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Appetite

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https://doi.org/10.1016/j.appet.2024.107503

Appetite 199 (2024) 107503

Contents lists available at ScienceDirect

Appetite

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

Social norms and young adults' self-reported meat and plant-based meal intake: Findings from two online cross-sectional studies

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ARTICLE INFO

Keywords:
Social influence
Plant-based eating
Social norms
Eating behaviour

ABSTRACT

Plant-based eating is beneficial for human and planetary health. It is important to identify factors which may encourage people to reduce meat, and increase plant-based meal intake. Perceived social norms are associated with meat and plant-based meal intake in adults, however, less is known about the relationship between perceived social norms and young adults' own self-reported meat and plant-based eating in general, and in different social contexts. Across two online studies we examined this. In Study 1 (n = 217 young adults, aged 18–25 years, mean age = 19.50 years, SD = 1.37 years, mean BMI = 24.21, SD = 5.45, 91% cisfemale, 92.0% omnivores), perceived descriptive (the perceived behaviour of others) and injunctive (the perceived approval of others) norms were measured in general. In study 2 (n = 151 young adults aged 18–25 years, mean age = 19.62 years, SD = 1.50 years, mean BMI = 24.32, SD = 4.99, 88.8% cisfemale, 71.1% omnivore), perceived descriptive and injunctive norms were examined in a variety of social contexts. In Study 1, perceived descriptive norms about friends were associated with self-reported meat, and descriptive norms about peers and friends, and injunctive norms about friends were positively associated with self-reported plant-based meal intake. In Study 2, descriptive norms about friends were associated with self-reported meat intake in fast-food restaurants and at friends' houses, and injunctive norms about friends were associated with meat intake in restaurants. There were no other significant associations between either type of social norm and meat or plant-based meal intake. We provide the first evidence that peers and friends may be relevant for plant-based meal intake, and only friends may be relevant for meat intake. Further research is needed to examine people's actual food intake, and in longitudinal studies to rule out reverse causality.

1. Introduction

Plant-based diets are thought to be beneficial for human health and the health of our environment (The Eat-Lancet Commission, 2019), whereas meat production is one of the largest contributors to global warming and environmental degradation (Stewart et al., 2021). While meat intake decreased in general in a UK sample between 2008 and 2019, meat intake steadily increased in young adults (Stewart et al., 2021). Therefore, understanding factors which could help to reduce meat, and increase plant-based meal intake in this young adult age group is important.

Social norms refer to codes of conduct about socially acceptable and normal behaviour (Higgs, 2015), and may be an important factor which can help to reduce meat, and increase plant-based meal intake in young adults. There are two main types of social norm: Perceived descriptive and injunctive norms. Perceived descriptive norms refer to the perceived behaviour of others (i.e., what others do), and perceived injunctive norms refer to the perceived approval of others (i.e., what others approve of) (Cialdini & Goldstein, 2004). Descriptive norms are proposed to guide behaviour when people are uncertain of how to behave, known as Informational social influence (Cialdini & Goldstein, 2004; Deutsch & Gerard, 1955; Robinson et al., 2014; Sharps & Robinson, 2017). Whereas injunctive norms provide information about the correct behaviour in a situation (Cialdini & Goldstein, 2004). Behaving in line with these norms may be a way of demonstrating group membership and maintaining relationships, otherwise known as normative social influence (Cialdini & Goldstein, 2004; Deutsch & Gerard, 1955; Jacobson et al., 2011). There is consistent evidence that descriptive norms influence actual eating behaviour, and are associated with self-reported food intake intentions (Robinson et al., 2014; Stok et al., 2016; Vartanian

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https://doi.org/10.1016/j.appet.2024.107503
Received 23 November 2023; Received in revised form 16 May 2024; Accepted 17 May 2024
Available online 17 May 2024

et al., 2015). The evidence for injunctive norms is mixed, but several studies showed that injunctive norms are associated with self-reported food intake intentions in cross-sectional studies (Stok et al., 2016).

There is emerging evidence for the role of social norms on meat and plant-based meal intake (Nguyen & Platow, 2021; Sparkman et al., 2020; Sparkman & Walton, 2017). In particular, research has started to examine whether social norm following differs depending on the social group that the norm refers to. According to Cialdini et al. (1990) and Cialdini and Goldstein (2004), people may hold multiple norm perceptions about their food intake at the same time, which may differ depending on the social context and who the norm refers to. Social Identity Theory also proposes that people are more likely to behave similarly to those who they perceive themselves to be more similar to (Tajfel & Turner, 2004). Research has shown that people were more likely to eat plant-based meals around friends, family, (Michel et al., 2021; Sharps et al., 2021), and significant others (Sharps et al., 2021). Whereas, people were more likely to eat meat when they perceived their significant others to do so, and when they perceived their significant others and friends to approve of this (Sharps et al., 2021). Recently, Wolfswinkel et al. (2024) examined how social norm perceptions favouring meat consumption differed across social groups (family, friends, and colleagues) and social contexts (supermarkets, restaurants, and the workplace). They found that descriptive norm perceptions favouring meat consumption were strongest in supermarkets and restaurants. Furthermore, people identified most strongly with their family in supermarkets and restaurants, and with colleagues in the workplace.

The research discussed above supports that different social groups and social contexts may be important for meat and plant-based meal intake in a broad age-range of adults (18–69 years). However, this has not been examined in a young adult population to date. Meat intake increased in young adults specifically (Stewart et al., 2021), and young adults are a unique age group who are establishing their social identity, and their sensitivity to social norms is heightened (Gall et al., 2000; Stok et al., 2016). Therefore, it is important to gain a more comprehensive understanding of the relevance of social norms about different social groups' meat and plant-based meal intake on young adults' own meat and plant-based meal intake, and to identify whether this differs across social contexts. Both peers and friends are key sources of information during young adulthood (Pelletier et al., 2014; Stok et al., 2016), and are important social groups to study in relation to young adults' meat and plant-based meal intake. Numerous experimental studies have shown that social norms about peers are associated with the consumption of a variety of foods, including high calorie snack foods and fruit and vegetables (Robinson et al., 2014; Stok et al., 2016). Stok et al. (2016) review showed that similar effects of social norms were observed regardless of whether the social norm referred to a group of friends or peers, and the authors suggested that the key factor is that the referent group is one which people can identify with. Furthermore, interventions aiming to reduce meat and increase plant-based meal intake typically use peer referent groups (Alblas et al., 2022; Sparkman et al., 2020; Çoker, Pechey, et al., 2022). Therefore, it is important to understand the role of a general peer group, as well as a group of a closer social proximity, such as friends, on young adults' meat and plant-based meal intake. Understanding these factors will be informative for interventions through enabling researchers to tailor interventions effectively depending on the meal type and social context for meat and plant-based meal intake.

The two studies examined in this paper provide the first examination of whether perceived descriptive and injunctive norms about young adults' peers' and friends' meat and plant-based meal intake were associated with young adults' own self-reported meat and plant-based meal intake in general (Study 1), and in a variety of social contexts (Study 2). Study 1 was conducted to build on our previous study (Sharps et al., 2021) by using a younger adult sample and examining different social groups which may be particularly relevant for this age range. Study 2 was conducted to build on the findings of Study 1, and to provide the first examination of whether perceived social norms about the two social groups' meat and plant-based meal intake differed in their relevance for young adults' own meat and plant-based meal intake in the different social contexts.

We opted to examine both meat and plant-based meal intake for two reasons: First, our previous study showed that social norms about different social groups were relevant for meat and plant-based meal intake (Sharps et al., 2021). Thus, we felt it was necessary to also explore this in a young adult sample. Second, since meat consumption is the norm and is more prevalent than plant-based eating behaviour in the UK (Lee & Simpson, 2016; Sparkman & Walton, 2017), people may be more aware of the behaviour and approval of their peers and friends with regards to meat than plant-based meal intake. This could affect the strength of the social norms, and therefore, the likelihood of different social norms being associated with participants' own meat and plant-based eating. This may be more pronounced in Study 2 as the participants may be aware of their peers' and friends' meat and plant-based behaviour and approval in general, as demonstrated by our previous study (Sharps et al., 2021). However, people may be less certain of their peers' and friends' meat and plant-based eating in a variety of social contexts. Examining these factors will provide a more comprehensive understanding of the role of perceived social norms about young adults' peers' and friends' meat and plant-based meal intake in general and in a variety of social contexts. Understanding this will be valuable for interventions aiming to promote plant-based eating, and reduce meat intake in this age group.

Based on our previous research (Sharps et al., 2021), we expected that participants would report eating both meat and plant-based meals more frequently when they perceived their peers and friends to frequently eat these meals. We also expected that participants would report eating meat more frequently when they perceived their peers and friends to approve of this. Based on the findings of the previous study (Sharps et al., 2021), we did not expect to find associations between perceived injunctive norms and plant-based eating. At the time we conducted these studies there was no published research, to our knowledge, which examined associations between social norms and meat and plant-based meal intake in different social contexts. Therefore, we did not have hypotheses relating to the different social norms in the different social contexts.

2. Study 1

2.1. Method

2.1.1. Participants

Two hundred and thirty UK-based 18-25-year-old adults were recruited through opportunity sampling and snowballing from social media and using De Montfort University's research participation system for Psychology students. Due to dropout, incomplete responses, and participants being outside of the 18-25-year-old age range, the final sample consisted of 217 young adults aged 18–25 years (mean age = 19.50 years, SD = 1.37 years, mean BMI = 24.21, SD = 5.45, 91% cis-female, 92.0% omnivores, 8% flexitarians). An a-priori power analysis (G*power, $\alpha = 0.05$, 95% power for a medium effect size, with 7 predictors) indicated that a minimum sample of 160 participants were required. The study employed a cross-sectional questionnaire design and the questionnaire was hosted on Qualtrics and took approximately 15 min to complete. Participants who accessed the study via the research participation scheme at De Montfort university received study credits. The other participants were not compensated for their time. All participants were required to read an information sheet and give their consent before being allowed to continue with the study. Both studies received ethical approval from De Montfort University Health and Life Sciences ethics committee (ref: 509607). We used the STROBE checklist for cross-sectional studies which has been included as additional document.

2.1.2. Questionnaire measures

All questions in study 1 and 2 were based on questions used in previous research (Lally et al., 2012; Pelletier et al., 2014; Sharps et al., 2021). The questions in these studies were adapted to only ask about peers and friends. Attention checks were included in both studies by asking participants if they were happy to continue with the study on four occasions.

2.1.2.1. Demographics, participant's diet, and inclusion criteria. Consistent with a previous study (Sharps et al., 2021), participants were asked their age, sex, ethnicity, height and weight. Participants were also asked about their living situation (i.e. who they live with), and about their typical diet 'Which best describes your dietary lifestyle?' with options 'Omnivore (a person who eats meat and plant-based food)', 'Pescatarian (A person who does not eat meat but does eat fish)', 'Flexitarian (A person who eats some meat and fish but mostly eats plant-based food)', 'Vegetarian (A person who does not eat meat or fish but does eat animal products such as eggs and milk)', 'Vegan (A person who does not eat or use animal products), and 'Other'. Participants who selected vegan, vegetarian, or pescatarian were asked to exit the study. If they continued with the study then their data was removed.

2.1.2.2. Participants' frequency of intake. To measure participants' frequency of meat and plant-based meal intake, participants were asked *'How often do you eat meat/plant-based meals (i.e. meals not containing meat)?'* in separate questions. These questions, and the perceived descriptive and injunctive norm questions (below) were based on questions by previous research (Lally et al., 2012; Pelletier et al., 2014; Sharps et al., 2021) and were rated on a 5-point Likert-style scale with options 'Never' (a score of 1), 'Monthly or less than monthly' (a score of 2), 'Weekly' (a score of 3), 'Several times a week' (a score of 4), and 'Daily or more than once per day' (a score of 5). None of the questions were reverse scored.

2.1.2.3. Perceived descriptive and injunctive norms

2.1.2.3.1. Perceived descriptive norms about peers and friends. To assess participants' perception of their peers' eating behaviour, they were presented with the statement *'the next set of questions are about your perceptions of the typical eating behaviour of other 18–25-year-olds. Answer based on how often you think other 18–25-year-olds eat these foods. You do not need to ask anybody, just base your answers on your own perceptions (what you think)'*. They were then presented with the statements *'18–25 year olds eat plant-based meals (meals not containing meat or fish) ….* Or *'18-25-year-olds eat meals containing meat ….* With response options 'never', 'monthly or less than monthly', 'weekly', 'several times a week', 'daily or more than once per day'.

To assess participants' perceptions of their friends' eating behaviour they were presented with the statement *'The next set of questions are about your perceptions of the typical eating behaviour of your 18–25-year-old **friends**. Answer based on how often you think your friends eat these foods. You do not need to ask anybody, just base your answers on your own perceptions (what you think)'* followed by the statements *'My 18–25-year-old friends eat meals containing meat … '* and *'my 18–25-year-old friends eat plant-based meals (meals not containing meat or fish) …* with the same response options as above from 'never' to 'daily or more than once per day'. Questions about peers were always presented before questions about friends.

2.1.2.3.2. Perceived injunctive norms about peers and friends. To assess participants' perceptions of the approval of their peers, participants were presented with the statement *'The next set of questions are about your perception of the opinions of other 18–25-year-olds. Do not ask them, but answer based on what you think they think.'* And were then presented with the statements *'18-25-year-olds think that other 18–25-year-olds should eat meat',* and *'18-25-year-olds think that other 18–25-year-olds should eat plant-based meals' …* with response options from 'never' to 'daily or more than once per day'.

To assess participants' perceptions of the approval of their friends, participants were presented with the statement *'The next set of questions are about your perception of the opinions of your 18–25-year-old **Friends**. Do not ask them, but answer based on what you think they think.'* Participants were then presented with the statements *'My 18–25-year-old friends think that other 18–25-year-olds should eat plant-based meals … '* and *'My 18–25-year-old friends think that other 18–25-year-olds should eat meat'* with the same response options as the questions above.

2.1.2.4. Additional questions. Participants were also asked about fruit and vegetable, fast-food, sugar-sweetened beverage, and snack intake and approval for themselves and for their peers and friends which helped to conceal the aims of this study.

2.1.2.5. Analysis strategy. To examine whether participants' self-reported frequency of meat and plant-based meal intake was associated with perceived descriptive and injunctive norms, two linear regressions were conducted. Due to running two regressions, we manually Bonferroni corrected the p value to 0.02, therefore, we only report results as significant which are equal to or less than this value. Multicollinearity tests indicated low multicollinearity with no VIF scores above 1.5.

2.2. Results

2.2.1. Plant-based meal intake

The overall model significantly predicted young adults' self-reported frequency of plant-based meal intake, $R^2 = 0.22$, $F(7, 216) = 9.99$, $p < 0.001$. Perceived descriptive norms about both peers and friends, and perceived injunctive norms solely about friends were positively associated with young adults' own plant-based meal intake; people frequently ate plant-based meals when they perceived their peers and friends to frequently eat plant-based meals, and when they perceived their friends to approve of frequent plant-based meal intake. See Table 1 for all results for Study 1.

2.2.2. Meat

The overall model significantly predicted young adults' self-reported frequency of meat intake, $R^2 = 0.10$, $F(7, 216) = 4.57$, $p < 0.001$. Perceived descriptive norms about friends were positively associated with young adults' meat intake; young adults frequently ate meat when they perceived their friends to frequently eat meat.

Table 1
Study 1 associations with reported meat and plant-based intake.

		Standardised B, CI
Plant-based meals	Adjusted R^2 R^2 change Age	0.22[b].25[b].08 (−0.04, 0.15)
	Sex	0.11 (−0.06, 0.81)
	BMI	−0.06 (−0.04, 0.01)
	Peer injunctive norms	−0.14 (−0.28, −0.003)
	Friend injunctive norms	0.19 (0.06, 0.34)[a]
	Friend descriptive norms	0.25 (0.12, 0.43)[b]
	Peer descriptive norms	0.26 (0.11, 0.39)[b]
Meat	Adjusted R^2	0.11[b]
	R^2 change	0.13[b]
	Age	−0.02 (−0.09, 0.07)
	Sex	−0.07 (−0.54, 0.18)
	BMI	−0.002 (−0.02, 0.02)
	Peer injunctive norms	−0.01 (−0.16, 0.14)
	Friend injunctive norms	0.08 (−0.08, 0.24)
	Peer descriptive norms	0.11 (−0.05, 0.35)
	Friend descriptive norms	0.25 (0.10, 0.43)[a]

[a] $p < .02$.
[b] $p < .001$.

2.3. Discussion

In study 1, young adults were more likely to report consuming plant-based meals when they perceived their friends and peers to frequently consume plant-based meals (perceived descriptive norms), and when they perceived their friends to approve of this (perceived injunctive norms). Young adults were also more likely to report frequent meat consumption when they perceived their friends to frequently consume meat. These results suggest that both peers and friends may be relevant sources of information for plant-based meal intake, but only friends appear to be relevant for meat intake. However, since these studies examined meat and plant-based meal intake in general, they cannot provide information about social norms about peers and friends in different eating contexts. People eat in a variety of social contexts, such as fast-food restaurants, and may look to their peers and friends as relevant sources of information about how to behave (Cialdini et al., 1990). Thus, exploring associations between perceived descriptive and injunctive norms about peers and friends on young adults' meat and plant-based meal intake within these contexts would be of value.

3. Study 2

3.1. Method

3.1.1. Participants

Two hundred and fifteen UK-based young adults (aged 18–25 years) were recruited through opportunity sampling and snowballing from social media and using De Montfort University's research participation system for Psychology students. Due to dropout, incomplete responses, and participants being outside of the 18-25-year-old age range, the final sample consisted of one hundred and fifty-one 18–25 year olds n = 151 young adults aged 18–25 years, (mean age = 19.62 years, SD = 1.50 years, mean BMI = 24.32, SD = 4.99, 88.8% cisfemale, 71.1%). An a-priori power analysis (G*power, $\alpha = 0.05$, 95% power for a medium effect size, with 7 predictors) indicated that a minimum sample of 160 participants were required. The study employed a cross-sectional questionnaire design and the questionnaire was hosted on Qualtrics and took approximately 15 min to complete. Participants who accessed the study via the research participation scheme at De Montfort university received study credits. The other participants were not compensated for their time. All participants were required to read an information sheet and give their consent before being allowed to continue with the study.

3.1.2. Questionnaire measures

3.1.2.1. Demographic questions and participant's diet. The same demographic questions were asked as in Study 1, and the same inclusion and exclusion criteria were used. As in Study 1, participants were asked if they wished to continue with the study on several occasions to act as an attention check.

3.1.2.2. Participants' own frequency of intake. To measure participants' typical plant-based eating behaviour in a variety of contexts, participants were presented with the statement '*How often do you eat the foods listed below in the different settings'* and were presented with the statements '*Eat meals containing meat'* and '*Eat plant-based meals'* and were asked to indicate how often they ate these foods at home (where they live during term time), in restaurants, in fast food restaurants (e.g. McDonalds, Costa), and at friends' houses. They were asked to rate their responses from 'never', 'less than half the time', 'about half the time', 'more than half the time', 'every time'. The contexts were presented in the order listed above in a matrix table on Qualtrics. We chose to alter the response options for Study 2 in order to enable the participants to be specific about how often they ate these foods in the different settings. We felt that the response options for Study 1 (i.e. daily or more than once a day) were not applicable for Study 2 since people may not eat in the different contexts that regularly.

3.1.2.3. Perceived descriptive and injunctive norms about peers and friends. To assess perceived descriptive norms about peers, participants were presented with the statement *'How often do you think other 18–25-year-olds eat the food listed below in the different* settings'. To assess perceived descriptive norms about friends, participants were presented with the statement '*How often do you think your 18–25-year-old friends eat the food listed below in the different settings'*. As above, participants were presented with the statements '*Eat meals containing meat'* and *'Eat plant-based meals'* and were asked to indicate how frequently they perceived their peers and friends to eat these foods in the different settings (listed above) with the response options ranging from 'never' to 'every time'. The different eating contexts were listed in the same order for each question, and were presented in a matrix table format.

To assess perceived injunctive norms about peers and friends, participants were presented with the statement '*The next set of questions are about how often you think other people think that people should eat a variety of foods***.** followed by, in separate question blocks, *'I think that 18–25-year-olds think that other 18–25-year-olds should'* and '*I think that my 18–25-year-old friends think that other 18–25-year-olds should … '* then were presented with the statements *'eat meals containing meat'* and '*eat plant-based meals'* and were asked to rate these for the different contexts listed above. These were also presented in the same fixed order and format.

3.1.2.4. Additional questions. As in Study 1, participants were also asked about fruit, vegetable, fast-food, sugar-sweetened beverage, and snack intake and approval for themselves and for their peers and friends which helped to conceal the aims of this study.

3.1.3. Analysis strategy

To examine whether participants' self-reported frequency of meat and plant-based meal intake was associated with perceived descriptive and injunctive norms in the different eating contexts, eight linear regressions were conducted (one for each eating context for meat and plant-based eating). The predictors included in the analyses were age, sex, and BMI, injunctive norm predictors, and descriptive norm predictors. Due to the high number of comparisons, we manually Bonferroni adjusted the p value to $p \leq 0.01$, therefore we only viewed results to be significant when they were at or below 0.01. We also ran multicollinearity tests, and no VIF score was above 1.5 indicating low multicollinearity.

3.2. Results

3.2.1. Plant-based eating

3.2.1.1. Home. The overall model significantly predicted young adults' self-reported frequency of plant-based meals at home, $R^2 = 0.13$, $F(7, 150) = 4.27$, $p < 0.001$. Age was significantly positively associated with plant-based meal intake; older participants were more likely to eat plant-based meals at home. See Table 2 for all results for Study 2.

3.2.1.2. Restaurants. The overall model did not significantly predict young adults' self-reported frequency of plant-based meal intake at restaurants, $R^2 = 0.03$, $F(7, 150) = 1.69$, $p = 0.12$.

3.2.1.3. Fast-food restaurants. The overall model significantly predicted young adults' self-reported frequency of plant-based meal intake at fast food restaurants, $R^2 = 0.11$, $F(7, 150) = 3.66$, $p = 0.001$. Age was significantly positively associated with plant-based meal intake in fast-food restaurant; older young adults reported eating plant-based meals more frequently in fast-food restaurants than younger young adults.

Table 2
Study 2 associations with reported meat and plant-based meal intake.

		Plant-based meals	Meat
		Standardised B (CI)	Standardised B (CI)
Home	Adjusted R^2	0.13[b]	0.19[b]
	R^2 change	0.17[b]	0.23[b]
	Age	0.37 (0.13, 0.33)[b]	−0.37 (−0.31, −0.13)[a]
	Sex	0.11 (−0.16, 0.79)	−0.15 (−0.85, 0.01)
	BMI	−0.03 (−0.03, 0.02)	0.09 (−0.01, 0.04)
	Peer IN	0.09 (−0.09, 0.26)	0.13 (−0.04, 0.28)
	Friend IN	0.10 (−0.08, 0.27)	0.10 (−0.07, 0.25)
	Peer DN	0.07 (−0.11, 0.27)	0.03 (−0.16, 0.23)
	Friend DN	0.06 (−0.10, 0.22)	0.15 (−0.01, 0.33)
Restaurants	Adjusted R^2	0.03	0.16[a]
	R^2 change	0.08	0.20[a]
	Age	0.13 (−0.03, 0.23)	−0.15 (−0.23, 0.002)
	Sex	0.17 (−0.01, 1.21)	−0.20 (−1.21, −0.15)
	BMI	−0.10 (−0.06, 0.01)	0.07 (−0.02, 0.05)
	Peer IN	0.05 (−0.15, 0.27)	−0.03 (−0.22, 0.16)
	Friend IN	0.02 (0.20, 0.24)	0.25 (0.09, 0.46)[a]
	Peer DN	0.05 (−0.16, 0.28)	0.003 (−0.22, 0.22)
	Friend DN	0.12 (−0.08, 0.34)	0.18 (0.02, 0.42)
Fast food restaurants	Adjusted R^2	0.11[b]	0.14[b]
	R^2 change	0.15[b]	0.18[b]
	Age	0.28 (0.07, 0.26)[b]	−0.04 (−0.13, 0.08)
	Sex	0.16 (0.004, 0.91)	−0.19 (−1.13, −0.11)
	BMI	0.04 (−0.02, 0.04)	0.01 (−0.03, 0.03)
	Peer IN	0.15 (−0.03, 0.30)	0.11 (−0.07, 0.34)
	Friend IN	0.02 (−0.16, 0.19)	−0.01 (−0.20, 0.17)
	Peer DN	−0.19 (−0.42, −0.02)	0.07 (−0.15, 0.34)
	Friend DN	0.19 (0.01, 0.36)	0.27 (0.11, 0.50)[a]
Friends' houses	Adjusted R^2	0.03	0.24[b]
	R^2 change	0.08	0.27[b]
	Age	0.08 (−0.07, 0.18)	−0.12 (−0.24, 0.03)
	Sex	0.04 (−0.44, 0.75)	−0.10 (−1.06, 0.21)
	BMI	−0.16 (−0.07, 0.001)	−0.02 (−0.05, 0.03)
	Peer IN	0.18 (−0.01, 0.41)	0.19 (0.05, 0.45)
	Friend IN	−0.15 (−0.40, 0.06)	−0.18 (−0.43, −0.03)
	Peer DN	−0.03 (−0.23, 0.17)	0.01 (−0.20, 0.22)
	Friend DN	0.20 (<0.001, 0.36)	0.42 (0.29, 0.67)[b]

[a] $p \leq .01$.
[b] $p \leq .001$.

There were no other significant associations.

3.2.1.4. Friends' houses. The overall model did not significantly predict young adults' self-reported frequency of plant-based meals at friends' houses, $R^2 = 0.03$, $F(7, 150) = 1.72$, $p = 0.11$.

3.2.2. Meat intake

3.2.2.1. Home. The overall model significantly predicted young adults' self-reported frequency of meat intake at home $R^2 = 0.19$, $F(7, 150) = 6.11$, $p < 0.001$. Age was significantly negatively associated with frequency of meat consumption in the home environment, whereby, older participants reported eating meat less frequently in this environment. There were no other significant associations.

3.2.2.2. Restaurants. The overall model significantly predicted young adults' self-reported frequency of meat intake in restaurants, $R^2 = 0.16$, $F(7, 150) = 4.94$, $p < 0.001$. Injunctive norms about friends were positively associated with meat intake in restaurants; young adults self-reported eating meat more frequently when they perceived their friends to approve of meat consumption in restaurants.

3.2.2.3. Fast food restaurants. The overall model significantly predicted young adults' self-reported frequency of meat intake at fast food takeaways, $R^2 = 0.14$, $F(7, 150) = 4.62$, $p < 0.001$. Descriptive norms about friends were positively associated with meat intake in fast-food restaurants; young adults self-reported eating meat more frequently when they perceived their friends to eat meat in this setting.

3.2.2.4. Friends' houses. The overall model significantly predicted young adults' self-reported frequency of meat intake at friends' houses, $R^2 = 0.24$, $F(7, 150) = 7.70$, $p < 0.001$. Perceived descriptive norms about friends were significantly positively associated with meat intake at friends' houses; young adults reported eating meat more frequently at friends when they perceived their friends to do so.

3.3. Discussion

Perceived descriptive norms about *friends* were associated with meat intake in fast-food restaurants and at friends' houses, and injunctive norms about friends were associated with meat intake in restaurants. No other descriptive or injunctive norms about peers or friends were associated with either meat or plant-based meal intake in any social context. The results indicate that friends may be relevant reference points for meat intake in certain social contexts, but neither peers nor friends are relevant for plant-based meal intake in any social context.

4. General discussion

Across two studies, we examined for the first time, whether perceived descriptive and injunctive norms about the meat and plant-based meal intake of peers and friends were associated with young adults' own self-reported frequency of meat and plant-based meal intake in general (Study 1) and in several social contexts (Study 2). Perceived descriptive norms about friends were associated with self-reported meat intake, and descriptive norms about peers and friends were associated with self-reported plant-based meal intake in general (Study 1). Perceived injunctive norms about friends were also associated with plant-based meal intake in general (Study 1). However, when young adults were asked to think about their consumption of these foods in a variety of social contexts, only perceived descriptive norms about friends were associated with meat intake at fast-food restaurants and friends' houses, and perceived injunctive norms about friends were associated with meat intake in restaurants. There were no significant associations between either type of social norm or social group on young adults' self-reported plant-based meal intake in Study 2. Our results provide the first evidence that peers and friends may be relevant reference points for plant-based meal intake, and friends may be relevant for meat intake when people are asked about their intake of these foods in general. Our results also provide the first evidence that friends may be a particularly relevant social groups with regards to meat intake in restaurants, fast-food restaurants and friends' houses. The results are informative for both future research and interventions and suggest that social norm-based interventions aiming to alter young adults' meat intake may benefit from using friends as a referent group in fast-food restaurants, friends' houses, and restaurants.

The results of these studies provide further support for the role of perceived descriptive and injunctive norms on adults' eating behaviour, which is consistent with previous research (Cruwys et al., 2012; Pachucki et al., 2011; Sharps et al., 2021; Stok et al., 2014; Çoker, Jebb, et al., 2022). In particular, these results add to the existing literature through examining social norms about peers as well as friends in a young adult age group, whereas the previous research examined family,

friends, significant others, and colleagues in adults in general (Sharps et al., 2021; Wolfswinkel et al., 2024). We also examined social contexts which had not been examined in previous research. Wolfswinkel et al. (2024) examined social norms in supermarkets, restaurants, and the workplace, whereas in Study 2 we examined fast-food restaurants, the home environment, friends' houses and restaurants (Sharps et al., 2021; Wolfswinkel et al., 2024). Since previous research showed that family and significant others were relevant social groups for meat and plant-based meal intake (Sharps et al., 2021; Wolfswinkel et al., 2024), it would be useful to examine these social groups in young adults across the different social contexts to gain further insight into the relevance of a variety of social groups on young adults' meat and plant-based eating. Thus, the results of the two studies presented in this paper help to provide a more comprehensive of understanding of whether perceived descriptive and injunctive norms about different social groups are associated with meat and plant-based meal intake, and whether this differs depending on the social context.

In line with the Informational social influence explanation of social norm following, and social identity theory (Cialdini & Goldstein, 2004; Deutsch & Gerard, 1955; Robinson et al., 2014; Tajfel & Turner, 2004), the young adults in these studies may have been uncertain about how frequently to eat meat in general, and at fast-food restaurants, and friends' houses. Therefore, they may have looked to their friends to inform their consumption of meat in general and in these settings. Interestingly, injunctive norms about friends were associated with meat intake in restaurants, which may be explained by normative social influence (Cialdini et al., 1990; Deutsch & Gerard, 1955); people may have reported engaging in meat intake in this setting in order to demonstrate group membership, in line with their perceived approval of their friends in this setting. We did not find associations between social norms and meat intake at home which may be explained by personal norms (Herman & Polivy, 2005). Personal norms are based on prior experience and can be used to make a decision about appropriate consumption (Bevelander et al., 2012; Herman & Polivy, 2005). People may rely on their personal norms in this context to inform their behaviour rather than norms related to their peers and friends. However, since we did not measure personal norms or ask about other social groups, this explanation is speculative. Therefore, further research is needed to understand the role of these factors in relation to social norms to gain a more comprehensive understanding of social and environmental influences on young adults' meat and plant-based eating.

For plant-based meal intake, the results of Study 1 are also consistent with informational social influence (Cialdini et al., 1990; Deutsch & Gerard, 1955) and Social Identity Theory (Tajfel & Turner, 2004), indicating that people may have looked to their peers and friends to determine appropriate plant-based meal intake in general. Since, plant-based meal intake is less prevalent than meat intake in the UK (Lee & Simpson, 2016; Sparkman & Walton, 2017), people may be more unsure of how to behave with regards to plant-based eating, and may look to a wider peer group as well as their friends to determine the appropriate plant-based meal intake. However, while people may have an idea of how frequently their peers and friends eat plant-based meals in general, young adults may be less aware of how frequently their peers and friends eat plant-based meals in specific social contexts. Therefore, this may explain the lack of associations between the different social norms and plant-based meal intake in Study 2.

An important consideration in the present studies is the possibility of reverse causality (Robinson, 2015), whereby, people may have reported that their peers and friends ate meat and plant-based meals in general, and in the different settings, because that is what they currently do. Therefore, they believe that others engage in a behaviour because they do so themselves. Longitudinal and/or randomised research, and research examining people's actual intake in different settings in response to social norms is now needed to examine this further. It would also be of value to measure meat attachment as this has been shown to be an important factor (Graça et al., 2015, 2019). Furthermore, in both studies we asked participants questions about their own behaviour, followed by their perceptions of their peers', then their friends' behaviour. This may have been a confounding factor as people may have thought about their friends when answering the peer question. We made the questions explicit with regards to who we wanted them to think about, but randomising the order of these questions would be useful in future research. It would also be useful to conduct qualitative research on this topic, as it is likely that people have friends who have a variety of eating behaviours (e.g. some omnivore, some vegan etc). Thus, it may not be as simple as asking people to think about friends in general, but instead, may be useful to ask people to think about specific friendship groups in terms of social norms.

This paper is the first to examine the role of peers and friends on young adults' meat and plant-based eating in a variety of social contexts. However, the studies are not without limitations; first, our questions were self-reported food intake and we did not use a validated measure of dietary intake as we wanted to assess consumption of specific foods (namely meat and plant-based meals) in specific social contexts. Therefore, we adapted these questions from previous research (Lally et al., 2012; Pelletier et al., 2014; Sharps et al., 2021) to allow us to address our research question appropriately. However, this may have introduced bias and needs to be taken into consideration when interpreting the results of these studies. Second, we did not ask participants how close they felt to their friends/peers (i.e. identification with the referent group and their need to belong to these groups) and how often they ate with friends/peers in these different contexts. We also asked about friends in general and did not attempt to identify sub-sets of friendship groups and the influence these may have. Understanding this would allow us to identify whether the impact of perceived norms differ between people who spend more time socialising and eating with friends/peers and those who spend less time doing this, and the impact that closer vs. more distant friends have on behaviour. Horgan et al. (2019) suggested that the composition of meals may vary across the time of the day, and the days of the week. We did not ask participants how often they ate in the different contexts and at what times. Thus, further research could gain a greater insight into young adults' meat and plant-based eating, and the influence of peers and friends on this behaviour by addressing these questions. A final limitation is that in Study 2 the sample size we aimed for was 160, however, due to drop out and incomplete responses the final sample size was 151. This could play a role in the results reported in this paper, and future studies may wish to recruit larger sample sizes to examine this topic.

In conclusion, these studies indicate that perceived descriptive norms about friends may be relevant for self-reported frequency of meat intake, and perceived descriptive and injunctive norms about peers and friends may be relevant for plant-based meal intake when people are asked about their consumption of these meals in general. However, when asked to think about consumption of meat and plant-based meals in several social contexts, only social norms about friends were relevant for meat intake, with no associations for either type of social norm or social group for plant-based meal intake. The results of Study 2 demonstrate that interventions may benefit from utilising social norms focusing on friends' behaviour in fast-food restaurants and at friends' houses, and friends' approval in restaurants in order to reduce meat intake in a young adult population. Further research is needed to identify whether reverse causality may be an explanation for these findings, and to examine people's actual eating behaviour rather than relying on self-report.

Ethics statement: Ethical approval for the involvement of human subjects in this study was granted by De Montfort University Health and Life Sciences ethics committee (ref: 3605), 27/07/21.

Funding

This research received funding from De Montfort University internal funding.

CRediT authorship contribution statement

M.A. Sharps: Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **S. Raghoebar:** Writing – review & editing. **H. Coulthard:** Writing – review & editing, Conceptualization.

Declaration of competing interest

None.

Data availability

Data will be made available on request.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.appet.2024.107503.

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