Appetite 195 (2024) 107227

Contents lists available at ScienceDirect

Appetite

journal homepage: www.elsevier.com/locate/appet

How perceptions of meat consumption norms differ across contexts and meat consumer groups

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ARTICLE INFO

Keywords:
Social norm perceptions
Dynamic norms
Meat consumption
Eating behaviour
Contexts
Consumer segments

ABSTRACT

Social norm perceptions are implicit standards describing what is typically done or seen as acceptable and have shown to be important both in sustaining meat consumption as well as facilitating meat reduction. Norm perceptions depend on individual differences and the contexts (e.g., supermarket, restaurant). Yet, evidence how norm perceptions differ within and across individuals is scarce. The primary aim of this study was to investigate how descriptive, injunctive, and personal norms perceptions favouring meat consumption differ across contexts and meat consumer groups. The second aim was to investigate how generic dynamic norm perceptions vary across meat consumer groups. British meat eaters (n = 1205, 25–65 years) participated in an online cross-sectional survey. Weekly meat, fish and meat substitute consumption was measured with the adapted Oxford Meat Frequency Questionnaire. All but dynamic norm perceptions were measured for the supermarket, restaurant and worksite cafeteria context. Dynamic norms were measured without a specified context. A two-step cluster analysis was conducted to identify meat consumer groups. Descriptive norm perceptions favouring meat consumption were strongest in supermarket and restaurant contexts, compared to the worksite cafeteria. Injunctive and personal norms favouring meat consumption were both perceived strongest in the supermarket, followed by the restaurant, and least in the worksite cafeteria context. Four meat consumer groups were identified and those with higher meat intake (i.e., Meat lovers and Exceeders) perceived norms favouring meat consumption stronger and norms favouring meat avoidance weaker than the groups with lower meat intake (i.e., Flexitarians and Moderates). While norm perceptions differed between meat consumer groups, the pattern of contextual differences is similar for these meat consumer groups. Our findings underscore the importance of considering contexts and meat consumer groups in efforts to reduce meat consumption.

1. Introduction

It has been widely acknowledged that what we eat, how much we eat, and why we eat is influenced by what others around us eat (Herman et al., 2003; Higgs, 2015; Higgs & Thomas, 2016). One important social mechanism that drives individual eating behaviour is the perception of social norms. Eating-related social norms describe what is normal and appropriate to eat (Higgs, 2015). Social norms are implicit standards describing what is typically done (i.e., descriptive norms) or prescribing what ought to be done (i.e., injunctive norms) in a specific social context (Cialdini et al., 1990). Descriptive and injunctive norms differ in how they motivate and influence behaviour. On the one hand, descriptive norms may guide behaviour by functioning as a heuristic, i.e., others do it, so it must be the acceptable thing to do. This type of norm is specifically functional in novel environments where one might feel unsure about the common behaviour in that context (Cialdini et al., 1990). On the other hand, injunctive norms prescribe what is thought to be the correct and appropriate behaviour in a certain context (Cialdini et al., 1990) and are typically followed as a way to build and maintain relationships (Jacobson et al., 2011). Social norms can communicate a

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https://doi.org/10.1016/j.appet.2024.107227
Received 13 July 2023; Received in revised form 16 January 2024; Accepted 17 January 2024
Available online 23 January 2024

static mode, describing behaviour in its current state (e.g., most people choose meat for dinner), but may also be framed in a dynamic mode, depicting a change in the common behaviour over time (e.g., "More and more people are *starting* to reduce their meat intake"; Sparkman & Walton, 2017). Different from, but closely related to social norms are personal norms. Personal norms are believed to be internalized social norms that reflect internalized standards of what one personally considers the right or wrong thing to do and are also considered to be a powerful driver of behaviour (Schultz et al., 2016; Schwarz, 1977). Personal norms are argued to induce feelings of pride and increased self-esteem when acted upon or feelings of guilt or lessened self-esteem when not acted upon (Bertoldo & Castro, 2016; Schwartz, 1977). Although the forcefulness of social and personal norms can guide one to conform to eating behaviour beneficial to, for example, one's health (e.g., eat safe foods), the power of these norms may also sustain eating behaviours that could potentially be considered harmful to human and/or planetary health.

The excess of meat consumption is negatively affecting both planetary and human health (Nelson et al., 2016; Willett et al., 2019). The production of meat is considered an important contributor to climate change, and particularly red and processed meat consumption is associated with diseases as type 2 diabetes, various types of cancer, as well as total mortality (Campbell et al., 2017; Nelson et al., 2016; Willett et al., 2019). In the UK, average grams of daily protein intake exceed the recommended amount of 66 g by 6 g a day, requiring a reduction in red and processed meat consumption (Eatwell Guide, 2016, https://www.gov.uk/government/publications/the-eatwell-guide; Scarborough et al., 2016). This is a large challenge, given that eating meat is still widely qualified as normal and nice, necessary and natural, specifically in Western countries (Cheah et al., 2020; Dagevos, 2021; Hartmann & Siegrist, 2017; Stoll-Kleemann & Schmidt, 2017; Piazza et al., 2015). Yet, while this societal norm is seemingly omnipresent in Western societies, there may be individual variation in the norms that meat eaters perceive, both within individuals as between individuals.

1.1. Norm perceptions varying within individuals: contexts and referent groups

An individual may hold multiple norm perceptions concerning meat consumption at the same time, that varies across contexts or depends upon the referent group one identifies with (Cialdini et al., 1990). With respect to contexts, Horgan et al. (2019) found that the likelihood of people eating meat was higher in restaurants compared to at home or at the office. The amount of meat consumed was also found more likely to be higher in a restaurant compared to home (Horgan et al., 2019). Further, German flexitarians (meat eaters that abstain from meat for a number of days a week) indicated to eat meat more often at a restaurant compared to at home and German consumers perceived meat substitutes as less appropriate to eat in a restaurant setting (Biermann & Rau, 2020; Michel et al., 2021). Based on the aforementioned studies, it remains unknown whether different norm perceptions regarding meat consumption then also vary across different contexts – i.e., does an individual perceive different descriptive meat consumption norms in supermarkets, compared to restaurants, or worksite cafeterias? As there is evidence that stronger norm perceptions favouring meat consumption are associated with increased self-reported meat intake (Sharps et al., 2021), it is important to investigate whether different eating and food purchasing contexts affect norm perceptions. Besides different contexts, individuals may hold multiple norm perceptions depending on their referent group. One may have the feeling that one ought to eat meat while dining with family, but may perceive an equally strong norm to eat vegan while dining with fellow students. As social norms guide behaviour through the behaviour of *others*, the extent to which one identifies with these *others* is important for that norm to become salient (Higgs, 2015; Robinson et al., 2014; Stok et al., 2016). Meat consumers may have different referent groups that they identify with in certain contexts, which may affect what and how the norms propagated by these groups are perceived. To illustrate, Çoker and colleagues (2022) found that the norms propagated by referent groups that were socially closer (i.e., people they share their meals with) as opposed to groups more distant to them (i.e., general population), had a stronger influence on them purchasing healthier and more sustainable groceries. Moreover, Sharps et al. (2021) showed that the extent to which norm perceptions were positively associated with meat intake varied across referent groups, such as significant others, family and friends. For example, social norms favouring meat consumption were associated with increased meat intake when propagated by significant others, but not when propagated by family and friends. Despite the important role of referent groups in norm perceptions, as far as we know, referent groups have not yet been incorporated into measurements that measure norm perceptions regarding meat consumption. To get a more detailed understanding of meat consumption norm perceptions, the present study measured norm perceptions referring to the social group one identifies most with.

1.2. Norm perceptions varying between individuals: meat consumer groups

Besides the notion that norm perceptions may vary within individuals as argued before, it is important to note that norm perceptions also vary between individuals as meat consumers are heterogenous as a group. Not only do they have varying sociodemographic characteristics, but they also vary in consumption patterns, habits, and attitudes (Pfeiler & Egloff, 2018; Verain et al., 2022). Multiple studies have shown that normative perceptions that discourage meat consumption, may indeed promote meat avoidance among different meat consumer groups (Cheah et al., 2020; Eker et al., 2019; Schenk et al., 2018; Sharps et al., 2021). Verain et al. (2022) recently found that meat consumers with a negative attitude towards meat reduction and frequent meat intake, found eating meat more normal and displayed a weaker injunctive and personal norm favouring meat avoidance than meat consumers with more positive attitudes towards meat reduction with less frequent meat intake. Moreover, Onwezen et al. (2022) showed that 'meat lovers' reported lower norm perceptions favouring non-meat burger consumption, compared to flexitarians. While this indicates a variation in norm perceptions favouring *meat avoidance* between individuals, the extent to which social and personal norm perceptions favouring *meat consumption* differs between individuals remains unclear. In the present study, we aim to further investigate different norm perceptions regarding meat consumption across meat consumer groups categorized by their meat consumption (i.e., grams a week). That is, do meat consumer groups also differ in their norm perceptions regarding meat consumption?

Given the urgency to reduce meat consumption to enhance human and planetary health and the powerful influence of norms on behaviour, social norm interventions within the field of meat reduction have gained scholarly attention (e.g., Alblas et al., 2022; Raghoebar et al., 2020; Sparkman & Walton, 2017; Sparkman et al., 2020; Stea & Pickering, 2019; Çoker et al., 2022). However, results of these interventions so far are mixed, yielding positive effects (e.g., Sparkman et al., 2020; Stea & Pickering, 2019), but also no (e.g., Aldoh et al., 2021; Çoker et al., 2022) or countereffects (e.g., increased meat intake among subgroups; e.g., Sparkman et al., 2020). We pose that a fine-grained understanding of meat consumption norm perceptions could aid in more tailored communication towards meat consumers aimed at meat reduction, potentially enhancing the effectiveness of such communications. Therefore, the objective of this study was to investigate the extent to which norm perceptions regarding meat consumption differ within individuals across three different contexts (i.e., supermarket, restaurant, and worksite cafeteria), and between individuals across meat consumer groups, accounting for their most important social group in each context (i.e., referent groups). Hereto, we will measure norm perceptions favouring both meat consumption and meat avoidance across contexts, yet the main focus is on norm perceptions favouring meat consumption.

2. Methods

2.1. Study design

A two-part cross-sectional online survey study among British meat eaters was conducted to determine the extent to which social and personal norms regarding meat consumption and avoidance are perceived differently within individuals (i.e., across contexts) and between individuals (i.e., across different types of meat consumer). The present study uses the data of the first part of a two-part questionnaire. The first questionnaire measured meat (substitute) consumption, and norm perceptions favouring both meat consumption and avoidance. The second part of the questionnaire measured socio-demographics and psychological determinants of meat consumption (e.g., habit strength) and are part of a different study (see, OSF https://osf.io/xc3ve/?view_only=a33b6ad133024dbca218e9a557005aa0). Only the socio-demographics measured in part two of the survey were used for the present study. The overall study was preregistered at OSF (https://osf.io/xc3ve/?view_only=a33b6ad133024dbca218e9a557005aa0), the present study differs slightly from the preregistration in that the present study only uses the data from the first questionnaire and, therefore, only focuses on the norm perceptions within and between meat consumers. Ethical approval was granted by the Social Sciences Ethics Committee of Wageningen University (reference code: 2021-50-Wolfswinkel).

2.2. Participant recruitment and procedure

Participants were recruited in November 2021 through the online international research agency Prolific Academic (https://www.prolific.co/). A total of 8017 participants were eligible to participate in the study, based on the inclusion criteria being between 25 and 65 years old, employed (non-student), and consuming meat at least once a week. Because the two parts of the questionnaire together would take over 20 min, data collection was split up into two separate questionnaires, to minimize fatigue. To minimize bias from the first questionnaire on the second, the questionnaires were administered nine days apart. No a priori sample size calculations were conducted for this study. The sample size was based on Van Rongen et al. (2020) plus an additional 250 participants to anticipate on potential loss between part 1 and 2 of the survey. For budget reasons, data collection stopped after 1250 participants (15.6 % of 8017 eligible participants) completed the questionnaire.

Participants that met the eligibility criteria were invited on their Prolific account. They were informed about the topic of the survey (i.e. "meat preferences, social and personal influences"), that the survey consisted of two parts, 9 days apart, and that they would receive an incentive (i.e., £2.76) if they finished both questionnaires. The informed consent form was presented on the first page on the survey. If a participant did not want to continue, they were directed to the end of the survey.

Participants were first asked to indicate the number of days a week they eat meat, followed by the number of days a week they eat meat substitutes. After that, participants received an explanation about the Oxford Meat Frequency Questionnaire (MFQ; Stewart et al., 2021), after which they were directed to the MFQ itself. Next, social and personal norm perceptions were measured. They were presented with the context they had to imagine (e.g., supermarket), asked with whom they identified most in that context (e.g., family), followed by the social and personal norm perception measurements. For each context, social and personal meat consumption norms were measured first, followed by a separate page on which meat avoidance norm perceptions were measured. The order in which the contexts were presented was randomized and the order in which the social and personal norm perceptions were presented was randomized within each context. After that, their dynamic norm perceptions were measured. Lastly, participants were thanked for their time and reminded that they would have to complete the second questionnaire to receive the reward.

2.3. Measures

2.3.1. Participant characteristics

Most participant characteristics were obtained automatically through the database of the research agency, including age, sex (as assigned at birth), UK area of residence, and household income. Household size, and household composition were measured as part of the second questionnaire. Two generic questions were included to measure weekly meat (substitute) and fish consumption in numbers of days a week (i.e., "How many days a week do you usually eat meat?" and "How many days a week do you usually eat meat analogues").

2.3.2. Meat, fish and meat substitute consumption (grams per week)

Meat, fish, and meat substitute consumption (weight in grams per week) were included as segmentation variables and were measured using an adapted version of the MFQ (Stewart et al., 2021). The MFQ includes various types of meats (e.g., chicken, pork, beef, game, lamb etc.) and various types of fish (e.g., salmon, oysters, etc.). Because meat substitutes were not included in the original MFQ, seven meat substitutes were added to survey, including: vegetarian slices (e.g., mock bacon), vegetarian burgers (e.g., mock beef burger), non-breaded pieces (e.g., mock chicken), breaded pieces (e.g., mock fish fingers), mock meat balls or falafel, vegetarian sausages, and tofu and tempeh. The types of meat substitutes were inspired by both meat products as well as meat substitutes as sold in common UK supermarkets (Tesco, Sainsbury's, and Morrisons).

Although the original MFQ measured daily meat consumption for seven days consecutively, in the present study participants were asked once to indicate what types of meat (substitutes) they had eaten the past seven days. Participants indicated what they consumed (e.g., as part of mixed dish or snack (pie), pieces and cuts, burger, slices etc.) and how many servings they consumed (e.g., one burger patty, six sardines, one turkey sandwich slice) during breakfast, lunch, dinner or as snack. The servings and corresponding weights were based on the UK Food Standards Agency (FSA) as captured in the MFQ (Stewart et al., 2021). The weight in grams of the meat substitutes were assessed based on the serving sizes most common among different brands per product (e.g., The Vegetarian Butcher, Quorn, Vivera). To determine total weekly consumption in grams separately for red meat, white meat, fish, and meat substitutes, all servings consumed were multiplied by the corresponding weight per serving in grams.

2.3.3. Social and personal norms

Social and personal norm perceptions were measured for a supermarket, restaurant, and worksite cafeteria context separately. To make these contexts more salient, participants were asked to picture that specific context and remember the last time they were in a similar context through the following vignettes: "Imagine you are going to the supermarket to get groceries for tonight's dinner. You are picking groceries for yourself. You are in the meat aisle."; "Imagine you are going to a restaurant to eat dinner. You are picking a meal for yourself. You have the menu right in front of you."; and "Imagine you are going to pick a lunch from the worksite cafeteria. You are picking a lunch for yourself. You are in the cafeteria".

For each of these contexts, participants were asked to select one group with whom they identify the most ("Who do you identify most with in this situation?"), and the following answers were predefined: family members, friends, peers, neighbours, colleagues, other men, other women, other meat eaters, other Brits, other customers. These referent groups were presented in a random order to each participant. The group the participant had picked for that context was then put into the norm perception measurement.

For each of these contexts descriptive, injunctive, and personal norm perceptions were measured for both meat consumption and meat

avoidance, separately, on a 7-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree). Questions were presented in random order. Descriptive, injunctive, and personal norm perception measurements were inspired by Raghoebar et al. (2019). General dynamic norm perceptions were measured for meat avoidance, only, independent of context, and were inspired by Sparkman et al. (2020; Sparkman & Walton, 2017). All norm perception items were measured on a 7-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree), and are summarized in Table 1.

For two-item scales Spearman-Brown coefficient was calculated as it is considered the most appropriate reliability coefficient for two-item scales (Eisinga et al., 2013). Spearman-Brown coefficient was calculated for all norm perceptions (descriptive, injunctive, personal) for each context (Table 2). The Spearman-Brown coefficient for dynamic norm perceptions favouring meat reduction was $r_{Spearman\text{-}Brown} = 0.95$. The reliability of multi-item scales was assessed based on McDonald's Omega (ω). Although Cronbach's alpha (α) is a widely used measurement of internal scale consistency, McDonald's ω is considered a more appropriate reliability coefficient because, unlike α, the coefficient does not assume unidimensionality of the scale (Crutzen & Peters, 2017; Hayes & Coutts, 2020). Thus, McDonald's ω was calculated for general descriptive, injunctive, and personal norm perceptions (supermarket, restaurant and worksite cafeteria measures taken together). The mean scores of norm perceptions over the contexts (i.e., six items per variable) were calculated for descriptive, injunctive, and personal meat consumption and avoidance norms (McDonald's ω in Table 2).

2.4. Statistical analyses

All data were analysed with IBM SPSS version 25.0. Statistical analyses were planned in the preregistration at OSF (https://osf.io/xc3ve/?view_only=a33b6ad133024dbca218e9a557005aa0). Participants that indicated to have a weekly meat and fish consumption of >10.5 kg were excluded from the sample (>1.5 kg a day, consistent with by Stewart et al., 2021). The descriptive data (M (SD); N (%) of the total sample were calculated for age, sex, country of birth, educational level, household income level, household size, household composition, weekly meat and weekly meat substitute consumption.

A two-step cluster analysis was conducted to distinguish different types of meat consumers based on their meat, fish and meat substitute consumption (grams per week). Relative red meat, white meat, fish and meat substitutes in grams a week were used to label the meat consumer types. Age (M(SD)), distribution of sex (n (%)), and meat (substitute) consumption in days a week (M(SD)) were used to describe the meat consumer types.

Because two-step cluster analysis is known to be sensitive to case-order (i.e., order of participants), we randomized the order of cases ten times. Lowest Bayesian Information Criterion (BIC), BIC change, ratio of smallest to largest cluster, silhouette measure, and interpretability were taken into account to identify the types of meat consumers. In all ten rounds, the biggest drop change in BIC was at the solution with two segments (e.g., mean score of ten rounds $BIC_{change} = -993.6$) and the lowest BIC was between nine and eleven segments (mean score of ten rounds at a solution of ten segments BIC = 1668.3). The solution with two segments was not considered the optimal solution, because of the relatively high BIC score (i.e., BIC>2300 in each of ten rounds), and because one of the two segments would include between 80 % and 90 % of the total participants. Because of the insufficient interpretability of ten segments, this was also ruled out as an optimal solution. In all ten rounds the BIC change declined between 3 and 5 clusters. Therefore, 3, 4 and 5 cluster solutions were examined based on interpretability, ratio of smallest to largest cluster and silhouette measure. The silhouette measure was the same for each solution (0.4) and the ratio smallest to largest cluster was lowest for the four-segment solution (5.3) compared to the three segment (6.0), and five-segment solution (9.4). Therefore, it was decided that four segments were the optimal solution of the Two-Step cluster analysis.

To assess differences in descriptive, injunctive, personal and dynamic norm perceptions between meat consumer groups, Univariate Analysis of Variances (ANOVAs) were conducted. Post-hoc Bonferroni tests were performed to examine how norm perceptions differed across meat consumer types. To assess differences in descriptive, injunctive, and personal norm perceptions between contexts (i.e., supermarket, restaurant, and worksite cafeteria), repeated measures ANOVAs were conducted with post-hoc Bonferroni tests. Partial η^2 were used to indicate the size of the difference between the meat consumer groups and contexts and were interpreted as small (Partial $\eta^2 = 0.01$), medium (Partial $\eta^2 = 0.06$), large (Partial $\eta^2 = 0.14$) (Richardson, 2011).

Table 1
Norm perception items.

	You indicated that you identify with {referent group} at the {context}. To what extent do you agree with the following statements?
Descriptive norm	
Item 1	It is likely that these people would (avoid to) choose meat at the {context}.
Item 2	It is common that these people would (avoid to) choose meat at the {context}.
Injunctive norm	
Item 1	These people think it is appropriate that you (avoid to) choose meat at the {context}.
Item 2	These people think you are supposed to (avoid to) choose meat at the {context}.
Personal norm	
Item 1	I personally believe that (avoiding) to choose meat at the {context} is the normal thing to do.
Item 2	I personally believe that (avoiding) to choose meat at the {context} is the appropriate thing to do.
Dynamic norm	
Item 1	An increasing number of people around me are starting to lower their meat consumption.
Item 2	People around me are increasingly starting to lower their meat consumption.

3. Results

3.1. Participant characteristics

3.1.1. Total sample

A total of 1212 participants completed both questionnaires (96.7 % of the participants that completed the first survey). Seven participants (0.6 %) were excluded because they indicated to consume 10.5 kg of meat and fish a week, resulting in a final sample of 1205 (99.4 %) participants that were included in the analyses.

Participants were on average 39.2 years old (SD = 10.2 [range 25–65]), 602 (50 %) were female, the majority (93.9 %) was born in the United Kingdom, 844 (70 %) had completed higher education (i.e., technical/community college, undergraduate, graduate, doctorate degree; lower level education includes no education and secondary school, middle level education include A-levels; UK Government, *no date*), (60.7 %) had a middle level household income (£20,000- £59,999; categories based on 75 %–200 % of UK median disposable household income of £31,400 in 2021; OECD, 2019; Office for National Statistics, 2022), the average household existed of 2.9 (SD = 1.6 [range 0–8[1]]) members, and 480 (39.8 %) lived with partner and children. Participants indicated a weekly meat consumption of 5.3 days a week (SD = 1.6). Meat substitutes were consumed on average on 0.2 days a week (SD = 1.4; Table 3).

[1] One participant indicated a household size of 40 members. This participant indicated to only live with their partner and did not indicate to live in a group or with a family. Therefore, we treated this number as a missing value.

Table 2
Spearman-Brown coefficient for norm perceptions favouring meat consumption and meat avoidance per context and McDonalds's ω for descriptive, injunctive, and personal norm perceptions averaged over the contexts.

	Supermarket		Restaurant		Worksite cafeteria		McDonalds's ω	
	Meat consumption	Meat avoidance	Meat consumption	Meat avoidance	Meat consumption	Meat avoidance	Meat consumption	Meat avoidance
Descriptive	.93	.92	.94	.86	.91	.91	.83	.73
Injunctive	.82	.81	.72	.77	.70	.76	.83	.82
Personal	.89	.90	.89	.90	.87	.87	.92	.91

Table 3
Descriptive data of total sample and meat consumer types (M(SD), n (%)).

	Total (n = 1205)	Meat lovers (n = 398)	Exceeders (n = 103)	Flexitarians (n = 158)	Moderates (n = 546)	Test	Effect size	p
Age	39.2 (10.2; 25–65)	38.2[a] (9.8)	36.5[a,b] (9.0)	39.9[a,c] (10.7)	40.2[c,d] (10.4)	F (3,1201) = 5.8	Partial η^2 = .014	.001
Sex						X^2 (3, 1205) = 18.5	Cramer's V = .124	<.001
Female	603 (50.0 %)	176 (44.2 %)[a]	42 (40.8 %)[a]	76 (48.1 %)[a, b]	309 (56.6 %)[b]			
Male	602 (50.0 %)	222 (55.8 %)[a]	61 (59.2 %)[a]	82 (51.9 %)[a, b]	237 (43.4 %)[b]			
Nationality						X^2 (51, 1205) = 66.2		.074
United Kingdom	1131 (93.9 %)	387 (97.2 %)	94 (91.3 %)	148 (93.7 %)	525 (96.2 %)			
Educational level						X^2 (6, 1205) = 20.1	Cramer's V = .091	.003
Low	160 (12.2 %)	65 (16.3 %)[a]	15 (14.6 %)[a]	14 (8.9 %)[a]	66 (12.1 %)[a]			
Middle	196 (16.3 %)	70 (17.6 %)[a]	23 (22.3 %)[b]	13 (8.2 %)[b]	90 (16.5 %)[a, b]			
High	849 (70.0 %)	263 (66.1 %)[a]	65 (63.1 %)[a]	131 (82.9 %)[b]	390 (71.4 %)[a]			
Employment						X^2 (9, 1205) = 13.7		.134
Full-time	921 (76.4 %)	318 (79.9 %)	83 (80.6 %)	114 (72.2 %)	406 (74.4 %)			
Part-time	255 (21.2 %)	73 (18.3 %)	19 (18.4 %)	38 (24.1 %)	125 (22.9 %)			
Household income level						X^2 (9, 1205) = 7.2		.616
Low	122 (10.1 %)	36 (9.0 %)	12 (12.0 %)	14 (9.0 %)	60 (11.0 %)			
Middle	732 (60.7 %)	248 (62.0 %)	59 (57.0 %)	92 (58.0 %)	333 (61.0 %)			
High	257 (21.3 %)	88 (22.0 %)	24 (23.0 %)	33 (21.0 %)	112 (21.0 %)			
Household size	2.9 (1.6; 0–40)	3.0[a] (1.3)	3.1[a] (3.9)	2.7[a] (1.2)	2.8[a] (1.2)	F (3,1201) = 3.0	Partial η^2 = .008	.028
Household composition						X^2 (18, 1205) = 29.2	Cramer's V = .090	.046
Living with partner/spouse and child (ren)	480 (39.8 %)	182 (45.7 %)[a]	39 (37.9 %)[a]	54 (34.2 %)[a]	205 (37.5 %)[a]			
Living with partner/spouse	344 (28.5 %)	98 (24.6 %)[a]	31 (30.1 %)[a]	53 (33.5 %)[a]	162 (29.7 %)[a]			
Living alone	152 (12.6 %)	44 (11.1 %)[a]	13 (12.6 %)[a]	22 (13.9 %)[a]	73 (13.4 %)[a]			
Living with parent(s)	96 (8.0 %)	39 (9.8 %)[a]	11 (10.7 %)[a]	9 (5.7 %)[a]	37 (6.8 %)[a]			
Living with child (ren), without partner/spouse	7 (6.3 %)	20 (5.0 %)[a]	3 (2.9 %)[a]	9 (5.7 %)[a]	44 (8.1 %)[a]			
Living with friend(s)/roommate (s)	37 (3.1 %)	9 (2.3 %)[a]	2 (1.9 %)[a]	9 (5.7 %)[a]	17 (3.1 %)[a]			
Meat (substitute) consumption (days per week)								
Meat consumption	5.3 (1.6)	6.1 (1.2)[a]	5.6 (1.6)[b]	4.1 (1.6)[c]	5.1 (1.6)[d]	F (3,1201) = 72.7	Partial η^2 = 0.15	<.001
Meat substitute consumption	0.2 (1.4)	0.0 (1.0)[a]	0.8 (1.9)[b]	2.0 (1.4)[c]	0.0 (1.1)[a]	F (3,1201) = 156.4	Partial η^2 = 0.28	<.001
Meat, fish, meat substitute consumption (weight in grams past seven days)								
Red meat	792.9 (852.5)	1178.3 (647.4)[a]	2131.6 (1671)[b]	347.1 (349.5)[c]	388.3 (271.4)[c]	F (3,1201) = 285.8	Partial η^2 = 0.42	<.001
White meat	492.8 (520.1)	672 (365.8)[a]	1426.6 (1017.6)[b]	300.4 (243.6)[c]	241.7 (164.9)[c]	F (3,1201) = 312.8	Partial η^2 = 0.44	<.001
Fish	273.9 (406.9)	296 (300.0)[a]	923.5 (934.4)[b]	238.7 (236.4)[a]	145.4 (154.6)[c]	F (3,1201) = 144.5	Partial η^2 = 0.27	<.001
Meat substitutes	72.1 (188.0)	9.8 (39.0)[a]	280 (456.7)[b]	307.1 (146.6)[b]	10.2 (29.9)[a]	F (3,1201) = 261.5	Partial η^2 = 0.40	<.001

[a – d] Different letters indicate a significant *difference*.

3.1.2. Meat consumer segments

The Two-Step Cluster analysis resulted in four distinct meat consumer types: Meat lovers, Exceeders, Flexitarians, and Moderates. Segment 1 (n = 398, 33 % of total sample) was labelled 'Meat lovers' because of the relatively high red and white meat consumption in that segment, relatively low fish, and close to no meat substitute consumption. Participants in the Meat lover segment ate significantly more red and white meat than segment 3 (Flexitarians) and 4 (Moderates) (Table 3, Table 4 for post-hoc pairwise comparisons). Segment 2 (n = 103, 8.5 %) was labelled 'Exceeders', because participants in this segment showed the significantly highest consumption of red and white meat, and fish. Moreover, although comparable to segment 3

Table 4
Post-hoc Bonferroni tests for descriptive variables between segments.

Segments	Segments	Age	Household size	Meat consumption (days)	Meat substitute consumption (days	Red meat (weekly in grams)	White meat (weekly in grams)	Fish (weekly in grams)	Meat substitutes (weekly in grams)
		M_{dif} (se), *p*	M_{dif} (se), *p*	M_{dif} (se), *p*	M_{dif} (se), *p*	M_{dif} (se), *p*	M_{dif} (se), *p*	M_{dif} (se), *p*	M_{dif} (se), *p*
Meat lovers	Exceeders	1.7 (1.12), p = .732	−0.2 (0.18), p = 1.000	0.5 (0.16), p = .01	−1.1 (0.13), p < .001	−953.3 (72.08), p < .001	−754.6 (43.14), p < .001	−627.5 (38.61), p < .001	−270.1 (16.18), p < .001
	Flexitarians	−1.6 (0.95), p = .520	0.3 (0.15), p = .317	1.9 (0.14), p < .001	−2.2 (0.11), p < .001	831.2 (61.31), p < .001	371.6 (36.69), p < .001	57.4 (32.84), p = .490	−297.3 (13.77), p < .001
	Moderates	−2.0 (0.67), p = .017	0.2 (0.11), p = .233	1.0 (0.10), p < .001	−0.1 (0.08), p = .912	790.0 (42.97), p < .001	430.3 (25.72), p < .001	150.7 (23.02), p < .001	−0.4 (9.65), p = 1.000
Exceeders	Flexitarians	−3.4 (1.28), p = .052	0.5 (0.21), p = .169	1.4 (0.19), p < .001	−1.1 (0.15), p < .001	1784.47 (82.57), p < .001	1126.3 (49.42), p < .001	684.9 (44.23), p < .001	−27.2 (18.54), p = 854
	Moderates	−3.7 (1.09), p = .004	0.4 (0.17), p = .184	0.5 (0.16), p = .01	1.0 (0.13), p < .001	1743.3 (70.04), p < .001	1184.9 (41.92), p < .001	778.2 (37.52), p < .001	269.7 (15.33), p < .001
Flexitarians	Moderates	−0.4 (0.91), p = 1.000	−0.1 (0.15), p = 1.000	−0.9 (0.13), p < .001	2.1 (0.11), p < .001	−41.2 (58.90), p = 1.000	58.7 (35.25), p = .577	93.3 (31.55), p = .02	296.9 (13.22), p < .001

(Flexitarians), they also showed significantly higher meat substitute consumption compared to segment 1 (Meat lovers) and segment 4 (Moderates). Segment 3 (n = 158, 13.1 %) was labelled 'Flexitarians', because of the significantly lowest red and white meat consumption in this segment and a meat substitute consumption that was significantly higher compared to segment 1 (Meat lovers) and segment 4 (Moderates) (Table 3, Table 4 for post-hoc pairwise comparisons). Segment 4 (n = 546, 45.3 %) was labelled 'Moderates', because their red and white meat consumption was significantly lower compared to the Meat lover and Exceeder segment but statistically comparable to the Flexitarian segment. Yet, unlike the Flexitarian and Exceeder segment, participants in the Moderates segment reported close to no meat substitute consumption, similar to eating patterns in the Meat lovers segment.

With an average age of 38.2 and 36.5, respectively, Meat lovers and Exceeders were significantly younger than the participants in the Moderates segment that were on average 40.2 years old (Table 3, Table 4 for post-hoc pairwise comparisons). Exceeders were also marginally significantly younger than the Flexitarians with an average age of 39.9. Whereas Flexitarians showed a close to even distribution of sex, both Meat lovers and Exceeders segments contain larger proportions of men, and Moderates a larger proportion of women (Table 3). Further, Meat lovers had a larger proportion of people that completed lower education and a smaller proportion within their segment of people that completed higher education. Flexitarians had significantly more people that completed higher education compared to what would be expected at an even distribution within the segment. The Meat lover segment had a larger proportion of participants that live with both their partner and children, but a smaller proportion living with only a partner and no children within their segment. Moreover, Flexitarians had relatively more participants that live with friend and/or roommates within the segment. Lastly, Moderates had a larger proportion within the segment of participants living with their children, but not a partner.

3.2. Referent groups and norm perceptions across different contexts

3.2.1. Referent groups across contexts

In the supermarket context, participants in all segments most frequently selected 'family members' as the group they identified most strongly with, followed by 'other customers'. Yet whereas for Meat lovers and Exceeders 'other meat eaters' were the third most selected group they identified most with in the supermarket, this was 'friends' for the Flexitarian and Moderates segments (Table 5).

In the restaurant context, all segments but the Flexitarian segment, selected 'family members' most frequently as the group they identified most with, followed by 'friends'. Participants in the Flexitarian segment selected 'friends' most frequently as the group they identified with most, followed by 'family members'. In all segments, other customers were the third most frequently selected group in the restaurant (Table 5).

In the worksite cafeteria context, all segments selected 'colleagues' most frequently as the social group they identified most with. 'Friends' was the second most frequently selected group for all segments. 'Other customers' were the third most frequently selected group for all segments, except for the Moderates segment. In the Moderates segment, the third most frequently selected group was 'peers' (Table 5).

Table 5
Top 3 of Identification groups per context per meat consumer segment (n (%)).

	Supermarket		Restaurant		Worksite cafeteria	
Meat lovers	family members	146 (36.7 %)	family members	161 (40.5 %)	colleagues	233 (58.5 %)
	other customers	105 (26.4 %)	friends	115 (28.9 %)	friends	56 (14.1 %)
	other meat eaters	66 (16.6 %)	other customers	56 (14.1 %)	other customers	22 (5.5 %)
Exceeders	family members	35 (34 %)	family members	34 (33 %)	colleagues	55 (53.4 %)
	other customers	23 (22.3 %)	friends	34 (33 %)	friends	20 (19.4 %)
	other meat eaters	18 (17.5 %)	other customers	14 (13.6 %)	other customers	10 (9.7 %)
Flexitarians	family members	62 (39.2 %)	friends	61 (38.6 %)	colleagues	100 (63.3 %)
	other customers	38 (24.1 %)	family members	57 (36.1 %)	friends	20 (12.7 %)
	friends	19 (12 %)	other customers	22 (13.9 %)	other customers	16 (10.1 %)
Moderates	family members	201 (36.8 %)	family members	246 (45.1 %)	colleagues	320 (58.6 %)
	other customers	157 (28.8 %)	friends	156 (28.6 %)	friends	90 (16.5 %)
	friends	54 (9.9 %)	other customers	69 (12.6 %)	peers	37 (6.8 %)

3.2.2. Norm perceptions across different contexts

Descriptive norms favouring meat consumption were perceived stronger in the supermarket and restaurant context, compared to the worksite cafeteria context. The descriptive norm perceptions did not statistically differ between supermarket and restaurant context (Table 8).

Injunctive norm perceptions favouring meat consumption were strongest in the supermarket context compared to the other two contexts. Injunctive norms perceptions were weaker in the restaurant context compared to the supermarket, but stronger compared to the worksite cafeteria context. These perceptions were weakest in the worksite cafeteria context compared to the other two contexts (Table 8).

Personal norms favouring meat consumption were strongest in the supermarket context compared to the other two contexts. Personal norms perceptions were weaker in the restaurant context compared to the supermarket, but stronger compared to the worksite cafeteria context. Personal norm perceptions were weakest in the worksite cafeteria compared to the other two contexts (Table 8).

3.3. Norm perceptions across meat consumer segments

3.3.1. Norm perceptions favouring meat consumption

Flexitarians perceived the weakest descriptive norm favouring meat consumption compared to the Meat lovers, Exceeders, and Moderates. Also, Moderates showed lower descriptive norms than Meat lovers (Table 6, Table 7 for post-hoc pairwise comparisons). However, no statistically significant differences were observed.

Meat lovers and Exceeders displayed the strongest injunctive norm favouring meat consumption, followed by the Moderates. Flexitarians displayed the weakest injunctive norm with regards to meat consumption (Table 6, Table 7 for post-hoc pairwise comparisons).

Flexitarians portrayed relatively weaker personal norm perceptions favouring meat consumption compared to Meat lovers, Exceeders, and Moderates. Also, Moderates reported weaker descriptive norms compared to Meat lovers, Table 6 (Table 7 for post-hoc pairwise comparisons). Further, no statistically significant differences were observed (Table 6).

3.3.2. Norm perceptions favouring meat avoidance

Meat Lovers and Exceeders generally showed the weakest meat avoidance norm perceptions compared to the other segments. Flexitarians reported the strongest norm perceptions favouring meat avoidance compared to the other segments. Moderates tend to display weaker norm perceptions favouring meat avoidance compared to Flexitarians, but stronger than Meat Lovers and Exceeders (Table 6, Table 7 for post-hoc pairwise comparisons). For example, Flexitarians displayed the strongest dynamic norm perception favouring meat reduction and Meat Lovers the weakest, compared to the other segments. Exceeders and Moderates both showed a significantly stronger dynamic norm perception compared to the Meat lovers, weaker compared to the Flexitarians, and did not statistically differ from each other (Table 9).

3.3.3. Norm perceptions favouring meat consumption within segments between contexts

For all segments but Flexitarians, descriptive norm perceptions favouring meat consumption were strongest in the supermarket and restaurant context, compared to the worksite cafeteria. For the Flexitarian segment, besides not statistically differing between the supermarket and restaurant context, descriptive norm perceptions also did not statistically differ between the restaurant and worksite cafeteria (Table 8).

For Meat lovers, Flexitarians and Moderates, injunctive norm perceptions favouring meat consumption were strongest in the supermarket compared to the other two contexts, followed by the restaurant. In the Exceeder segment, injunctive norm perceptions did not statistically differ between supermarket and restaurant, but both were stronger compared to the worksite cafeteria. In the Flexitarian segment, injunctive norm perceptions did not differ between the restaurant and worksite cafeteria (Table 8).

For Meat lovers and Moderates, personal norm perceptions favouring meat consumption were strongest in the supermarket compared to the other two contexts, followed by the restaurant, and weakest in the worksite cafeteria context compared to the other two contexts. In the Exceeder segment, personal norm perceptions did not statistically differ between supermarket and restaurant, but both were stronger compared to the worksite cafeteria. For the Flexitarian segment personal norm perceptions were stronger in the supermarket context compared to the worksite cafeteria. Yet, the supermarket and restaurant, and the restaurant and worksite cafeteria did not differ statistically (Table 8).

4. Discussion

4.1. Norm perceptions differ across contexts and meat consumer groups

The present study suggested that individuals perceive descriptive, injunctive, and personal norms favouring meat consumption differently across supermarket, restaurant, and worksite cafeteria contexts. Specifically, participants perceive choosing meat as more normal in a supermarket and restaurant setting (i.e., descriptive norm perception) compared to the worksite cafeteria. By the same token, individuals

Table 6
Norm perceptions across the four different meat consumer segments.

Norm perceptions favouring meat consumption (averaged over contexts)								
	Total (n = 1205)	Meat lovers (n = 398)	Exceeders (n = 103)	Flexitarians (n = 158)	Moderates (n = 546)	Test	Effect size	p
Descriptive	5.2 (1.1)	5.5 (1.0)^{a}	5.3 (1.1)$^{a, b}$	4.9 (1.1)^{c}	5.1 (1.1)$^{b, d}$	F (3,1201) = 14.5	Partial η^2 = 0.04	<.001
Injunctive	4.5 (1.2)	4.7 (1.3)^{a}	4.8 (1.2)^{a}	4.1 (1.1)^{b}	4.4 (1.2)^{c}	F (3,1201) = 11.2	Partial η^2 = 0.03	<.001
Personal	4.7 (1.4)	5 (1.4)^{a}	4.9 (1.3)$^{a, b}$	4.1 (1.2)^{c}	4.6 (1.3)$^{b, d}$	F (3,1201) = 19.6	Partial η^2 = 0.05	<.001
Norm perceptions favouring meat avoidance (averaged over contexts)								
Descriptive	2.6 (1.0)	2.4 (0.9)^{a}	2.6 (0.9)$^{a, b}$	3.0 (1.0)^{c}	2.6 (1.0)^{b}	F (3, 1201) = 19.5	Partial η^2 = 0.05	<.001
Injunctive	2.5 (1.0)	2.3 (1.0)^{a}	2.6 (1.0)$^{a, b}$	2.9 (1.0)$^{b, c}$	2.6 (1.0)$^{b, d}$	F (3, 1201) = 12.9	Partial η^2 = 0.03	<.001
Personal	2.8 (1.2)	2.5 (1.2)^{a}	2.8 (1.2)^{a,b}	3.5 (1.1)^{c}	2.8 (1.2)$^{b, d}$	F (3, 1201) = 25.5	Partial η^2 = 0.06	<.001
Dynamic norm perceptions favouring meat reduction	4.1 (1.6)	3.7 (1.6)^{a}	4.2 (1.5)^{b}	5.1 (1.3)^{c}	4.2 (1.6)^{b}	F (3, 1201) = 28.4	Partial η^2 = 0.07	<.001

$^{a-d}$ Different letters indicate a significant difference.

Table 7
Post-hoc Bonferroni tests for norm perceptions between segments.

		Meat consumption			Meat avoidance			
		Descriptive norms	Injunctive norms	Personal norms	Descriptive norms	Injunctive norms	Personal norms	Dynamic norms
		M_{dif} (se), *p*	M_{dif} (se), *p*	M_{dif} (se), *p* (se)	M_{dif} (se), *p*	M_{dif} (se), *p*	M_{dif} (se), *p*	M_{dif} (se), *p*
Meat lovers	Exceeders	0.17 (0.12), p = .844	−0.08 (0.13), p = 1.000	0.096 (0.15), p = 1.000	−0.20 (0.10), p = .368	0.25 (0.11), p = .120	−0.33 (0.13), p = .076	−0.46 (0.17), p = .05
	Flexitarians	0.60 (0.10), p < .001	0.57 (0.11), p < .001	0.939 (0.13), p < .001	−0.68 (0.09), p < .001	−0.55 (0.09), p < .001	−0.99 (0.11), p < .001	−1.35 (0.15), p < .001
	Moderates	0.33 (0.07), p < .001	0.27 (0.08), p = .004	0.353 (0.09), p < .001	−0.23 (0.06), p = .002	−0.24 (0.06), p < .001	−0.33 (0.08), p < .001	−0.43 (0.10), p < .001
Exceeders	Flexitarians	0.43 (0.13), p = .008	0.65 (0.15), p < .001	0.843 (0.17), p < .001	−0.48 (0.12), p < .001	−0.30 (0.12), p = .093	−0.65 (0.15), p < .001	−0.90 (0.20), p < .001
	Moderates	0.15 (0.11), p = 1.000	0.35 (0.13), p = .039	0.257 (0.14), p = .454	−0.03 (0.10), p = 1.000	0.01 (0.11), p = 1.000	0.01 (0.13), p = 1.000	0.02 (0.17), p = 1.000
Flexitarians	Moderates	−0.28 (0.10), p = .023	−0.30 (0.11), p = .036	−0.586 (0.12), p < .001	0.45 (0.09), p < .001	0.31 (0.09), p = .003	0.66 (0.11), p < .001	0.92 (0.14), p < .001

Table 8
Norm perceptions favouring meat consumption within meat consumer segments, between contexts.

	Total sample	Meat lovers (n = 398)	Exceeders (n = 103)	Flexitarians (n = 158)	Moderates (n = 546)
Descriptive norm perception					
Supermarket	5.4 (1.4)[1]	5.7 (1.3)[1]	5.4 (1.3)[1]	5.0 (1.5)[1]	5.3 (1.4)[1]
Restaurant	5.4 (1.4)[1]	5.6 (1.3)[1]	5.5 (1.3)[1]	4.9 (1.4)[1,2]	5.4 (1.4)[1]
Worksite cafeteria	4.8 (1.3)[2]	5.0 (1.3)[2]	5.0 (1.4)[2]	4.7 (1.2)[2,3]	4.8 (1.3)[2]
F	F (1.98, 2378.94) = 124.5	F (2,396) = 59.6	F (2,101) = 5.9	F (2,156) = 4.3	F (1.97,1071.4) = 55.4
p	<.001	<.001	.004	.016	<.001
partial η^2	0.09	0.23	0.11	0.05	0.01
Injunctive norm perception					
Supermarket	4.8 (1.5)[1]	5.0 (1.5)[1]	5.0 (1.5)[1]	4.4 (1.5)[1]	4.7 (1.5)[1]
Restaurant	4.5 (1.5)[2]	4.7 (1.5)[2]	4.9 (1.5)[1]	4.1 (1.4)[2]	4.5 (1.5)[2]
Worksite cafeteria	4.1 (1.4)[3]	4.3 (1.5)[3]	4.4 (1.4)[2]	3.8 (1.3)[2,3]	4.0 (1.4)[3]
F	F (2,1203) = 122.9	F (2,396) = 50.9	F (2,101) = 6.4	F (2,156) = 10.9	F (2,544) = 57.3
p	<.001	<.001	0.002	<.001	<.001
partial η^2	0.17	0.21	0.11	0.12	0.17
Personal norm perception					
Supermarket	4.9 (1.5)[1]	5.2 (1.5)[1]	5.1 (1.5)[1]	4.2 (1.5)[1]	4.9 (1.5)[1]
Restaurant	4.7 (1.6)[2]	5.0 (1.6)[2]	5.0 (1.5)[1]	4.0 (1.5)[1,2]	4.6 (1.5)[2]
Worksite cafeteria	4.5 (1.5)[3]	4.7 (1.5)[3]	4.6 (1.4)[2]	3.9 (1.3)[2,3]	4.4 (1.4)[3]
F	F (2, 2392.2) = 90.0	F (2,396) = 38.3	F (2,101) = 8.9	F (1.93,302.5) = 6.5	F (2,544) = 40.7
p	<.001	<.001	<.001	.002	<.001
partial η^2	0.07	0.16	0.15	0.04	0.13

Note 1–3 Different numbers in superscript indicate a significant difference in norm-perceptions between contexts, within columns.

Table 9
Meat avoidance norm perceptions between contexts.

	Descriptive norms	Injuntive norms	Personal norms
	M(SD)	M(SD)	M(SD)
Supermarkt	2.43 (0.04)[1]	2.47 (0.04)[1]	2.47 (0.04)[1]
Restaurant	2.45 (.04)[1]	2.45 (0.04)[1]	2.45 (0.04)[1]
Worksite cafetaria	2.86 (.04)[2]	2.72 (0.04)[2]	2.7 (0.04)[2]
F	F (1.98,2380.56) = 57.58	F (.98, 2384.5) = 33.83	F (2,1203) = 13.03
p	<.001	<.001	<.001
partial eta squared	0.09	0.05	0.02

Note 1–3 Different numbers in superscript indicate a significant difference in norm-perceptions between contexts, within columns.

perceive choosing meat also as most appropriate both socially (i.e. injunctive norms) and personally (i.e., personal norms) in the supermarket, compared to the restaurant, and even less so in the worksite cafeteria context. Not only do individuals simultaneously hold different norm perceptions, the results also indicated that these norms differed between meat consumer groups. Meat lovers and Exceeders (characterized by high-meat intake) showed the strongest norms favouring meat consumption, and Flexitarians and Moderates (characterized by lower meat intake) showed corresponding weaker norms favouring meat consumption. Yet, within all four meat consumer groups, norm perceptions favouring meat consumption remain strongest within the supermarket and restaurant context, compared to the worksite cafeteria context.

4.2. The role of food environments in norm perception differences across contexts

The finding that individuals hold different norm perceptions depending on the context, may be explained by varying physical and socio-cultural food environments within these contexts. Several studies showed that social norms may be communicated through physical aspects of food environments (e.g., high availability of meat or fast food), and that this is associated with stronger norm perceptions towards the consumption of these foods (Raghoebar et al., 2019, 2020; Van Rongen et al., 2020). The stronger norm perceptions in the supermarket and restaurant context could be explained by a higher availability of meat in these contexts compared to worksite cafeterias. Besides that, the higher availability of meat in these contexts may also increase the opportunity to see others choosing meat which may also increase the perception that eating meat is appropriate. Yet, investigating the physical aspects of the contexts we referred to in this study was beyond its scope, and may be a valuable direction for future research. The finding that participants held

stronger norm perceptions in the supermarket and restaurant context may also be due to meat being a prominent component of dinner (Douglas & Nicod, 1974; Horgan et al., 2019; Schösler et al., 2012). The habit of eating meat at dinner may have induced a more salient norm favouring meat consumption, when thinking of buying groceries for dinner in the supermarket or choosing a dish for dinner at a restaurant, compared to picking a lunch at the worksite cafeteria.

4.3. The role of important referent groups in norm perception differences across contexts

Another potential explanation that norm perceptions differed across contexts could be that different referent groups are important in each of the contexts. To illustrate, we found that family members were the people identified most with group in the supermarket and restaurant context, and colleagues at the worksite cafeteria. Past research showed that social norm influence on meat consumption differed across referent groups (e.g., family members versus friends, close versus distant referents; Çoker, et al., 2022; Sharps et al., 2021). Following these findings, the distance people may experience towards their colleagues as opposed to their family members may explain why the norm perceptions regarding meat consumption were weaker in the cafeteria compared to the supermarket and restaurant contexts.

4.4. Different norm perceptions across different meat consumer groups

As stronger norm perceptions favouring meat consumption are associated with higher meat intake (Sharps et al., 2021), it is unsurprising to find segments with higher meat intake to have stronger norm perceptions favouring meat consumption. Less obvious results of this study showed that segments with similar amounts of meat substitute intake still showed different norm perceptions favouring meat reduction. For example, Flexitarians and Exceeders both ate similar amounts of meat substitutes, although Flexitarians perceived stronger dynamic meat reduction norms. Moreover, Moderates and Meat lovers both indicated low to no meat substitute consumption, but Moderates still perceived dynamic norms favouring meat reduction stronger than Meat lovers. Similarly, segments with significantly different norm perceptions favouring meat reduction, did not necessarily indicate significantly different meat consumption intake. For example, Flexitarians indicated the strongest dynamic norm perception towards meat avoidance, but had similar levels of meat consumption as the Moderates. Focussing on groups of meat consumers that seem to have a stronger dynamic norm perception favouring meat reduction may be a fruitful starting point for future intervention developments. However, it remains unclear how pre-existing norm perceptions affect (social norm) interventions which may be an interesting direction for future research. Sharps et al. (2021) found that norm perceptions favouring plant-based meals are associated with higher intake of plant-based meals. However, the findings of the present study contradict this finding by indicating that dynamic norm perceptions favouring meat reduction (as opposed to plant-based consumption) may not be related to meat substitute consumption.

The differences in norm perceptions regarding meat consumers between segments may also be explained by psychological determinants of meat consumption. For example, meat consumption habit strength (Rees et al., 2018), justification of meat consumption (Piazza et al., 2015), and meat attachment (Graça et al., 2015) are also important drivers of meat consumption that may differ across meat consumer groups. These determinants may also relate to norm perceptions regarding meat consumption. For example, Verain et al. (2022) found that meat consumers characterized by negative attitude towards meat reduction that ate meat most days of the week, and reported weaker personal and injunctive norm perceptions favouring meat reduction, also showed a stronger attachment to, and justification of, meat compared to other segments.

4.5. Strengths and limitations

The strength of the present study lies in the tailored measurement of norm perceptions regarding meat consumption. To the best of our knowledge, this is the first study that incorporated context-dependent referent groups into norm perception measurements. This contributes to the novelty of the measurement of norms, as norm perceptions are both context dependent (Cialdini et al., 1990; Prentice, 2018) as well as dependent on the extent to which one identifies with a referent group (Higgs, 2015; Robinson et al., 2014; Stok et al., 2016). Moreover, personal norms and social norms are often discussed separately in the literature. In addition, although personal norms are often considered an important influence on pro-environmental behaviour (e.g., Bertoldo & Castro, 2016; Harland et al., 2007; Lai et al., 2020), to the best of the authors' knowledge, this is the first study to investigate personal norms in relation to environmentally unfriendly behaviour such as meat consumption. Including both social and personal norms in one study regarding meat consumption provides a more comprehensive picture of normative influence related to meat consumption. Further, we took a novel approach in acknowledging meat consumer heterogeneity through cluster analysis incorporating meat consumption patterns assessing participants' meat, fish as well as meat substitute consumption (Stewart et al., 2021). This provides a more detailed and combined picture of meat consumers' meat, fish, and meat substitute consumption, beyond consumption in days per week and beyond limiting to one food group (e.g., limiting to only meat or only meat substitute consumption). With this approach to meat consumer segmentation, we also extend the blossoming line of research investigating socio-psychological, motivational, and demographic differences across meat consumer groups (Dagevos, 2021 for an overview; Verain et al., 2022).

The present study has some limitations that need to be discussed. First, descriptive, injunctive and personal norm perceptions were measured based on a hypothetical context. Although these context may function as a proxy of real-life context, the present study did not measure social and personal norm perceptions in the actual contexts. Another limitation is that in prompting the context for the supermarket we explicitly mentioned the meat aisle while such explicit prompt was lacking for the worksite canteen and restaurant. This may have made a norm favouring meat consumption salient. Moreover, the stronger norm perceptions favouring meat consumption amongst the meat consumer segments with higher meat intake may indicate that social norm perceptions increase meat consumption. However, because we conducted a cross-sectional survey, we are unable to draw any conclusions on the causality of social norm perceptions and meat consumption. Lastly, we only included meat substitutes that were most closely related to conventional meat products. Therefore, the present study lacks a wider picture of products rich in animal and plant-based proteins (e.g., legumes, dairy, eggs). In addition, Food Frequency Questionnaires like the MFQ used in the present study, are not suitable to gain insights into actual consumption of meat and meat substitutes but does provide a reasonable ranking of intake to identify persons with low versus high meat (substitute) consumption. It would be interesting for future research to include more accurate measures to assess the association between norms and actual consumption of animal and plant-based proteins.

4.6. Suggestions for future research

An interesting next step for future research would be to investigate the extent to which there are causal relationships between meat consumption related norm perceptions and protein intake (i.e., meat, fish, meat substitutes, and legumes) (e.g., Sharps et al., 2021), while accounting for differences within and between contexts, referent groups and meat consumer groups. In addition to this, it may be a valuable next step to investigate potential underlying mechanisms behind the influence of social norms on meat consumption, to, for example, elicit the

conditions under which norm perceptions may stimulate meat reduction. Moreover, the present study may inspire further research to investigate how meat consumers perceive meat consumption norms across different types of restaurants (e.g., fast food chains, high end restaurants, pubs), supermarkets (e.g., discounters, supermarket chains), and worksite cafeterias (e.g., in small businesses, in large corporations), but also other contexts in and/or outside home (e.g., railway stations, gas stations). Next, considering that this is the first study to measure perceptions of dynamic norms favouring meat reduction, we did not measure these norm perceptions accounting for norm referent groups and contextual differences. Provided the results of the present study showing the variability of norm perceptions and referent groups across contexts, further research could investigate the contextual and referent group differences in dynamic norm perceptions. Moreover, further research could investigate further characteristics (meat related psychographics, meat consumption habits, demographics) of the referent groups people most identify with in a specific context. Lastly, future research could investigate the extent to which tailoring norm communication interventions to specific meat consumer groups enhance their effectiveness in reducing meat consumption (e.g., Lacroix & Gifford, 2020). For example, through the implementation of meat reduction (norm) interventions in receptive contexts (e.g., context with weaker norm perceptions favouring meat consumption), and by addressing specific meat consumer groups (e.g., targeting potential flexitarians).

4.7. Conclusion

In this study, we took a novel and detailed approach in measuring norm perceptions regarding meat consumption. The results of this study suggest that social and personal norm perceptions regarding meat consumption differ across contexts and meat consumer groups. The findings of this study underscore the importance of accounting for contexts, referent groups, and meat consumer groups in attempting to understand the role of social norms in meat consumption, especially given the wide variety of contexts in which meat consumption takes place. Nevertheless, additional research is needed to shed light on the causality of the relationship between norm perceptions and meat consumption, including potential moderating factors. These insights can ultimately be used to tailor social norm interventions to specific contexts and meat consumer groups.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Ethical statement

Ethical approval was granted for this study by the Social Sciences Ethics Committee (SSEC) of Wageningen University & Research (reference code: 2021-50-Wolfswinkel, date: July 12th, 2021).

CRediT authorship contribution statement

Sofia Wolfswinkel: Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Conceptualization. **Sanne Raghoebar:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Conceptualization. **Hans Dagevos:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Conceptualization. **Emely de Vet:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Conceptualization. **Maartje P. Poelman:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Conceptualization.

Declaration of competing interest

None.

Data availability

Data will be made available on request.

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