Eating a plant-based burger makes me feel proud and cool : An online survey on food-evoked emotions of plant-based meat

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Short Communication

Eating a plant-based burger makes me feel proud and cool: An online survey on food-evoked emotions of plant-based meat

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ABSTRACT

Positive emotions are critical for the success of food products in the marketplace. Yet, little is known about the emotional response to plant-based meat alternatives. This study investigated food-evoked emotions of plant-based burgers and meat burgers, and their associations with liking and choice for either of the burgers. In an online survey, 279 Dutch adults (meat eaters and flexitarians) were shown pictures of a plant-based burger and a meat burger in random order. They were asked to imagine eating the burgers, and then to rate the expected experience of 13 food-evoked emotions and liking for each burger on a 7-point Likert scale. Participants also had to indicate which of the two burgers they would choose to eat. Results showed that participants expected to feel more *'proud'* and *'cool'* and less *'guilty'* and *'worried'* when eating a plant-based burger compared to a meat burger ($p < 0.05$). In contrast, they expected to feel more *'happy'* and less *'bored'* when eating a meat burger ($p < 0.05$). Anticipated emotions *'satisfied'* (B = 0.30), *'anxious'* (B = 0.22) and *'worried'* (B = −0.30) were significantly related to the expected liking of the plant-based burger; choosing a plant-based burger was mainly influenced by being flexitarian (B = 0.28) (all $p < 0.05$). This study provided valuable new insights in the anticipated emotional response to plant-based and meat burgers and identified potential emotional targets to encourage people to switch meat for plant-based alternatives. Future research should investigate whether (interventions to reinforce) anticipated food-evoked emotions impact actual food choice behaviour and liking of plant-based meat alternatives.

1. Introduction

Diets rich in animal-derived foods, especially red and processed meat, have negative impacts on human health and environmental sustainability. A shift towards diets lower in animal-derived foods, and higher in plant-based foods is therefore necessary to stay within planetary boundaries, meet global climate targets, and improve population health (Springmann et al., 2018). However, this shift is hindered as many people are strongly emotionally attached to meat (Eckl, Biesbroek, Van'T Veer, & Geleijnse, 2021; Graça, Calheiros, & Oliveira, 2015). Emotions evoked by food products play an important role in food choice and the pleasure of eating them (e.g., 'product makes me feel happy', 'product relaxes me'); they can better predict food choice than perceived liking alone (Dalenberg et al., 2014; Gutjar et al., 2015). Especially for novel or unfamiliar foods, such as meat alternatives, the purchase decision can be dominated by emotional connotations (Jiang, King, & Prinyawiwatkul, 2014; Onwezen, Verain, & Dagevos, 2022). In a longitudinal Dutch study, positive (i.e. 'happy', 'satisfied', and 'proud') but not negative (i.e., 'guilty', 'angry', 'sad') anticipated food evoked emotions have been shown to be the most relevant factor predicting intentions to consume alternative proteins, as compared to other potential drivers such as food choice motives, personal norms or food neophobia (M. C. Onwezen et al., 2022). Also, among Thai adults, positive (i.e. 'happy', 'satisfied', 'delighted', 'excited') but not negative emotions (i.e., 'anxious', 'upset', 'sad', depressed') were positively associated with desire to eat plant-based meat alternatives, which in turn was positively related with intention to purchase plant-based meat (Chen, 2022). Moreover, as reviewed by Kwasny et al. (2022), research showed that people are more likely to change their attitudes, intentions and meat eating behaviour when they are addressed in an emotional way, especially when negative emotions like disgust, guilt, or regret were evoked (Kwasny, Dobernig, & Riefler, 2022).

Understanding the emotions consumers experience in relation to meat and plant-based meat may help finding ways to overcome their

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emotional barriers and encourage the shift to a more plant-based diet. Yet to date, little is known about emotional responses towards plant-based meat alternatives. Schouteten et al. (2016) investigated food-evoked emotions and liking of a plant-based, meat-based, and insect-based burger among young adults in Belgium. They found that the meat burger was liked best and evoked more positive (i.e., *'happy', 'contented', 'pleasant', 'merry'*) and less negative emotions (i.e., *'dissatisfied', 'disappointed', 'discontented, 'disgust')* compared to plant- and insect-based burgers (Schouteten et al., 2016). A recent study found that photos of plant-based burgers evoked more positive (e.g., *'happy', 'satisfied', 'secure'*) and less negative expected emotions (i.e*., 'disgusted', 'bored'*) among supporters of meat reduction, while among meat rejecters the opposite was found (Moussaoui et al., 2023). Interestingly, Hoek et al. (2011) also found that non-users and medium- to light-users of plant-based meat alternatives expected meat to have a more beneficial effect on their mood than meat alternatives, while heavy users of meat alternatives expected the opposite (Hoek et al., 2011). To advance the knowledge in this area, this study investigated anticipated food-evoked emotions when imagining eating a plant-based burger and a meat burger on a bun, and how these food-evoked emotions relate to the expected liking and choice for either of the burgers. We hypothesized that imagining eating a meat burger would generally evoke more positive and less negative emotions than imagining eating a plant-based burger (H1), and that positive anticipated emotions for plant-based burgers would be associated with better expected liking of plant-based burgers (H2) and a more frequent choice for plant-based burgers (H3).

2. Materials and methods

2.1. Participants

In total, 306 Dutch participants were recruited via a market research agency (Essensor B.V., the Netherlands) according to two selection criteria: 1) 18–65 years of age, 2) 50 % male, 50 % female. Twenty-seven participants were excluded from analysis: participants who reported to be pescatarian (n = 11), vegetarian (n = 10), or vegan (n = 2), and those who provided contradictory responses regarding their dietary habits (i. e., flexitarians reporting to eat meat daily (n = 2), and meat-eaters reporting to replace meat by meat substitutes every day (n = 2). This resulted in a final sample of 279 participants (see Table 1).

2.2. Survey

An online survey was distributed via the market research agency and participants were informed that they would be queried about their eating behaviour. Participants reported their age, gender, dietary pattern and consumption frequency of meat, meat burgers, and of vegetarian alternatives that mimic meat or meat burgers. To assess anticipated food-evoked emotions when eating a plant-based burger or meat burger, all participants were presented with four consecutive pictures showing 1) a plain meat burger; 2) a plain plant-based burger; 3) a meat burger on a bun; and 4) a plant-based burger on a bun. The depicted plant-based burger was a soy-based burger, which was designed to look and taste like a meat burger. Burgers on a bun were depicted with a tomato and lettuce garnish (Fig. 1).

Each picture was presented along with the following instructions: "*Imagine you were to eat a [meat/vegetarian] burger [on a bun] tonight, such as in the picture above. You just took the first bite and eat the burger as you normally would. Please take a moment to imagine the emotions you feel when eating this [meat/vegetarian] burger.*" With each of the four pictures, participants then rated their expectations to experience the following food-evoked emotions on a seven-point scale, with anchors "*not at all*" to "*very much*": *'happy', 'satisfied', 'proud', 'cool', 'relaxed', 'energetic', 'disappointed', 'worried', 'anxious', 'dissatisfied', 'bored', 'disgusted',* and *'guilty'.* We considered emotions that had been assessed in prior research with meat alternatives that was available at the time the survey was set

Table 1
Characteristics of the study population.

	Meat-eaters (n = 132)	Flexitarians (n = 147)	Whole population (n = 279)
Age group, n (%)			
18–33 years	33 (25.0)	49 (33.3)	82 (29.4)
34–49 years	47 (35.6)	50 (34.0)	97 (34.8)
50–65 years	52 (39.4)	48 (32.7)	100 (35.8)
Gender, n (%)			
Male	67 (50.8)	74 (50.3)	141 (50.5)
Female	65 (49.2)	73 (49.7)	138 (49.5)
Meat consumption, n (%)			
Daily	39 (29.5)	0 (0.0)	39 (14.0)
4–6 days a week	79 (59.8)	48 (32.7)	127 (45.5)
1–3 days a week	14 (10.6)	77 (52.4)	91 (32.6)
2–3 days a month	0 (0.0)	20 (13.6)	20 (7.2)
Once a month	0 (0.0)	1 (0.7)	1 (0.4)
Less than once a month	0 (0.0)	1 (0.7)	1 (0.4)
Meat replacer consumption, n (%)			
Daily	0 (0.0)	1 (0.7)	1 (0.4)
4–6 days a week	2 (1.5)	11 (7.5)	13 (4.7)
1–3 days a week	42 (31.8)	84 (57.1)	126 (45.2)
2–3 days a month	30 (22.7)	27 (18.4)	57 (20.4)
Once a month	15 (11.4)	9 (6.1)	24 (8.6)
Less than once a month	18 (13.6)	5 (3.4)	23 (8.2)
Never	25 (18.9)	10 (6.8)	35 (12.5)
Consumer traits, mean ± SD			
Food neophobia[1]	28.0 ± 9.6	27.4 ± 9.6	27.7 ± 9.6
Vegetarian attitude[2]	2.5 ± 1.3	2.0 ± 0.9	2.3 ± 1.1
General health attitudes[3]	4.3 ± 1.0	4.7 ± 0.8	4.5 ± 0.9
Meat attachment[4]	4.8 ± 0.9	3.8 ± 0.9	4.2 ± 1.0

[1] measured on a 7-point scale; sum of scores for ten statements, with a possible range of 10–70 (Pliner & Hobden, 1992).
[2] measured on a 7-point scale; average of scores for four statements, with a possible range of 1–7 (Michel, Knaapila, Hartmann, & Siegrist, 2021).
[3] measured on a 7-point scale; average of scores for eight statements, with a possible range of 1–7 (Roininen, Lahteenmaki, & Tuorila, 1999).
[4] measured on a 7-point scale; average of scores for sixteen statements, with a possible range of 1–7 (Graça et al., 2015).

up (Schouteten et al., 2016), emotions from the EsSense Profile® (King, Meiselman, & Carr, 2010), i.e., a standard emotion profile for foods, and emotions suggested by the authors of this paper. In a small pilot study (n = 5), we asked participants for feedback on which emotions they considered most relevant for plant-based or meat burgers. Based on these inputs and aiming for a balance between emotions classified as positive and negative (Jiang et al., 2014; King & Meiselman, 2010), the final list of emotions was agreed among the authors of this paper. The sequence in which plant-based burgers and meat burgers were presented and the order in which the different emotions were rated were randomized across subjects. However, all subjects evaluated their anticipated emotions for the plain burgers before evaluating emotions for burgers on a bun (results on the plain burgers are not reported here). Subsequently, participants had to indicate which of the two burgers on a bun they would choose to eat and rate the expected liking of both burgers on a 7-point scale with anchors "*not at all liked*" to "*very much liked*".

Finally, consumer traits were evaluated using validated questionnaires: food neophobia (Pliner & Hobden, 1992), meat attachment (Graça et al., 2015), general health attitudes (i.e., based on the Health Scale items of the Health and Taste Attitude Scales, (Roininen et al., 1999)), and attitudes towards vegetarianism (Michel et al., 2021) were assessed by rating multiple statements on a 7-point Likert scale with

Fig. 1. Pictures of a meat burger (left) and plant-based burger (right) on a bun.

anchors "totally disagree" and "totally agree"; the order of individual statements was randomized.

2.3. Data analysis

For the consumer traits, total scores were calculated as the average or sum (i.e., for food neophobia) across individual item scores. Negative statements were reverse-coded, such that overall, higher scores indicated stronger meat attachment, greater food neophobia, stronger health attitudes, and a more negative attitudes towards vegan and vegetarian diets.

For statistical analysis, the statistical software package IBM SPSS Statistics version 26.0 was used (IBM Corp., 2019). Differences in anticipated emotions between the meat burger and plant-based burger were analyzed by means of a mixed model analysis of variance, with Burger Type as within subject factor and Diet, Gender, and Age Group as between-subject factors. Main effects of Burger Type, Diet, Gender, and Age Group were investigated, as well as interaction effects between product type and diet, product type and gender, and product type and age groups. Significant interaction effects ($p < 0.05$) were followed up with post-hoc pairwise comparisons and p-values were corrected with Bonferroni multiple tests adjustment. The difference in choice frequency of plant-based burgers and meat burgers was assessed with a one-sample *t*-test and the difference in mean liking scores between the different burgers was assessed with a paired samples *t*-test. To evaluate the relationship between anticipated emotions and expected liking and choice of the burgers, we performed linear regression analyses. Separate regression analyses were carried out for emotions anticipated when eating a plant-based burger and for emotions anticipated when eating a meat burger. Besides the anticipated emotions, also Gender, Diet and Age Group were included in the regression analyses using the enter method. For all linear regression analyses, bootstrapping was performed. A p-value of 0.05 was used as threshold for significance.

3. Results

3.1. Food-evoked emotions for plant-based and meat burgers

There was a significant main effect of Burger Type for six out of the 13 anticipated food-evoked emotions that were assessed. The plant-based burger scored significantly higher on the emotions *'proud'* (F

$(1,284) = 81.255$; $p < 0.001$), *'cool'* ($F(1,274) = 3.88$; $p = 0.05$), and *'bored'* ($F(1, 284) = 4.79$; $p = 0.03$), while the meat burger scored significantly higher on the emotions *'happy'* ($F(1, 284) = 6.56$; $p = 0.01$), *'guilty'* ($F1, 284) = 70.76$; $p < 0.001$), and *'worried'* ($F(1, 274) = 22.20$; $p < 0.001$). No significant differences were found for the emotions *'satisfied', 'disappointed', 'anxious', 'dissatisfied', 'disgust', 'energetic',* and *'relaxed'* (Fig. 2).

Diet had a significant main effect on the emotions *'guilty'* ($F(1, 27) = 6.848$; $p = 0.01$) and *'dissatisfied'* ($F(1,274) = 4.01$; $p = 0.05$), with flexitarians expecting to feel more *'guilty'* and more *'dissatisfied'* irrespective of the type of burger. Factorial analysis showed significant interaction effects between Burger Type and Diet, for all emotions except for *'bored'* and *'cool'* (all $p < 0.05$). The interaction effects indicated that flexitarians generally expected to feel more positive and less negative emotions when eating a plant-based burger compared to a meat burger than meat-eaters (Fig. 3a & b). Post-hoc comparisons showed that flexitarians expected to feel significantly more *'satisfied'* and *'relaxed'* and less *'disappointed', 'dissatisfied'* and *'disgusted'* when eating a plant-based burger compared to a meat burger, while meat-eaters expected to feel the opposite. Both flexitarians and meat-eaters expected to feel more *'proud'* when eating a plant-based burger and more
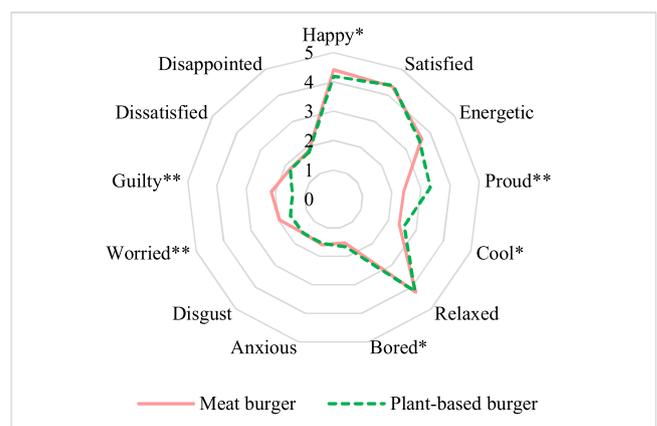

Fig. 2. Mean scores of anticipated emotions for eating a plant-based and meat burger. *$p < 0.05$, **$p < 0.001$, Mixed model analysis of variance, main effect of Burger Type corrected for Age, Gender, and Diet.

Fig. 3. Post-hoc comparisons between anticipated food-evoked emotions for eating a plant-based burger versus a meat burger per dietary pattern, gender, and age group. *p < 0.05; **p < 0.01; ***p < 0.001, p-values are Bonferroni adjusted.

'guilty' when eating a meat burger, but for flexitarians these feelings were more pronounced. In addition, only flexitarians expected to feel significantly more *'worried'* and *'anxious'* when eating a meat burger, while meat-eaters expected to feel more *'happy'* and *'energetic'* when eating a meat-burger compared to a plant-based burger.

Gender had a significant main effect on anticipated emotions, such that irrespective of Burger Type, men expected to feel more *'satisfied'* (F (1, 274) = 6.51; p = 0.01), *'cool'* (F(1, 274) = 5.54; p = 0.02), *'relaxed'* (F(1, 284) = 4.21; p = 0.04), and less *'guilty'* (F(1, 274) = 6.67; p = 0.01) than women. Significant interaction effects between Burger Type and Gender showed consistently more positive and less negative expectations towards eating a plant-based burger versus a meat burger for

women than for men for the emotions *'proud'* (F(1, 284) = 11.44; p < 0.001), *'satisfied'* (F1, 274) = 6.31; p = 0.13), *'cool'* (F(1, 274) = 8.63; p = 0.004) and *'guilty'* (F(1, 274) = 4.61; p = 0.03) (Fig. 3c & d). Though both men and women expected to feel significantly more *'proud'* when eating a plant-based burger compared to a meat burger and more *'guilty'* when eating a meat burger, for women these differences were more distinct. Moreover, only women expected to feel significantly more *'cool'* when eating a plant-based burger compared to a meat burger, while men expected to feel more *'bored'* and less *'happy'*.

Age Group had a significant main effect on emotions, with younger adults (18-33y) generally expecting to feel significantly more *'proud'* (F (2,284) = 5.75; p = 0.004), *'happy'* (F(2,284) = 11.74; p < 0.001), *'satisfied'* (F(2, 274) = 8.61; p < 0.001), *'energetic'* (F2,274) = 4.42, p = 0.01), *'relaxed'* (F(2, 284) = 5.72; p = 0.004) and *'guilty'* (F(2, 274) = 3.64; p = 0.03) than the older age groups. The interaction effects between Burger Type and Age Group were not significant.

3.2. Anticipated food-evoked emotions, liking and choice of burgers

Overall, the meat burger was chosen significantly more often than the plant-based burger (respectively 70 % vs. 30 %; t(278) = 10.94; p < 0.001). Participants also expected the meat burger to taste significantly better than the plant-based burger, with liking scores of respectively 5.8 ± 1.0 and 4.6 ± 1.3 on 7-point scales (t(278) = 14.39; p < 0.001).

Table 2 shows the results of the multiple linear regression analyses for expected liking and choice of the burgers. Expected liking of a meat burger was significantly positively related to expectations of feeling *'happy'* when eating a meat burger (B = 0.24; p < 0.001) and increased with increasing age groups (B = 0.14; p = 0.05). Expected liking of the plant-based burger was significantly related to expectations of feeling *'satisfied'* (B = 0.30; p < 0.001), *'anxious'* (B = 0.22; p = 0.04) and *'worried'* (B = −0.30; p = 0.01) when eating a plant-based burger. Being flexitarian significantly predicted a higher liking of the plant-based burger (B = 0.28; p = 0.05) as well as a greater likelihood of choosing the plant-based burger instead of the meat burger (B = 0.21; p < 0.001). Expectations to feel *'satisfied'* (B = 0.06, p = 0.05), *'dissatisfied'* (B = 0.07; p = 0.03) and *'bored'* (B = −0.06, p = 0.03) when eating a plant-based burger were also significantly associated with burger choice, while none of the anticipated emotions for eating a meat burger significantly predicted burger choice.

4. Discussion

This study provided valuable new insights into anticipated food-evoked emotions for a plant-based burger and a meat burger, and how these emotions relate to the expected liking and choice of the different burgers.

Our results showed that anticipated emotions for plant-based burgers and meat burgers differed, with both burgers evoking a mix of positive and negative emotions, i.e., participants expected to feel more *'proud'* and *'cool'* but also more *'bored'* when eating a plant-based burger, and more *'happy'* but also more *'guilty'* and *'worried'* when eating a meat burger. These findings are not in line with our hypothesis (H1) that a meat burger would evoke more positive and less negative emotions than a plant-based burger and contrast with previous research by Schouteten et al. (2016), who found that consumers generally associated plant-based burgers with more negative (i.e., *'dissatisfied'*, *'disappointed'*, *'disgust'*, *'discontented'*) and less positive emotions (i.e., *'happy'*, *'contented'*, *'pleasant'*, *'merry'*) compared to meat burgers (Schouteten et al., 2016). Notably, when participants in the study of Schouteten et al. (2016) were allowed to actually taste the burgers, negative emotions for the plant-based burger diminished, suggesting that sensory exposure can positively influence the emotional experience. Improvements in the sensory quality of plant-based meat alternatives and increased consumer experience with these products in recent years may thus explain the more balanced emotional response towards plant-based burgers in our study. Moreover, rising awareness and attention on the negative aspects of meat consumption for the environment, animal welfare, and personal health in recent years may explain that we found plant-based burgers to score higher on the emotions *'proud'*, *'guilty'* and *'worried'*.

The anticipated emotions *'proud'* and *'guilty'* (which were not assessed by Schouteten et al. (2016)) showed the most pronounced and consistent differences between plant-based burgers and meat burgers across all participants. Pride and guilt are self-conscious emotions that relate to personal goals as well as social standards. Therefore, anticipated pride and guilt can exert a strong self-regulatory function, and have previously been shown to positively influence healthy and sustainable consumption behaviours (Marleen C. Onwezen, Bartels, & Antonides, 2014). In the context of reducing meat consumption, intervention studies showed that inducing feelings of guilt about eating meat (e.g., by referring to human-animal friendship) contributed to less

Table 2
Multiple linear regressions for expected liking and choice of the burgers.[1]

a)	Expected liking meat burger		Choice meat burger		b)	Expected liking plant-based burger		Choice plant-based burger	
	B	SE B	B	SE B		B	SE B	B	SE B
Intercept	**4.70****	0.33	**0.30***	0.15	Intercept	**3.28****	0.38	0.03	0.15
Anticipated emotions meat burger					Anticipated emotions plant-based burger				
Happy	**0.24***	0.06	0.05	0.03	Happy	0.08	0.07	−0.02	0.03
Satisfied	−0.07	0.05	−0.03	0.03	Satisfied	**0.30***	0.07	**0.06***	0.03
Energetic	0.09	0.05	−0.01	0.02	Energetic	−0.05	0.07	−0.03	0.03
Proud	0.04	0.04	−0.02	0.02	Proud	−0.01	0.05	0.03	0.21
Cool	0.02	0.04	0.04	0.02	Cool	0.03	0.05	0.02	0.21
Relaxed	−0.00	0.06	0.01	0.02	Relaxed	0.01	0.05	0.00	0.02
Bored	−0.10	0.09	0.02	0.04	Bored	0.00	0.08	**−0.06***	0.03
Anxious	0.11	0.07	0.03	0.05	Anxious	**0.22***	0.11	−0.01	0.04
Disgust	−0.07	0.08	0.04	0.04	Disgust	−0.13	0.11	−0.01	0.04
Worried	−0.10	0.08	0.01	0.04	Worried	**−0.30***	0.11	−0.01	0.04
Guilty	0.09	0.07	−0.06	0.03	Guilty	0.17	0.10	0.06	0.04
Dissatisfied	−0.12	0.10	−0.03	0.05	Dissatisfied	−0.16	0.09	**0.07***	0.03
Disappointed	−0.03	0.08	−0.08	0.05	Disappointed	−0.05	0.09	−0.05	0.04
Flexitarian	−0.07	0.11	**−0.20***	0.05	Flexitarian	**0.28***	0.13	**0.21****	0.05
Women	0.04	0.11	0.02	0.05	Women	0.03	0.13	0.01	0.06
Age Group	**0.14***	0.07	0.03	0.04	Age Group	0.02	0.08	−0.02	0.04
Model, F; R²	F = 6.112**; R² = 0.272		F = 4.426**; R² = 0.21		Model, F; R²	F = 9.190**; R² = 0.359		F = 3.183**; R² = 0.16	

[1] Results shown are based on 1000 bootstrap samples; * p < 0.05; **p < 0.001.

favorable attitudes and lower intentions to purchase or consume meat (Kwasny et al., 2022; Wang & Basso, 2019). The difference in the anticipated feelings '*guilty*' and '*proud*' between meat and plant-based burgers in our study was most pronounced among flexitarians, women, and young adults; but also, meat-eaters, men, and older age groups expected to feel significantly more '*proud*' and less '*guilty*' when eating a plant-based burger. With evolving social norms and personal ethical values fostering a reduction in meat consumption, pride and guilt can be important emotional targets to encourage a shift towards more plant-based eating across different population groups. Further research is needed to investigate whether interventions that reinforce or prompt feelings of pride or guilt can influence actual food choice behaviour and liking of plant-based meat alternatives.

Previous research showed that mainly positive (e.g., *happy*', '*satisfied*', and '*proud*') rather than negative emotions were related to liking, choice, or intentions to consume specific foods (Chen, 2022; Gutjar et al., 2015; Onwezen et al., 2022). We could not confirm this in our study in which we found only few associations between anticipated emotions and expected liking of the burgers or burger choice. Yet, in line with our hypotheses, the only positive emotion (i.e., '*satisfied*') that was significantly associated with expected liking and choice of a plant-based burger, was associated in a positive way. Among the negative emotions, '*worried*' was most strongly associated with a lower expected liking of the plant-based burger. This may indicate that '*worried*', in the context of plant-based burgers, may refer to worries about the taste of the burger, besides potential other worries like their nutritional quality. Overall, individual associations between anticipated emotions and burger choice were very small, and the choice for a plant-based burger was mainly dependent on being flexitarian. As anticipated emotions for plant-based burgers were strongly related to diet, emotions may have indirectly contributed to influence burger choice as underlying factor, mediated by diet type.

The current study investigated anticipated food evoked emotions in a hypothetical situation. Anticipated emotions when imagining eating a food may differ from emotions that are experienced when actually eating the food, as previously found by Schouteten et al. (2016). Nevertheless, anticipated emotions are important as they may influence consumers' food choice and purchasing decisions, i.e., before tasting the product. While available research showed that emotions are related to the intention and desire to consume or purchase meat alternatives (Chen, 2022; Onwezen et al., 2022), future research should investigate whether anticipated food-evoked emotions impact actual food choice behaviour, e.g., at the point of purchase.

The selection of emotions, which were assessed in this study, was based on their supposed relevance for plant-based and meat burgers, as discussed and agreed among the authors of this paper. Out of the thirteen emotions we assessed, six had previously been investigated in research with meat alternatives (i.e., '*happy*', '*energetic*', '*disgust*', '*worried*', '*dissatisfied*', '*disappointed*') (Schouteten et al., 2016), and seven were also part of the EsSense Profile® (i.e., '*happy*', '*satisfied*', '*energetic*', '*bored*', '*disgust*', '*worried*', '*guilty*') (King et al., 2010). Four emotions (i.e., '*proud*', '*cool*', '*relaxed*', '*anxious*') were added based on suggestions of the authors of this paper. While at the time this study was conducted, no emotion lexicon specifically directed at meat and plant-based alternatives was available, in the meantime such a lexicon has been developed based on discussions with consumers (Orr, Giezenaar, Godfrey, & Hort, 2023). Most of the emotions, which we assessed in our study, are also covered by this emotion lexicon, except for '*proud*' and '*guilty*'. These emotions were removed from the final list of emotions in the new lexicon, because they seemed to be understood differently by different consumer groups (Orr et al., 2023). The emotion lexicon also contains additional emotional categories, such as '*curious*', '*amazed*', '*deceived*' or '*uncertain*', which were not assessed in our study. We greatly welcome the use of a standard emotion lexicon for future research directed at meat alternatives to better understand the emotions that are specific to this product category. Yet, in addition, we strongly advocate to also investigate - and not ignore - the emotions '*proud*' and '*guilty*', for which we found the most consistent and pronounced differences between plant-based and meat burgers and which seem to be promising targets to drive sustainable behaviour.

Positive emotions are important for the success of products in the marketplace (Gutjar et al., 2015; Jiang et al., 2014). To facilitate the switch from meat to plant-based alternatives, marketing strategies could make use of emotional drivers and address consumers' emotions in communication and presentation of plant-based meat alternatives. Besides inducing a feeling of pride, a more light-hearted approach could be to reinforce other positive emotions like feeling '*cool*' or '*happy*' when eating meat alternatives, e.g., by using influencers or joyful promotion campaigns. Counteracting negative feelings like feeling '*bored*', may help to overcome negative expectations and emotional barriers towards plant-based meat alternatives.

In conclusion, this study provides valuable new insights into anticipated emotions for plant-based and meat burgers, which can serve as a starting point to identify and address emotional barriers and motivators for switching meat with plant-based alternatives. We found that both meat burgers and plant-based burgers evoked a mix of positive and negative emotions, with flexitarians and women showing a more positive emotional response towards the plant-based burger than meat-eaters and men. However, markedly, and consistently across all groups, participants expected to feel more '*proud*' and less '*guilty*' when eating a plant-based burger compared to a meat burger. Associations between anticipated emotions and choosing the plant-based burger were limited and may have been overruled by the type of diet, i.e., being flexitarian. Future research should investigate whether (interventions that reinforce) food-evoked emotions can influence actual food choice behaviour and liking of plant-based meat alternatives and whether this may be mediated by the type of diet.

Ethical statement

Participation in this study was voluntary. The study was explained to participants in the online questionnaire, and they were informed that the answers they gave during the survey will be treated confidentially and stored anonymously. Participants received a small financial compensation (5 Euro) for participating in the study.

Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: NN and EHZ are employees of Unilever Foods Innovation Centre Wageningen. Unilever markets food products, including plant-based meat.

Data availability

The first author has full access to the data reported in this manuscript, which can be made available upon request. A formal data sharing agreement should be signed.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.foodqual.2023.105046.

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