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Resolving the masculinity dilemma: Identifying subtypes of male meat consumers with latent profile analysis

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ABSTRACT

Reducing meat consumption is necessary to meet Paris Agreement climate change targets. Efforts to reduce meat consumption should target male consumers, who are the biggest meat-eaters worldwide. However, men are often unwilling to reduce their meat intake, due partly to pressures to conform to dominant masculine ideological expectations that "real" men should eat meat (i.e., the masculinity dilemma). To build theoretical insights and more accurately inform interventions, the current study sought to identify latent subgroups of male consumers based on 20 psychosocial indicators related to meat consumption. A latent profile analysis of 575 Australian and English participants who self-identified as male yielded three distinct latent subgroups that differed significantly in indicator variables, self-reported meat consumption, and willingness to reduce their meat intake: "Resistant" consumers ate the most meat and were very unwilling to reduce, "Ambivalent" consumers ate moderate-to-high amounts of meat and were slightly unwilling to reduce, and "Meat-averse" consumers ate minimal quantities of meat and were very willing to reduce. Results suggest that previous meat-reduction intervention attempts may have been impeded by failing to target latent male consumer groups. Efforts to reduce men's meat consumption will require further focus on within- rather than between-gender differences in male populations.

1. Introduction

The planet is exponentially warming (Gleick, 2010), leading to potentially catastrophic consequences for ecosystems, human life, and overall planetary health (Heshmati, 2020; Letcher, 2021). To mitigate this threat, in 2015, 196 countries signed a legally binding international treaty on climate change, with the goal to "limit global warming to well below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels" (United Nations Framework Convention on Climate Change, n. d.). The global food system accounts for approximately one third of global greenhouse gas (GHG) emissions, but is often overlooked, with focus directed towards fossil fuel emissions (Clark et al., 2020). Alarmingly, a recent assessment of current food system trends estimated that, even if all fossil-fuel emissions were immediately reduced to zero, GHGs emitted by the food system alone would likely exceed the 1.5 °C target by 2063 (Clark et al., 2020). The analysis was based on conservative estimates of the food system, excluding emissions from transportation, processing, packaging, retail, and food preparation. Other researchers have come to similarly grim estimations regarding current food-related emission trends (Hedenus et al., 2014, p. 86).

Plant-based diets offer one of the most effective solutions to cutting emissions in the food sector. A systematic review comparing the environmental impacts of various diets found that vegan diets produced the lowest GHG emissions, followed by vegetarian, then omnivorous diets (Chai et al., 2019). Greenhouse gas output decreases in direct proportion to animal-based food consumption reductions (Aleksandrowicz et al., 2016). Transitioning from meat-based to plant-based diets offers an effective, and most likely necessary, step towards reaching climate targets, potentially cutting agriculture's GHG emissions by 49% (Poore & Nemecek, 2018). Despite this need, current economic development and population growth continue to push meat consumption trends upwards (Parlasca & Qaim, 2022). In response, interventions to reduce meat consumption are increasingly being developed and tested (e.g. Bianchi et al., 2018a; Bianchi et al., 2018b; Harguess et al., 2020).

1.1. The masculinity dilemma

As men are consistently the biggest meat consumers worldwide (Graça et al., 2019; Horgan et al., 2019), efforts to reduce meat consumption should target male consumers—particularly in developed

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countries where per capita meat consumption is the highest (Whitton et al., 2021). While a broad range of psychosocial factors influence people's meat intake, men experience additional gender role norm constraints. In many Western cultures, meat is associated with masculinity (Rozin et al., 2012), and as such, "real" men are expected to eat meat (Bogueva et al., 2020; Nath, 2011). In addition to this social pressure, evidence suggests that some men perform stereotypically "masculine" behaviours, such as eating meat, to affirm their masculine identity and present a masculine self-image (e.g. Mesler et al., 2022; Nakagawa & Hart, 2019; Rosenfeld & Tomiyama, 2021; Vartanian, 2015). This so-called "masculinity dilemma" (Bogueva et al., 2020) places men in a conflicting position when faced with the proposition of giving up meat. Thus, despite the detrimental consequences of meat consumption, men are consistently unwilling to reduce their meat consumption (Graça et al., 2019; Graça et al., 2015; Nakagawa & Hart, 2019; Schösler et al., 2015) and less likely than women to reduce their meat consumption, choose meat-free options, or change their attitudes towards meat-reduction, in intervention studies (Campbell-Arvai et al., 2014; Jalil et al., 2020; Pohlmann, 2022). The "masculinity dilemma" calls for more research focusing on men's meat consumption, to enable effective male-specific meat-reduction interventions to be developed.

As gender is one of the most consistent predictors of meat consumption, researchers have recommended that gender should be considered in meat consumption studies (Cordts et al., 2014; De Backer et al., 2020; Modlinska et al., 2020), and when designing interventions (Bogueva & Marinova, 2018; Graça et al., 2019). Despite these recommendations, the majority of meat consumption research neglects a gendered approach. Furthermore, researchers have drawn attention to the misdirected focus on male versus female comparisons, and the assumption that, regarding meat consumption, men comprise a homogenous group (De Backer et al., 2020; Rosenfeld & Tomiyama, 2021). This assumption overlooks potentially important within-group differences. Thus, the purpose of this study was to build a more fine-grained understanding of men's meat consumption by identifying the psychosocial profiles of male consumers. Both meat-eating and meat-avoiding (i.e., vegetarian and vegan) consumers were of interest to understand the differences between male consumers with different meat consumption preferences. Previous studies have demonstrated that successful interventions can be developed by firstly identifying latent subgroups of meat-eaters (Lacroix & Gifford, 2019) and then tailoring interventions to target these subgroups (Lacroix & Gifford, 2020).

1.2. Key profiling indicators

Selection of profile indicators was guided by the authors' own literature review in conjunction with Stoll-Kleemann and Schmidt's (2017) systematic review of factors influencing meat consumption and reduction. The main factors fall into "personal", "sociocultural", and "external" categories. While external factors (economic, political, food infrastructure) are important, this study assessed only personal and sociocultural factors.

1.2.1. Personal factors

Emotions and cognitive dissonance strategies are two of the strongest influencing factors on meat-reduction (Stoll-Kleemann & Schmidt, 2017). Meat-related cognitive dissonance (MRCD) is the psychological discomfort that arises when people realise their meat consumption conflicts with their values (e.g., concern for animal suffering; Rothgerber & Rosenfeld, 2021). Multiple strategies—such as rationalisation (Piazza et al., 2015), dehumanisation (Bilewicz et al., 2011), and denial of animal mind (Tian et al., 2016)—enable people to eat meat without psychological discomfort, and are associated with higher meat consumption and unwillingness to reduce meat intake. Regarding emotions, people who feel disgusted by meat's sensory qualities (i.e., sensory disgust) are less likely and less willing to eat meat (Becker & Lawrence, 2021; Kunst and Palacios Haugestad, 2018); and some people feel disgust in response to farm animal cruelty or slaughter (i.e., moral disgust; Buttlar & Walther, 2022 Graça et al., 2015; Khara et al., 2021), which is associated with lower meat consumption (Graça et al., 2015) and meat avoidance (Anderson et al., 2019; Rozin et al., 1997). Empathy for farm animal suffering is also negatively associated with intentions and willingness to eat meat (Earle et al., 2019; Herrewijn et al., 2021; Kunst & Hohle, 2016).

Regarding practical factors, people are more likely to reduce their meat consumption if they believe plant-based food is more affordable than meat (Lacroix & Gifford, 2019; Lentz et al., 2018; Neff et al., 2018), and more likely to eat meat if they believe it is more convenient than plant-based food (Malek et al., 2019; Schenk et al., 2018; Tucker, 2014). Furthermore, people only engage in behaviour with sufficient confidence in their ability to perform it (i.e., perceived behavioural control (PBC); Ajzen, 2002). High PBC towards meat-reduction is negatively associated with meat consumption (Lacroix & Gifford, 2019; Rees et al., 2018; Weibel et al., 2019), and positively associated with willingness to reduce (Graça et al., 2015; Wang & Scrimgeour, 2021). Habit (i.e., unconscious, automatic, and routine behaviour) also strongly impacts people's everyday actions (Wood & Rünger, 2016). Meat-eating habit strength is positively related to meat consumption (Mullee et al., 2017; Rees et al., 2018; Schösler et al., 2014), and can be a strong barrier to reducing meat consumption among men (Cordts et al., 2014; Lea et al., 2006).

Other personal factors include attitudes, ideological beliefs, and motivations. Attitude towards meat is a strong and consistent predictor of meat consumption (De Houwer & De Bruycker, 2007; Lentz et al., 2018). Social dominance orientation (SDO; i.e., endorsement of establishing social hierarchies and maintaining power over outgroups) is a consistent positive predictor of meat consumption (Holler et al., 2021). Finally, the main motives driving meat-reduction are for personal health benefits, ethical concern for animals, and preservation of the environment (Graça et al., 2019; Hopwood et al., 2020; Rosenfeld, 2018).

1.2.2. Sociocultural factors

Sociocultural factors also have a strong impact on meat-reduction (Stoll-Kleemann & Schmidt, 2017). People who believe others in their social circle would approve of or support them reducing their meat consumption are more likely to reduce (Lacroix & Gifford, 2019; Weibel et al., 2019) or intend to reduce their meat intake (Cheah et al., 2020; Schenk et al., 2018; Wyker & Davison, 2010). Conformity to traditional masculine norms positively predict, whereas new (non-traditional) masculinity norms negatively predict, men's meat consumption (Rosenfeld & Tomiyama, 2021; Rothgerber, 2013). Specifically, a recent analysis using the same dataset as the current study found that traditional masculine norms endorsing violence, the importance of sex, and heterosexual self-presentation were the key positive predictors of men's meat consumption (Camilleri et al., 2023b). Finally, people living in cultures where meat production is embedded in the country's economy, or where meat is a central part of cultural traditions (e.g., barbeques, the Sunday roast, etc.), have more positive attitudes to eating meat, and tend to eat more meat, when they have a stronger national identity (Bogueva et al., 2017, 2020; Nguyen & Platow, 2021).

1.3. Aims and hypotheses

The aims of this study were to: (1) identify the number of latent subgroups of men who differ according to psychosocial variables known to influence meat consumption; (2) assess the similarities, differences, and relative importance of each psychosocial indicator for each profile; and (3) validate the profiles by determining whether subgroups differ significantly in self-reported meat consumption and willingness to reduce meat consumption.

As male consumers have not previously been profiled on the basis of meat-related indicators, broadly speaking the current analysis was exploratory. However, previous latent variable mixture modelling

studies have found three (Lacroix & Gifford, 2019) and six (Apostolidis and McLeay, 2016; Latvala et al., 2012) latent subgroups of meat consumers in mixed gender samples, with profiles showing differences on a range of psychosocial variables. Therefore, our first hypothesis was that there would be latent subgroups within the population of male consumers (i.e., at least two), however the precise number of latent groups was unknown. Secondly, we hypothesised that the latent subgroups would exhibit distinct psychosocial characteristics by differing significantly on indicator scores. Thirdly, assuming that profiles would exhibit unique psychosocial characteristics relevant to meat consumption and reduction, we hypothesised that profiles would differ significantly in their self-reported meat consumption and in their willingness to reduce.

2. Methods and materials

2.1. Participants & procedure

Upon ethics approval, a convenience sample of Australian and English participants who self-identified as male was obtained through "Prolific" (https://www.prolific.co/). Participants were reimbursed $12 AUD for approximately 30 min of their time. We aimed for a minimum of 500 participants as this is the recommended minimum sample size for latent profile analysis (Nylund et al., 2007; Spurk et al., 2020). 596 participants returned the survey through Prolific, and an additional 45 Australian participants were recruited on Facebook via survey recruitment groups as well as the principal researcher's personal network. Sixty-six incomplete surveys were deleted, leaving a total of 575 participants (322 Australian, 253 English, mean age = 38.53, SD = 13.38). As the total dataset contained <1% of missing values, single imputation personal mean score replacement was appropriate to replace missing data (Eekhout et al., 2014; Hair Jr. et al., 2013).

2.2. Indicator variables

Twenty indicators were used to profile participants. There is some disagreement regarding the number of indicators that should be included in latent profile analysis, with studies using as little as three (Kovacs et al., 2022) and as many as 24 indicators (De Guzmán et al., 2016). Monte-Carlo simulations have shown that a greater number of indicators can "lead to more converged and proper replications, as well as few boundary parameter estimates and less parameter bias" and that using a greater number of indicators can compensate for small sample sizes (Wurpts & Geiser, 2014, p. 1). The most important point is that the researcher should have sound theoretical rationale for each indicator's inclusion (Weller et al., 2020). The current study used the following measures:

Rothgerber's (2013) Meat-Eating Justifications scale captures a broad range of MRCD strategies that can be categorised into "direct" or "indirect". Seven 3-item subscales comprised the *direct MRCD* scale (α = 0.89): pro-meat (i.e., loving the taste of meat); health (believing that meat is necessary for health and strength); hierarchical (believing that animals are lower than humans in a natural hierarchy); human destiny/fate (claiming that humans are biologically evolved and thus destined to eat animals); religious (believing that God created animals for human use); denial of animal suffering (denying the suffering caused to livestock animals in meat production); and dichotomisation (making a psychological distinction between animals used for food from other types of animals). Two 3-item subscales comprised the *indirect MRCD* scale (α = 0.80): dissociation (dissociating meat from the living, sentient animal from which it came); and avoidance (avoiding thinking about where meat comes from or how it is processed). Higher scores indicated greater use of MRCD strategies.

Sensory disgust was measured with the Animal Flesh Disgust subscale from Hartmann and Siegrist's (2018) Food Disgust Scale. Four items (e.g., "to see raw meat") were rated from 1 (*not at all disgusting*) to 6 (*extremely disgusting*). Higher scores indicated greater disgust towards meat (α = 0.87). *Moral disgust* and *animal empathy* were measured using an adapted method based on previous self-report emotional measurements (Anderson et al., 2019), where participants were shown three images of farm animals in distressing situations (Appendix A), and read one statement "when I think about the fact that animals are killed so that humans can eat them I feel…", indicating the extent to which they felt (1) sad, (2) disgusted, (3) empathetic, and (4) happy, on a scale of 0 (not at all) to 100 (very much so). The four "disgusted" items were summed to create a moral disgust score (α = 0.91); the four empathetic items were summed to create an animal empathy score (α = 0.93). Higher scores indicated greater moral disgust/animal empathy.

Convenience and *price* were measured with an adapted version of the convenience and price subscales from Steptoe et al.'s (1995) Food Choice Questionnaire. From 1 (*strongly disagree*) to 5 (*strongly agree*), for convenience, participants rated the extent to which they believe meat-free meals are: (1) easy to prepare; (2) convenient; (3) can be cooked very simply; (4) are easily available in shops, restaurants, and supermarkets; and (5) are quick to prepare; and for price, the extent to which (1) meat is cheap; (2) meat is good value for money; (3) meat is cheaper than plant-based foods; (4) a meat-based diet is more affordable than a plant-based diet; and (5) meat is expensive (reverse coded). Higher convenience scores indicated participants believed meat-free meals are convenient (α = 0.84); higher price scores indicated participants believed meat is more affordable than plant-based food (α = 0.85). *Habit strength* was measured using Rees et al.'s (2018) habit scale: "Eating meat is something… (1) I do automatically; (2) I do without having to consciously remember; (3) I do without thinking; (4) I have no need to think about doing; and (5) that is typically me. Items were rated from 1 (*strongly disagree*) to 5 (*strongly agree*). Higher scores indicate a stronger habit (α = 0.89). *Perceived behavioural control (PBC)* was measured with three items taken from previous scales of meat-related PBC (Graça et al., 2015; Lentz et al., 2018), and a fourth item created to cover the self-efficacy component of PBC based on Ajzen's (2002) theory of PBC. On a scale from 1 (*strongly disagree*) to 5 (*strongly agree*), participants rated agreement that: (1) I am confident I could change my meat consumption habits if I wanted to; (2) whether I change my meat consumption habits or not is entirely up to me; (3) changing my meat consumption habits or not is something that is under my control; and (4) changing my meat consumption habits would be difficult (reverse coded). Higher scores indicated greater PBC (α = 0.67).

Attitude to eating meat was measured with a 3-item scale adapted from previous research (Graça et al., 2015; Lentz et al., 2018). Participants rated from 1 to 5 the extent to which they believed the act of eating meat was (1) bad–good; (2) unpleasant–pleasant; (3) unfavourable–favourable. Higher scores indicated a more positive attitude towards eating meat (α = 0.88). *Social dominance orientation (SDO)* was measured with the 4-item Short Social Dominance Orientation Scale (Pratto et al., 2013) on a scale of 1 (extremely oppose) to 5 (extremely favour). Higher scores indicated greater endorsement of SDO (α = 0.82). Three subscales from the 15-item Vegetarian Eating Motives Inventory (Hopwood et al., 2020) measured the extent to which participants were motivated to reduce their meat consumption for *health* (4 items; α = 0.93), *environmental* (5 items; α = 0.97), or *animal welfare* reasons (5 items; α = 0.97), from 1 (*not important reason to reduce my meat intake*) to 7 (*very important reason to reduce my meat intake*). One item ("animals' rights are respected") was accidently excluded during data collection. Higher scores indicated greater motivation to reduce one's meat intake.

Perceived *social support* to reduce meat consumption was measured using a scale adapted from previous research (Cheah et al., 2020; Povey et al., 2001). Participants indicated the extent to which they agreed that members of their social circle (male/female friends (2 items); male/female family members (2 items); male/female work colleagues (2 items); partner (1 item); health expert (1 item)) would approve of them reducing their meat consumption, from 1 (*strongly disagree*) to 5 (*strongly agree*). Unapplicable items (i.e., 78 Australian and 59 English men without partners) were given a neutral score of 3 (*neither agree nor*

disagree). Higher scores indicated greater social support (α = 0.87). For conformity to traditional masculine norms, the *violence* (3 items; α = 76) and *heterosexual self-presentation* (3 items; α = 0.75) subscales was taken from the Conformity to Masculine Norms Inventory Short Form (Levant et al., 2020); the *importance of sex* (3 items; α = 0.84) subscale was taken from the Male Role Norms Inventory Short Form (Levant et al., 2013). *Non-traditional masculinity* (α = 0.88) was measured with the 17-item New Masculinity Inventory (Kaplan et al., 2017). Participants rated agreement with statements from 1 (*strongly disagree*) to 6 (*strongly agree*). Higher scores indicated greater conformity. *National identity* (α = 0.94) was measured with Nguyen and Platow's (2021) 13-item national social identification scale (e.g., "I feel a bond with other Australians/Britons"). Participants rated their agreement with each statement from 1 (*strongly disagree*) to 5 (*strongly agree*). One item ("I identify with being a(n) Australian/Briton") was accidentally excluded from the data collection. Higher scores indicated stronger national identity.

Meat Consumption: We used the Meat Consumption subscale of the Meat Consumption and Intention Scale (MCIS) that we developed through exploratory and confirmatory factor analysis prior to this analysis (Camilleri et al., 2023a). For seven different meat types (beef; lamb; poultry; pork; bacon/ham; other processed meats (e.g., sausages, salami, hot dogs); and fish/seafood) participants indicated 1) the total number of times they ate each meat type in the past two-weeks; and 2) the average quantity of each serving for each type of meat (*very small* (less than 10% of a typical meal); *small* (10–20% of a typical meal); *medium* (21–30% of a typical meal); *large* (31–40% of a typical meal; and *very large* (more than 40% of a typical meal). Scores for each meat type were calculated by multiplying the frequency by the quantity. A total meat consumption score was created by summing each meat score (α = 0.54). Removal of scale items did not improve the scale's alpha value, therefore we retained the scale as is. Although Cronbach's alpha was low, inter-item correlations of the total meat consumption scale was 0.161, falling into the acceptable range of 0.15 to 0.50, indicating sufficient internal consistency (Clark & Watson, 1995). An adapted *willingness to reduce meat consumption* scale was used based on a previous measurement (Graça et al., 2015), comprising three items asking the extent of the participants' willingness to 1) slightly reduce your meat consumption; 2) drastically reduce your meat consumption; and 3) stop eating meat altogether, using a scale from 1 (*very unwilling*) to 5 (*very willing*). Higher scores indicated greater willingness to reduce (α = 0.87).

Demographics: Participants were asked about their age; geographic location (urban versus rural); education; income; sexual orientation (heterosexual or non-heterosexual); and political orientation ("How would you describe your political view?" 1 = very liberal/left-wing, 2 = slightly liberal/left-wing, 3 = centre, 4 = slightly conservative/right-wing, 5 = very conservative/right-wing). Based on the distribution of incomes among participants, as well as data from the Office for National Statistics (2022; https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/bulletins/averageweeklyearningsingreatbritain/latest), and the Australian Taxation Office (2022; https://www.ato.gov.au/Individuals/Income-and-deductions/Offsets-and-rebates/Low-and-middle-income-earner-tax-offsets/), UK participants earning ≤ £9,999 annually before tax were classed as low income, those earning £10,000 – 39,999 were classed as medium, and £40,000 + were classed as high; and Australian participants earning ≤ $59,000 were classed as low income, $60,000 – 99,999 were class as medium, and ≥ $100,000 were classed as high.

2.3. Data analysis

Data was analysed with the tidyLPA package (Rosenberg et al., 2018) in the software program R using latent profile analysis (LPA), a person-centred latent variable mixture modelling analysis technique, which identifies unobserved subgroups of people within a population. The individuals within a subgroup share a unique set of characteristics (based on a set of indicator variables relevant to a phenomenon of interest) that distinguish them from other subgroups in the population (Berlin et al., 2014). Whereas variable-centred approaches focus on the relationships between variables, person-centred approaches focus on similarities and differences between individuals (Marsh et al., 2009), and can provide more detailed information by estimating parameters for multiple subpopulations (Howard & Hoffman, 2018). Latent class and latent profile analyses are similar techniques that are both able to identify latent subgroups within a population, however, latent class analysis uses categorical indicator variables, whereas LPA uses continuous indicators (Gunzler et al., 2021). As the indicators of interest to the current study were continuous, LPA was selected.

Further analyses were conducted in IBM SPSS Statistics v28.0. A series of one-way between-group analysis of variance (ANOVA) tests assessed differences between profiles on indicator scores. When Levene's test was significant, indicating that homogeneity of variance was violated, Welch's test was used. Additionally, to establish criterion-related validity for the profiles, ANOVAs tested differences between profiles on meat consumption and willingness to reduce (Table 2). Chi-square tests assessed whether the profiles differed on demographic variables (Table 3).

Five univariate outliers determined to be legitimate values were treated using a Winsorisation technique, in which the outlier is modified to one unit above or below the closest non-outlier (Kwak & Kim, 2017). Winsorisation was not appropriate for 11 legitimate remaining outliers, as scores were only one unit higher/lower than non-outliers, thus, these were left untreated. Multivariate outliers were assessed using Mahalanobis distance. With 20 indicators the chi-square cut-off value (p =.001) was 45.31, revealing ten potential multivariate outliers. As unusual or extreme cases occur naturally in populations, some researchers argue that outliers deemed legitimate cases (i.e., neither data entry errors nor intentional misreporting) should be retained to ensure that an entire population is represented (Hair et al., 2018, p. 91; Kwak & Kim, 2017). In a normally distributed dataset, approximately 1% of legitimate cases can be expected to fall outside three standard deviations from the mean (Osborne & Overbay, 2004). Moreover, unusual cases can lead to important theoretical advancements (Aguinis et al., 2013). The profile of each potential multivariate outlier was individually inspected, and all

Table 1
Latent profile analysis model testing.

Model	Number of Profiles	AIC	BIC	Entropy
1	1 Profile	32695.57	32869.74	1.00
1	2 Profiles	30645.17	30910.78	0.92
1	3 Profiles	29799.79	30156.85	0.9
1	4 Profiles	29322.06	29770.56	0.91
1	5 Profiles	29042.82	29582.76	0.89
1	6 Profiles	28982.02	29613.4	0.87
2	1 Profile	32695.57	32869.74	1.00
2	2 Profiles	30272.33	30625.03	0.94
2	3 Profiles	29503.95	30035.18	0.93
2	4 Profiles	28818.79	29528.56	0.92
2	5 Profiles	28454.57	29342.86	0.92
2	6 Profiles	28289.32	29356.14	0.92
3	1 Profile	28303.81	29305.31	1.00
3	2 Profiles	28102.07	29195.01	0.97
3	**3 Profiles**	28008.04	**29192.43**	**0.88**
3	4 Profiles	27972.99	29248.82	0.85
3	5 Profiles	27927.28	29294.55	0.84
3	6 Profiles	27892.25	29350.97	0.81
6	1 Profile	28303.81	29305.31	1.00
6	2 Profiles	28049.93	30057.3	0.99
6	3 Profiles	27835.74	30848.97	0.9
6	4 Profiles	27771.27	31790.36	0.93
6	**5 Profiles**	**27675.2**	32700.15	**0.96**
6	6 Profiles	27739.6	33770.41	0.97

Note. Output of latent profile analysis model testing. AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion. Underlined values indicate the lowest (i.e., optimal) model fit statistic. Bold values highlight key information for model assessment.

Table 2
Profile Means, Standard Deviations, and Z-scores of Indicator and Validation Variables.

	Resistant			Meat-averse			Ambivalent		
Indicator Variable	Mean	(SD)	Z score	Mean	(SD)	Z score	Mean	(SD)	Z score
Direct MRCD	72.35	(12.45)	0.67 [a]	30.92	(7.44)	−1.76[b]	59.32	(13.48)	−0.09[c]
Indirect MRCD	17.23	(5.83)	−0.37 [a]	16.15	(4.95)	−0.56 [a]	21.19	(5.30)	0.31[b]
Sensory Disgust	8.03	(4.21)	−0.51 [a]	20.76	(3.85)	1.72[b]	11.01	(4.83)	0.01[c]
Moral Disgust	114.97	(88.69)	−0.65 [a]	332.91	(91.83)	1.20[b]	210.88	105.66	0.17[c]
Animal Empathy	147.81	(99.56)	−0.67 [a]	328.36	(98.69)	0.87[b]	254.69	(103.24)	0.24[c]
PBC	14.96	(2.85)	−0.12 [a]	17.51	(3.45)	0.77[b]	15.14	(2.65)	−0.06 [a]
Habit	21.22	(3.58)	0.54 [a]	7.78	(2.32)	−2.00[b]	18.51	(4.17)	0.03[c]
Price	14.22	(4.48)	0.13 [a]	9.29	(3.87)	−0.97[b]	14.05	(4.19)	0.09 [a]
Convenience	16.23	(3.87)	−0.27 [a]	21.35	(4.05)	0.97[b]	17.33	(3.89)	−0.01[c]
Attitude to Eating Meat	13.32	(1.81)	0.67 [a]	4.15	(1.63)	−2.19[b]	11.16	(2.19)	−0.01[c]
SDO	9.56	(3.91)	0.44 [a]	6.71	(3.10)	−0.37[b]	7.34	(3.05)	−0.19[b]
Health Motive	15.25	(7.56)	−0.49[a]	23.05	(5.88)	0.68[b]	19.62	(5.35)	0.17[c]
Animal Motive	10.65	(4.50)	−1.20[a]	33.47	(3.62)	1.16[b]	26.99	(5.43)	0.49[c]
Environment Motive	13.73	(8.18)	−0.81[a]	32.05	(4.35)	1.15[b]	23.82	(7.21)	0.27[c]
Social Support	25.03	(6.00)	−0.38 [a]	29.00	(5.34)	0.33[b]	28.05	(4.93)	0.16[b]
Violence	9.44	(3.98)	0.25 [a]	6.62	(3.48)	−0.51[b]	8.31	(3.51)	−0.06[c]
Heterosexual Presentation	7.68	(4.72)	0.28 [a]	5.49	(4.31)	−0.23[b]	5.96	(3.81)	−0.12[b]
Importance of Sex	6.44	(3.67)	0.21 [a]	4.73	(2.80)	−0.31[b]	5.54	(3.07)	0.07[b]
Non-Traditional Masc	75.45	12.51	−0.30 [a]	85.40	(10.06)	0.52[b]	80.12	(11.68)	0.08[c]
National Identity	40.14	11.33	0.16 [a]	33.91	(11.90)	−0.38[b]	37.92	(11.33)	−0.03 [a]
Validation Variable									
Meat Consumption	68.82	(33.26)	0.41[a]	4.53	(10.27)	−1.51[b]	56.20	(28.04)	0.02[c]
WRMC	5.09	(2.11)	−0.62[a]	13.51	(2.67)	1.85[b]	7.38	(2.72)	0.05[c]

Note: Differences between profiles on raw and standardised mean indicator scores analysed with Welch's *F* ANOVAs and Games-Howell/Gabriel's post-hoc tests. Different letters within a row indicate significant differences between profiles ($p < .05$). Differences between profiles on validation variables (Meat Consumption and WRMC) were $p < .001$. PBC = perceived behavioural control; MRCD = meat-related cognitive dissonance strategies; "masc" = masculinity; SDO = social dominance orientation; WRMC = willingness to reduce meat consumption.

Table 3
Differences between profiles on demographic variables using chi-square tests.

Demographic Variable	Total Sample (n = 575, 100%)	Resistant (n = 188, 32.7%)	Meat-averse (n = 55, 9.6%)	Ambivalent (n = 332, 57.7%)	*X^2-statistic*	*Cramer's V*	*p-value*
Self-reported diet					**382.577**	**0.577**	**<0.001**
Unrestricted	344 (59.8%)	156 (83.0%)[a]	1 (1.8%)[b]	187 (56.3%)[c]			
Meat-reducer	184 (32.0%)	32 (17.0%)[a]	14 (25.5%) [a,b]	138 (41.6%)[b]			
Meat-avoider	47 (8.2%)	0 (0%)[a]	40 (72.7%)[b]	7 (2.1%)[a]			
Country of residence					**12.686**	**0.149**	**0.002**
Australia	322 (56.0%)	122 (64.9%)[a]	35 (63.6%)[a,b]	165 (49.7%)[b]			
England	253 (44.0%)	66 (35.1%)[a]	20 (36.4%)[a,b]	167 (50.3%)[b]			
Age					**13.283**	**0.108**	**0.039**
18–29	164 (28.8%)	62 (33.0%) [a]	13 (23.6%) [a]	91 (27.5%) [a]			
30–44	247 (43.4%)	78 (41.5%) [a]	19 (34.5%) [a]	151 (45.6%) [a]			
45–59	106 (18.6%)	27 (14.4%) [a]	14 (25.5%) [a]	67 (20.2%) [a]			
≥ 60	51 (9.0%)	21 (11.2%) [a,b]	9 (16.4%) [b]	22 (6.6%) [a]			
Education					0.225		0.894
< Tertiary	224 (39.0%)	72 (38.3%)	23 (41.8%)	129 (38.9%)			
≥ Tertiary	351 (61.0%)	116 (61.7%)	32 (58.2%)	203 (61.1%)			
Geographic Location		2 missing		2 missing	2.555		0.279
Urban	452 (78.6%)	140 (75.3%)	45 (81.8%)	267 (80.9%)			
Rural	119 (20.7%)	46 (24.7%)	10 (18.2%)	63 (19.1%)			
Income		1 missing			**9.517**	**0.049**	**0.049**
Low	166 (28.9%)	64 (34.2%)[a]	21 (38.2%)[a,b]	81 (24.4%)[b]			
Medium	235 (40.9%)	70 (37.4%)[a]	23 (41.8%)[a]	142 (42.8%)[a]			
High	173 (30.1)	53 (28.3%)[a]	11 (20.0%)[a]	109 (32.8%)[a]			
Sexual Orientation					**14.962**	**0.161**	**<0.001**
Heterosexual	512 (89.0%)	179 (95.2%) [a]	43 (78.2%)[b]	290 (87.3%)[b]			
Bi/homosexual	42 (11.0%)	9 (4.8%) [a]	12 (21.8%)[b]	42 (12.7%)[b]			
Political Orientation					**25.860**	**0.150**	**<0.001**
Left-wing	286 (49.7%)	72 (38.3%)[a]	39 (70.9%)[b]	175 (52.7%)[c]			
Centre	168 (29.2%)	59 (31.4%)[a]	9 (16.4%)[a]	100 (30.1%)[a]			
Right-wing	121 (21.0%)	57 (30.3%)[a]	7 (12.7%) [b]	57 (17.2%)[b]			

Note. Bold values indicate significant differences between profiles on that demographic variable. Different superscript letters within a row indicate significant differences between profiles. X^2 = chi-square statistic.

were determined to contain legitimate data. Considering firstly that the ten outliers represented only 1.7% of the sample, and secondly, that Cook's distance was <1 for all outliers, these cases were retained in the analysis.

3. Results

3.1. Selecting profiles

Assumptions regarding normality, multicollinearity, and outliers were addressed before conducting the analyses. LPA can utilise four different within-class variance–covariance structural parameter specifications to estimate latent profiles. As these specifications can dramatically influence the nature and number of latent profiles (Masyn, 2013), all four parameter specifications (TidyLPA Models 1, 2, 3, and 6) were assessed. To determine the optimal profile solution, we compared model fit statistics between one- and six-profile solutions for Models 1, 2, 3 and 6 (Table 1). Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) fit indices were analysed, with the lowest value indicating the best fitting model (Spurk et al., 2020). The lowest AIC value indicated a 5-profile solution was the best fitting model, whereas the lowest BIC value indicated that a 3-profile solution best fit the data. These two models were assessed further to select the optimal profile solution.

By comparing the 3- versus 5-profile solutions on several criteria, the 3-profile solution was selected as the most appropriate. Firstly, the proportion sizes of profiles were considered. Ideally in LPA, a profile group should not contain less than 5% of the total sample (He & Fan, 2018). As neither solution contained a profile with less than 5% of the sample, both solutions were deemed acceptable. Secondly, the 3-profile solution had the lowest BIC value, which researchers agree is more accurate at profile classification than the AIC (Nylund et al., 2007; Sinha et al., 2021; Tein et al., 2013; Weller et al., 2020). Thirdly, entropy values give an indication of "the confidence with which individuals have been classified as belonging to one profile or another" (Spurk et al., 2020, p. 13), and should exceed 0.80, with higher values indicating more distinct and accurate profile classification (Clark & Muthén, 2009). Both solutions provided a high level of confidence (entropy >0.80) that profiles were classified accurately. Lastly, theoretical and practical considerations should be used as a guide to model selection (Masyn, 2013; Ram & Grimm, 2009), with parsimony given priority if additional profiles do not provide "meaningful new insights" (Spurk et al., 2020, p. 13). Inspection of mean indicator plots showed that the 5-profile solution split the largest profile from the 3-profile solution into three smaller segments; these segments followed a similar mean pattern on all indicators, with the exception of two masculinity indicators. The additional profiles added little new insights, yet made the model substantially more difficult to interpret (considering the large number of indicators). The 3-profile solution offered greater simplicity and parsimony. In summary, the 3-profile solution had adequate profile proportions, the lowest BIC index, strong entropy, and offered the most parsimonious solution.

3.2. Profile descriptions

Profile 1 (32.7% of the total sample), which we named "Resistant" consumers, was overwhelmingly comprised of unrestricted meat-eaters (83.0%), and no meat-avoiders. Profile 2 (9.6% of the total sample), named "Meat-averse" consumers, contained mostly meat-avoiders (72.7%) and meat-reducers (25.5%). Profile 3, named "Ambivalent" consumers (57.7% of the sample), contained mostly unrestricted meat-eaters (56.3%) and meat-reducers (41.6%).

Significant differences in indicator scores were examined to identify distinguishing profile features. The biggest differences between profiles was in their attitudes towards eating meat, emotions, direct MRCD strategies, habit strength, and meat-reduction motives. Meat-averse consumers had very negative attitudes towards meat, very strong feelings of sensory disgust towards meat, strong emotional reactions to farm animal suffering (i.e., high moral disgust and animal empathy), and scored very low on direct MRCD strategies and meat-eating habit strength. They scored highly on all meat-reduction motives, but especially believed animals and the environment were important reasons to reduce. Conversely, Resistant consumers had very positive attitudes towards eating meat, the lowest meat disgust and emotional reactions to farm animal suffering, the highest use of direct MRCD strategies, and the strongest meat-eating habits. They did not believe that health, animals, or the environment were important reasons for meat-reduction, especially the animal welfare motive. Ambivalent men held somewhat positive attitudes towards meat, slightly below average sensory disgust, above average emotional responses to farm animal suffering, and moderate level habit strength. Like the Meat-averse group, Ambivalent men tended to use indirect rather than direct MRCD strategies. They agreed that health, animals, and the environment were important reasons for meat-reduction, especially animal welfare.

For other personal factors, Resistant and Ambivalent consumers had equally lower confidence than Meat-averse consumers in their ability to reduce their meat consumption if they wanted to (i.e., PBC), and were equally less likely to believe that plant-based diets are more affordable than meat-based diets (i.e., price). Meat-averse men tended to view meat-free meals as convenient; Ambivalent men viewed meat-free meals as somewhat convenient; whereas Resistant men felt neutral about this. Although none of the profiles strongly endorsed SDO, Resistant consumers scored significantly higher than the other two profiles.

Profiles also differed on sociocultural factors. While none of the profiles conformed strongly to traditional masculine norms, Resistant consumers scored significantly higher than other profiles, and lower on non-traditional masculine norms; conversely, the Meat-averse men scored the lowest on traditional masculine norms and highest on non-traditional masculinity. Perceived social support was significantly lower for Resistant men than other profiles, indicating that they were less likely to believe that others in their social circle would approve of them reducing their meat consumption. Finally, national identity was lower amongst Meat-averse men.

3.3. Profile validation

Welch's ANOVAs using Games-Howell or Gabriel's post hoc tests found significant differences between profiles on all indicator and validation variables, supporting all hypotheses (Table 2). A guide to interpreting raw indicator scores is provided in Appendix A. Standardised mean indicator scores are displayed in Fig. 1. Resistant consumers had the highest meat consumption and lowest willingness to reduce, whereas Meat-averse consumers had the lowest meat consumption and highest willingness to reduce (Fig. 2). Chi-square tests found significant differences between profiles in self-reported diet, country of residence, age, income, sexual orientation, and political orientation (Table 3).

4. Discussion

This study aimed to identify psychosocial profiles of male consumers to build theoretical insights into men's meat consumption and better inform meat-reduction interventions. Supporting the first hypothesis—that there would be at least two latent subgroups within the population of male consumers—latent profile analysis of 20 indicators yielded three distinct latent profiles: "Resistant", "Meat-averse", and "Ambivalent". One-way ANOVAs supported the second hypothesis that profiles would differ significantly on indicator scores, highlighting the psychosocial similarities and differences between profiles. Supporting the third hypothesis, significant differences between profiles on meat consumption and willingness to reduce provided evidence supporting the validity of the distinct profiles. Profile summaries and intervention recommendations are presented in Table 4.

The overarching feature of the Resistant profile—the heaviest meat-eaters—was their resistance to meat-reduction. They utilised direct MRCD strategies (which justify and defend meat consumption), lacked motivations to reduce as well as emotional sensitivity to farm animal

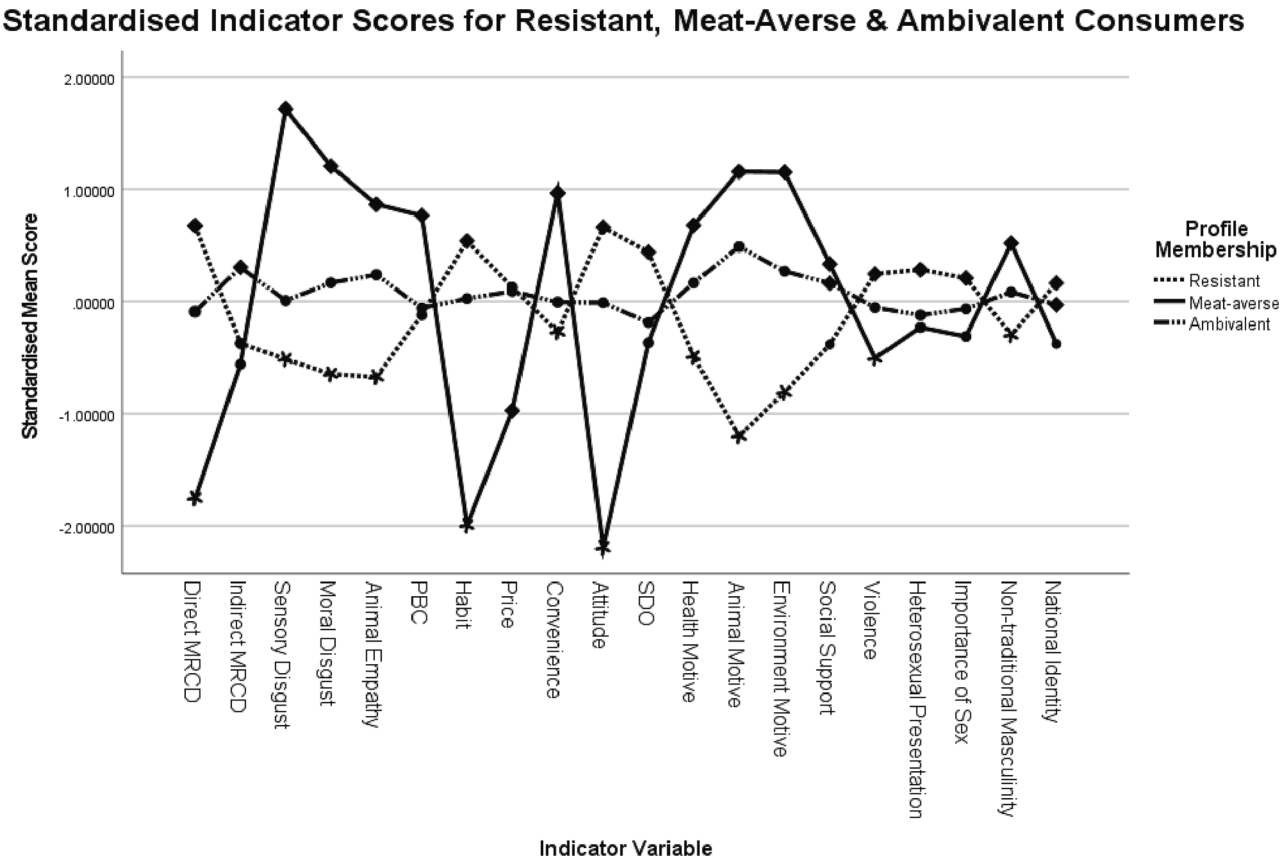

Fig. 1. The standardised mean scores of all 20 indicator variables are plotted above for the Resistant, Meat-averse, and Ambivalent profiles. Each line represents a different profile. For each indicator, differently shaped markers (either a square, circle, or star) indicate there is a significant difference between profiles in their mean indicator scores on that variable. MRCD = meat-related cognitive dissonance; PBC = perceived behavioural control; SDO = social dominance orientation.

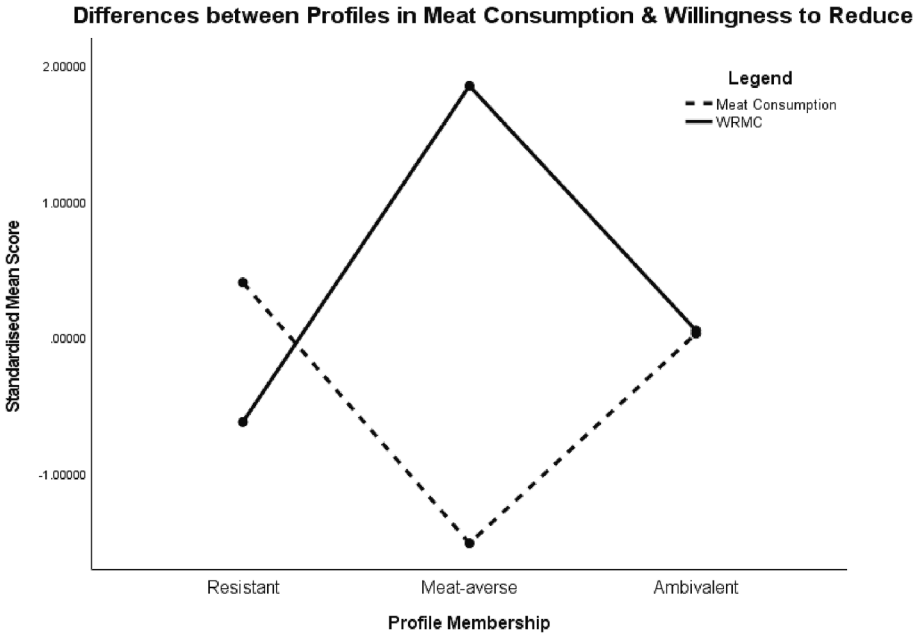

Fig. 2. Differences between Resistant, Meat-averse, and Ambivalent consumers in their standardised meat consumption and willingness to reduce meat consumption (WRMC) scores. Significant differences were found between all three profiles in their meat consumption and WRMC.

suffering, and had more ingrained meat-eating habits. This, in conjunction with higher SDO and right-wing political conservatism (a preference for preserving the status quo; Jost et al., 2008), and their strong unwillingness to reduce, suggests that the Resistant consumers would actively resist dietary change. Moreover, there was a lack of social support for Resistant consumers to reduce, as people in their social circle

Table 4
Key characteristics of profiles and corresponding intervention recommendations.

Profile	Key Characteristics	Intervention Recommendations
Resistant	• High use of direct MRCD strategies. • Unconcerned about farm animal welfare. • Most likely to perceive meat-free meals as inconvenient. • Highly unconscious, routinised meat-eating habits. • Lower perceived social support to reduce meat consumption. • Higher SDO & right-wing conservatism. • High conformity to traditional masculine norms (especially heterosexual self-presentation); low conformity to non-traditional masculinity.	• Avoid animal welfare appeals, as they are likely to incite defensive reactions and increase meat attachment (e.g., Dowsett et al., 2018; Rothgerber & Rosenfeld, 2021). • Improve the visibility, accessibility, and convenience of meat-alternatives (e.g., Vandenbroele et al., 2019). • Break meat-eating habits with methods that facilitate dietary awareness and self-monitoring: e.g., smart phone tracking (Piazza et al., 2022); text message reminders and food-diary (Carfora et al., 2019); goal-setting (Rees et al., 2018). • Increase perceived social support for meat-reduction by engaging the individual's entire household in intervention and promote meal-sharing (Kemper & White, 2021), communicating dynamic social norm information (Sparkman et al., 2020), and/or creating widespread public awareness and acceptance of the need for meat-reduction (e.g., via educational or social marketing campaigns). • Appeal to conservative values of purity (e.g., highlight meat contamination and the role of meat production in the spread of diseases and antibiotic resistant bacteria; Espinosa et al., 2020; Rothgerber, 2020). • Methods effective for high SDO: frame meat-alternatives as "superior" to meat (Gohary et al., 2023); frame the negative impacts of meat (e.g., health, environmental) as a superordinate threat (to the nation) rather than as a self-oriented threat (to the individual; Mesler et al., 2022); nudging (setting plant-based options as the default) effective at reducing meat preferences regardless of SDO/conservatism (Prusaczyk et al., 2021). • Market and frame plant-based foods and meat-alternatives as "masculine" to appeal to and align with traditional masculine norms; reduce the association between vegetarianism and femininity (e.g., Brough et al., 2016).
Meat-averse	• Strong negative attitude to eating meat. • Concerned about animal welfare & empathetic to farm animal suffering. • Strong sensory & moral disgust towards eating meat.	• Reinforce negative attitude towards meat with reminders of negative aspects of meat consumption. • Animal welfare appeals; elicit empathy for farm animal suffering (Mathur et al., 2021).

Table 4 (*continued*)

Profile	Key Characteristics	Intervention Recommendations
	• High conformity to non-traditional masculinity; low endorsement of traditional masculine norms (especially violence). • Stronger left-wing political orientation. • Very weak meat-eating habit strength	• Strengthen/reinforce sensory and moral disgust towards eating meat (Feinberg et al., 2019; Palomo-Vélez et al., 2018; Tybur et al., 2016). • Men who conform to non-traditional masculinity are more likely to be higher in masculinity stress, and thus, are more likely to choose meat-free options when these are framed as "masculine" (Leary et al., 2023). • Emphasise association between meat and violence. • Appeal to liberal/left-wing values (e.g., social equality/justice; social progressivism/change). • Left-wing/liberals more likely to support government regulations of (animal agricultural) industries (e.g., taxation; removing subsidies) versus private sector initiatives (e.g., Gillis et al., 2021; Lalot et al., 2022).
Ambivalent	• Ambivalent about meat: positive attitude to eating meat while simultaneously concerned about animal welfare. • Motivated to reduce meat consumption for the environment, health, and especially for animal welfare. • Emotionally responsive to farm animal suffering (i.e., moderate feelings of animal empathy and moral disgust). • High use of indirect MRCD strategies (dissociation & avoidance).	• Induce and/or amplify ambivalent feelings towards eating meat; this may be particularly effective if ambivalence is induced before presenting persuasive meat-reduction messages (Pauer et al., 2022). • Raise awareness of the negative consequences of meat consumption on animal welfare, the environment, and health to increase reduction motivations (e.g., Aberman & Plaks, 2022; Cordts et al., 2014; Jalil et al., 2020). • Elicit and increase animal empathy and moral disgust by highlighting animal suffering caused to farm animals in the meat industry (e.g., Feinberg et al., 2019; Herrewijn et al., 2021) or presenting ethical arguments highlighting moral transgressions against farm animals (e.g., Schwitzgebel et al., 2023); however, masculinity should be affirmed before implementing animal welfare appeals (Pohlmann, 2022). • Overcome dissociation and avoidance by making the meat-animal connection salient (e.g., Earle et al., 2019; Kunst & Hohle, 2016); using interactive and engaging approaches such as virtual reality (Herrewijn et al., 2021) or interactive dialogues (Buttlar et al., 2021); or using graphic warning labels on meat products (Choueiki et al., 2021; Kranzbühler & Schifferstein, 2023). • Foster other Meat-averse characteristics: increase PBC, perceived convenience & affordability of plant-based

(*continued on next page*)

Table 4 (*continued*)

Profile	Key Characteristics	Intervention Recommendations
		diets; break meat-eating habits.

Note. Intervention recommendations are based on various studies in the literature (referenced in the table). A systematic literature review of meat-reduction experiments found that combining multiple intervention strategies/techniques (e.g., educational information + emotional messages) is more effective than single strategy approaches (Harguess et al., 2020). Convenience, habit, and social support intervention techniques recommended for Resistant men are also likely to benefit Ambivalent men. SDO = social dominance orientation; MRCD = meat-related cognitive dissonance.

were significantly less likely to approve of them reducing their meat consumption compared to other profiles. Hence, interventions are unlikely to be effective reducing Resistant consumers' meat intake. Nevertheless, potential meat-reduction intervention strategies most suitable for Resistant consumers are outlined in Table 4.

The Meat-averse men ate minimal quantities of meat (if at all) and were characteristically opposite to Resistant men. The most distinctive feature was their strong meat aversion, demonstrated by an extremely negative attitude, and strong feelings of sensory and moral disgust, towards meat. Meat-averse men had minimal barriers to meat-reduction: they did not use direct MRCD strategies, had confidence in their ability to reduce (i.e., high PBC), believed meat-free meals are convenient, very weak meat-eating habit strength, and strong motivations and willingness to reduce. Another distinguishing feature of Meat-averse men was their lower scores on national identity and traditional masculine norms than other profiles, suggesting that dominant cultural norms may influence their identity and behaviour to a lesser extent. Overall, the Meat-averse characteristics were consistent with low meat consumption and meat-avoider traits (e.g., Becker & Lawrence, 2021; Holler et al., 2021; Ruby, 2012).

The Ambivalent men ate less meat and displayed fewer barriers to meat-reduction than the Resistant profile: they believed others would approve of them reducing their meat consumption; that meat-free meals were reasonably convenient; had moderate confidence in their ability to reduce their meat intake; believed that health, animal welfare, and the environment were all important reasons for meat-reduction; and were only slightly unwilling to reduce their meat intake. Notably, the Ambivalent men were characterised by ambivalence towards meat: on the one hand, they held positive attitudes towards and ate moderate-to-high amounts of meat; on the other, they were concerned about farm animals, citing animal welfare as the most compelling reason to reduce their meat intake, and showing empathy for farm animal suffering. Hence, Ambivalent men may be the best candidates for dietary change, as meat-related ambivalence is associated with lower meat consumption, greater willingness to reduce, and is an antecedent state to meat-reduction (Pauer et al., 2022). Their concern for animals suggests that animal welfare appeals may be an effective intervention technique for this consumer group. However, interventions will need to overcome their tendency to use indirect MRCD strategies: avoiding thinking about animal slaughter and dissociating meat from its sentient animal origins. The fact that most men in our sample used dissociation and avoidance strategies is inconsistent with literature that classifies these as "female" strategies (Rothgerber, 2013) and that finds men tend to score higher in direct strategies (Hartmann & Siegrist, 2020; Piazza et al., 2015). This discrepancy further highlights how important information can be overlooked when examining men as a single population.

4.1. Research implications

Our findings yielded three distinct types of male consumers who varied in 20 meat-related psychosocial characteristics. Thus, treating men as a single homogenous population of meat consumers may fail to capture within-group differences that are important for understanding, predicting, and influencing men's meat consumption. Previous meat-reduction interventions may have had less success with male participants because they did not consider differences between latent consumer groups. For example, studies have found that men increase their attachment to meat in response to animal empathy appeals (e.g., Dowsett et al., 2018), however, this response may occur mainly in Resistant consumers. In other words, profile membership is likely to moderate intervention effects.

This study has implications for the masculinity dilemma (i.e., men's willingness to reduce impeded by expectations that "real" men must eat meat). In line with the literature (Graça et al., 2019), most men in our sample were unwilling to reduce their meat intake. However, we found that the extent of this unwillingness varied according to profile membership. Notably, most men were only *slightly* unwilling to reduce their meat intake, and had ambivalent meat-related attitudes, indicating that (some) men may be more psychologically open to dietary change than previously assumed. The results suggest that the masculinity dilemma may only affect Resistant men, who were more influenced by dominant traditional standards of masculinity and experienced more social pressure to eat meat. Conformity to traditional masculine norms and perceived social support may interact, together increasing the likelihood of Resistant men eating meat and impeding their willingness to reduce. The masculinity dilemma may not affect Ambivalent or Meat-averse consumers, as they believed others would approve of them reducing their meat consumption and did not conform strongly to traditional masculine norms, indicating a lower degree of conflict.

Rather than expending time and resources on men who are unlikely to change their meat consumption habits, we argue that dietary interventions should target Ambivalent men, who exhibited less barriers to meat-reduction, and greater potential for meat-reduction than low-meat-intake Meat-averse men. Theoretical models of critical mass posit that when minority groups reach a certain size or "tipping point" (anywhere between 10% (Xie et al., 2011) to 40% (Grey, 2006) of the population), they can initiate the rapid widespread adoption of new social norms (Centola et al., 2018). Currently, men living on plant-based diets are the minority. Initiating a transition to plant-based eating among Ambivalent men can help reach this critical tipping point, spreading greater acceptance of plant-based diets among men.

In considering intervention design, the Meat-averse profile highlights which characteristics could be fostered in Ambivalent men to facilitate their meat-reduction. Identity (e.g., national or gender identity) and ideological/value-based factors (e.g., SDO), tend to remain stable over time (Jost et al., 2008; Mader & Schoen, 2023; Mahalik, 2014), and therefore may be difficult to change. However, intervention techniques (outlined in Table 4) can capitalise on these characteristics. Habits, attitudes, and perceptions (e.g., convenience, price, PBC) can be shifted, as can awareness of and concern for health, animal welfare, or environmental issues related to meat consumption. Intervention studies have also shown that emotions (animal empathy and disgust) can be manipulated and reduce people's willingness to eat meat (Kwasny et al., 2022; Palomo-Vélez et al., 2018). Therefore, interventions may wish to target a combination of these factors. For Ambivalent consumers, animal welfare appeals may be most effective, however, interventions will need to overcome indirect MRCD strategies, and consider that men can respond defensively to animal welfare appeals when their masculinity is threatened (Pohlmann, 2022).

4.2. Limitations & future directions

As this study was based on a relatively small sample of Australian and English men, results may not be generalisable to other cultures; replication studies are needed to support and generalise these findings. Our sample had a disproportionally high percentage of left-wing participants, which may have biased the results (particularly of the

Ambivalent group which represented the typical or most common type of consumer), as left-wing individuals tend to have more positive attitudes towards meat-reduction (Rosenfeld, 2018). Moreover, our intervention recommendations are based on cross-sectional data and are thus purely theoretical. Experimental evidence is needed to test how men from different profiles respond to various intervention techniques. As per our "tipping point" strategy, researchers should investigate the efficacy of different behaviour change techniques on Ambivalent men's meat consumption.

The MCIS meat consumption subscale may not have distinguished participants' meat consumption with a high level of precision, due to the low Cronbach's alpha (0.54), therefore results may not be replicable. Due to the lack of psychometrically validated meat consumption scales available, there is a wide and inconsistent range of meat consumption measures utilised in the literature, and a lack of reporting of Cronbach's alpha; hence, it is difficult to compare the reliability and validity of our measure to previous studies. Earlier development of the MCIS in a mixed gender sample found that the scale produced a higher reliability estimate in a mixed gender sample ($\alpha = 0.67$; Camilleri et al., 2023a). Therefore, reliability index differences may be due partly to sampling differences. Nevertheless, as the current study did not use meat consumption as a profiling variable the validity of the consumer profiles was not impacted.

Finally, we did not include all indicators relevant to men's meat consumption. Differences between male consumers in other masculinity factors, such as masculinity contingency (Burkley et al., 2016), masculinity stress (Swartout et al., 2015), or masculinity overcompensation (Willer et al., 2013), may further distinguish male consumers. The influence of profile membership on men's meat consumption behaviour should also be investigated, potentially extending current theories regarding the role of meat consumption in men's masculinity maintenance and gender performances. For example, men are more likely to prefer meat when sexually motivated (Chan & Zlatevska, 2019), or when their masculinity is threatened (Mesler et al., 2022; Pohlmann, 2022). Profile membership may moderate these effects.

4.3. Conclusions

The probability of meeting climate targets can be significantly improved by reducing meat consumption among consumers with the biggest demand for meat—men in developed countries. This study identified three distinct latent profiles of male consumers from Australia and the UK who varied in their meat consumption, willingness to reduce, and important psychosocial characteristics. Meat-reduction interventions should be designed with the unique characteristics of different types of male consumers in mind, and would obtain the most dramatic meat consumption reductions by targeting Ambivalent male consumers, who showed the most potential for meat reduction. Animal welfare appeals that overcome dissociation and avoidance strategies among Ambivalent male consumers may be an effective approach. Tackling the masculinity dilemma will require further focus on within- rather than between-gender differences in male populations.

Ethical statement

This study was conducted in accordance with the Code of Ethics of the World Medical Association and with approval from the Victoria University Human Research Ethics Committee. Application ID: HRE21-162, 14/3/22. All participants provided informed consent.

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CRediT authorship contribution statement

Lauren Camilleri: Conceptualization, Methodology, Data curation, Formal analysis, Writing – original draft. **Peter Richard Gill:** Conceptualization, Methodology, Data curation, Formal analysis, Supervision, Writing – review & editing. **Jessica Scarfo:** Conceptualization, Methodology, Data curation, Formal analysis, Supervision, Writing – review & editing. **Andrew Jago:** Conceptualization, Methodology, Formal analysis, Supervision, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

We have included the URL link for the online data repository at the end of the manuscript for readers wishing to access the data https://easy.dans.knaw.nl/ui/datasets/id/easy-dataset:271459

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.foodqual.2023.104890.

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