		4.954	.261		6.449	.419	
Age	.003	.004	.032	.003	.004	.032	.000	.004	.004
Education	-.242	.062	-.131***	-.242	.062	-.131***	-.214	.062	-.116***
SES	.013	.031	.014	.013	.031	.014	.010	.031	.011
Sex	-.747	.104	-.236***	-.760	.181	-.240***	-.664	.104	-.209***
TMF				.004	.049	.005			
NMI							-.302	.071	-.144***
R^2	.070			.070			.089		
F for change in R^2	16.174***			12.926***			16.815***		

Note. * $p < .05$; ** $p < .01$; *** $p < .001$; “Sex” was coded as follows: 0 = male, 1 = female ; All assumptions regarding multiple regressions were met. VIF values were below 10.

Table 6 Alt Text: A table showing multiple regressions analysing meat attachment in relation to masculinity. The table depicts three different models, with the first model only containing control variables (age, education, socio-economic status and sex). The second model contains all control variables and adds TMF. The third model contains all control variables and adds NMI into the regression.

Table 7: Multiple regressions regarding red meat reduction in relation to masculinity

Variable	Model 1			Model 2			Model 3		
	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β
(Constant)	3.086	.344		3.055	.378		.589	.624	
Age	-.009	.005	-.066	-.009	.005	-.067	-.004	.005	-.025
Education	.209	.093	.084*	.210	.093	.085*	.171	.092	.069
SES	.088	.045	.072	.088	.046	.072	.089	.045	.073*
Sex	.720	.150	.175***	.676	.269	.164*	.589	.150	.143***
TMF				.014	.072	.013			
NMI							.505	.106	.179***
R^2	.047			.047			.076		
<i>F</i> for change in R^2	8.913***			7.129***			11.889***		

Note. * $p < .05$; ** $p < .01$; *** $p < .001$; “Sex” was coded as follows: 0 = male, 1 = female ; All assumptions regarding multiple regressions were met. VIF values were below 10.

Table 7 Alt Text: A table showing multiple regressions analysing red meat reduction in relation to masculinity. The table depicts three different models, with the first model only containing control variables (age, education, socio-economic status and sex). The second model contains all control variables and adds TMF. The third model contains all control variables and adds NMI into the regression.

Table 8: Multiple regressions regarding white meat reduction in relation to masculinity

Variable	Model 1			Model 2			Model 3		
	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β
(Constant)	2.583	.313		2.851	.345		1.410	.568	
Age	-.015	.005	-.113**	-.015	.005	-.113**	-.012	.005	-.092*
Education	.328	.084	.145***	.328	.084	.145***	.309	.084	.136***
SES	.45	.041	.040	.045	.041	.040	.047	.041	.042
Sex	.536	.137	.141***	.533	.246	.140*	.475	.138	.125**
TMF				.001	.066	.001			
NMI							.237	.096	.092**
R^2	.053			.053			.061		
F for change in R^2	10.387***			8.298***			9.587***		

Note. * $p < .05$; ** $p < .01$; *** $p < .001$; “Sex” was coded as follows: 0 = male, 1 = female ; All assumptions regarding multiple regressions were met. VIF values were below 10.

Table 8 Alt Text: A table showing multiple regressions analysing white meat reduction in relation to masculinity. The table depicts three different models, with the first model only containing control variables (age, education, socio-economic status and sex). The second model contains all control variables and adds TMF. The third model contains all control variables and adds NMI into the regression.

Figures

Figure 1

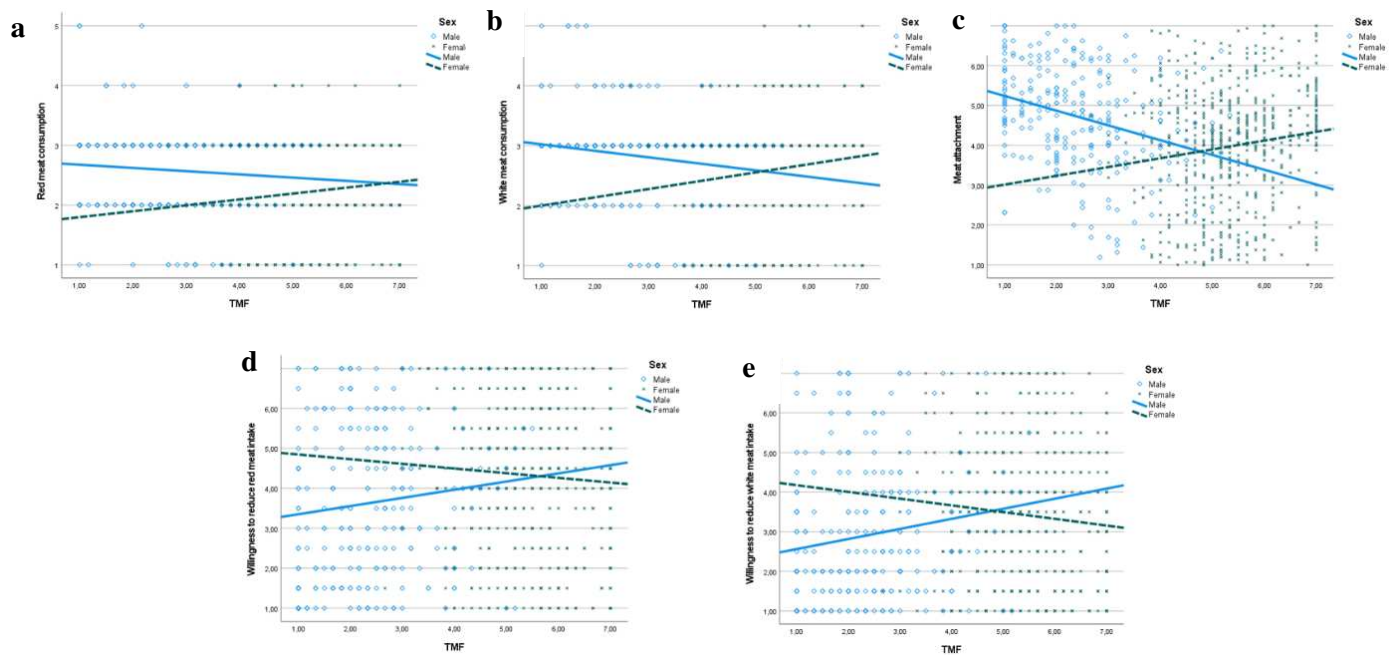


Figure captions (as a list)

Figure 1: Interaction effects between sex and TMF regarding red and white meat consumption, meat attachment, and willingness to reduce red and white meat consumption.

Figure 1 Alt Text: A figure with five panels. All panels show the interaction effect between sex and TMF regarding different types of meat consumption behavior. The first panel shows the interaction effect regarding red meat consumption, while the second panel shows the interaction effect of sex and TMF regarding white meat consumption. The third panel depicts the interaction effect regarding meat attachment. The fourth panel shows the interaction effect concerning the willingness to reduce red meat intake, while the last panel shows the interaction effect regarding the willingness to reduce white meat intake.