Predicting and promoting the consumption of plant-based meat

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Abstract

Purpose – The present research aimed to understand how to predict and promote plant-based meat (PBM) consumption.

Design/methodology/approach – In Study 1 (N = 550), the authors investigated the psychosocial antecedents of the intentions to add PBM and to replace animal meat with PBM. In Study 2 (N = 390), the authors tested the effectiveness of different environmental messages promoting PBM consumption. The authors compared the effects of an addition message condition (i.e. a message promoting the addition of PBM to one's diet), a replacement message condition (i.e. a message promoting the replacement of animal meat with PBM) and a control condition (i.e. no message). In both studies, the authors considered the moderation of past PBM consumption (PMB eaters vs PBM noneaters).

Findings – Study 1 showed that a positive attitude towards eating PBM and a high awareness of the environmental consequences of meat production were key antecedents of participants' intention to eat PBM. The role of the other psychosocial antecedents varied according to past PBM consumption. Study 2 showed that both addition and replacement messages increased non-PBM eaters' positive attitude towards eating PBM and in turn willingness to pay for PBM. Instead, only replacement messages increased PBM eaters' willingness to pay for PBM.

Originality/value – The present research developed a model integrating the key psychosocial predictors of people's intentions to eat PBM. Furthermore, it is the first research that compared the persuasiveness of different environment messages to promote PBM consumption.

Keywords Protein alternatives, Plant-based meat, Message framing, Meat consumption, Environmental message

Paper type Research paper

1. Introduction

Food production is one of the main culprits of current environmental problems. Livestock is among the food sectors that have the strongest impact on the environment, accounting alone for 16.5% of annual global greenhouse gas emissions (Twine, 2021). Nevertheless, a transition toward a more sustainable livestock industry is not enough to significantly reduce the environmental footprint of food production if this change is not accompanied by a reduction of meat consumption (Twine, 2021). More broadly, we need a transition towards a more sustainable diet, which can be defined as a diet including foods produced with little environmental impact (Tilman and Clark, 2014; Schmidt and Mouritsen, 2020). This diet can be exemplified as mainly composed of plant-based food (e.g. Baroni *et al.*, 2007; Schmidt and Mouristen, 2020; Twine, 2021), low consumption of meat and animal products, and the introduction of alternative sources of protein (de Boer *et al.*, 2014).

So far, the number of consumers adopting a sustainable diet is still low. It has been estimated that only 10% of European consumers are vegan (i.e. they do not eat animal products), vegetarian (i.e. they do not eat meat and fish) or flexitarian (i.e. they do not eat meat regularly) (Eurispes, 2021; Statista, 2020). However, consumers are selecting more and more sustainable foods in recent years, as highlighted by the 49% growth of the European plant food industry between 2018 and 2020 (Smart Protein, 2021). As to Italy, where the studies presented in this paper were carried out, only 8% of consumers are vegan, vegetarian or flexitarian. At the same time, there has been a 25.8% increase in plant-based food sales between 2019 and 2021 (Coop, 2021).

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To support this growing trend and help consumers to adopt a more sustainable diet, both businessmen and scholars are focusing on plant-based meat (PBM) products, that is vegetable food developed to simulate the meat-eating experience. Overall, PBM products (e.g. burgers, sausages or cold cuts) try to reproduce the appearance, taste and texture of their animal meat counterparts (Van Loo *et al.*, 2020). Furthermore, PBM products have a significantly lower environmental impact, as their production uses 47–99% less land and 72–99% less water, emits 30–90% less greenhouse gas and causes 51–91% less aquatic nutrient pollution compared to meat production (The Good Food Institute, 2019). Nowadays, the availability of PBM products on the market is exponentially increasing, as documented by the evidence that the European PBM sector grew by 68% between 2018 and 2020 (Smart Protein, 2021). Consequently, consumers are progressively attracted by these products. About 35% of European consumers and 48% of Italian consumers intend to try a PBM burger (Statista, 2020).

Although several researchers are analyzing the growing trend of PBM products, so far, the scientific literature on the key motives driving consumers to purchase PBM is still scarce. To fill this gap in current literature, a useful perspective is the one proposed by the social psychology of food, which is a branch of psychology considering food choices as guided by cognition, emotions and social relationships (Carfora *et al.*, 2021). Starting from this perspective, we carried out two studies. In the first study, we aimed to understand the predictors of intention to consume PBM. In the second study, we tested the effectiveness of persuasive messages that might increase PBM consumption.

2. Theoretical framework

2.1 Extended theory of planned behavior to predict intention to eat plant-based meat

Several studies have analyzed the psychosocial predictors of the intention to reduce animal meat consumption (e.g. Carfora *et al.*, 2019a, 2020; Cheah *et al.*, 2020; Zur and Klökner, 2014; Wolstenholme *et al.*, 2021), while only few studies have focused on the predictors of PBM consumption (e.g. Kopplin and Rausch, 2021). Most of the studies on the reduction of meat consumption were based on the theory of planned behavior (TPB; Ajzen, 1991), which states that behavioral decisions are determined by volitional processes involving a cognitive evaluation of the consequences of performing the behavior (i.e. attitude), social expectations (i.e. social norm) and external and personal resources to implement the behavior (i.e. perceived behavioral control). In line with the TPB, these studies showed that a positive attitude towards meat reduction (i.e. the evaluation that reducing meat is useful) is the strongest predictor of the intention to reduce meat consumption. Moreover, they confirmed the predictive role of injunctive social norm (i.e. the perception that others approve a reduction in meat consumption) and descriptive social norm (i.e. the observation that others are reducing meat consumption). Instead, perceived behavioral control (i.e. the perception that meat reduction is possible and controllable) emerged as a less significant or not significant predictor. To the best of our knowledge, so far only one study has considered the role of TPB variables in predicting the intention to purchase PBM, confirming the relevant role of attitude and subjective norm (Kopplin and Rausch, 2021).

Past TPB studies aimed at explaining people's intention to reduce meat showed the predictiveness of some additional variables. A couple of studies (Carfora *et al.*, 2017; Weibel *et al.*, 2019) showed a predictive role of anticipated emotions. Positive anticipated emotions concern the positive emotions that people anticipate experiencing if they will perform a behavior in the future (e.g. satisfaction and pride). Conversely, negative anticipated emotions refer to the mental expectation of experiencing negative emotions if the behavior will be not performed (e.g. guilt and regret). In the same studies, environmental awareness was found to be another additional predictor of meat reduction. Participants' intention to reduce meat

consumption was predicted by the awareness of environmental consequences of meat production, both directly and indirectly via the other TPB variables. Finally, previous research has documented that past meat consumption moderates the relationship between the intention to reduce meat consumption and its antecedents (e.g. Wolstenholme *et al.*, 2021). So far, all these additional variables have not been studied in relation to people's intention to eat PBM.

To assess people's intention to consume PBM, we considered two different strategies that people can employ in their food choices, namely addition and replacement (Sobal *et al.*, 2006). *Addition* regards the inclusion of a specific food in the diet, while *replacement* regards the substitution of a food option with another one. The antecedents of intention either to add PBM to one's diet or to replace animal meat with PBM are likely to be different. Nevertheless, to the best of our knowledge, no previous studies have studied the antecedents of these intentions related to PBM consumption.

Based on the above, in Study 1 we tested if TPB variables plus anticipated emotions and awareness of environmental consequences would predict both addition and replacement intentions, also considering the moderating role of past PBM consumption.

2.2 Intervention to increase plant-based meat consumption

Besides understanding the psychological predictors of the intention to purchase PBM (Study 1), we aimed to understand how exposure to a messaging intervention can increase receivers' intention to purchase PBM (Study 2). Again, due to the paucity of specific studies on the subject, we referred to previous studies on the effectiveness of messaging intervention on meat reduction. These studies provided information on the positive consequences of reduced meat consumption on one's health, the environment or animal welfare (Bianchi *et al.*, 2018; Harguess *et al.*, 2020; Palomo-Vélez *et al.*, 2018). In our study, we decided to focus only on the environmental consequences of purchasing PBM for two reasons: first, it remains unclear whether PBM products carry the same established nutritional benefits as traditional plant-based diets based on pulses, legumes and vegetables (Tso and Forde, 2021). Second, talking about animal welfare could activate the so-called "meat-related cognitive dissonance," which is a discomfort deriving from the conflict between meat eating behavior and affection toward animals (Loughnan *et al.*, 2014; Rothgerber and Rosenfeld, 2021). This discomfort generally produces a polarizing effect: individuals more attached to eating meat tend to increase their meat consumption, while individuals less attached to eating meat tend to reduce it (Rothgerber and Rosenfeld, 2021).

Only few researchers have tested the effectiveness of the provision of information on the promotion of PBM. Martin *et al.* (2021) showed that health and environmental messages linked to PBM consumption equally increased willingness to pay for PBM. Differently, Yan and Mattila (2021) showed that environmental messages were more effective than health messages in enhancing people's preference for PBM. In our research (Study 2), we tested whether messages focusing on the awareness of the environmental consequences of meat production would increase receivers' attitude towards eating PBM, as well as their willingness to pay for a package of PBM. Unlike previous studies, our messages differed from the ones employed in previous studies as regards the suggested strategy to increase PBM consumption. We compared environmental messages suggesting the *addition* of PBM to one's usual diet and messages suggesting the *replacement* of animal meat with PBM.

3. Study 1: predictors of the intention to eat plant-based meat

3.1 Aims and hypotheses

In Study 1, we investigated the psychosocial drivers of the addition and replacement intentions to eat PBM. Specifically, we tested the following hypotheses (Figure 1).

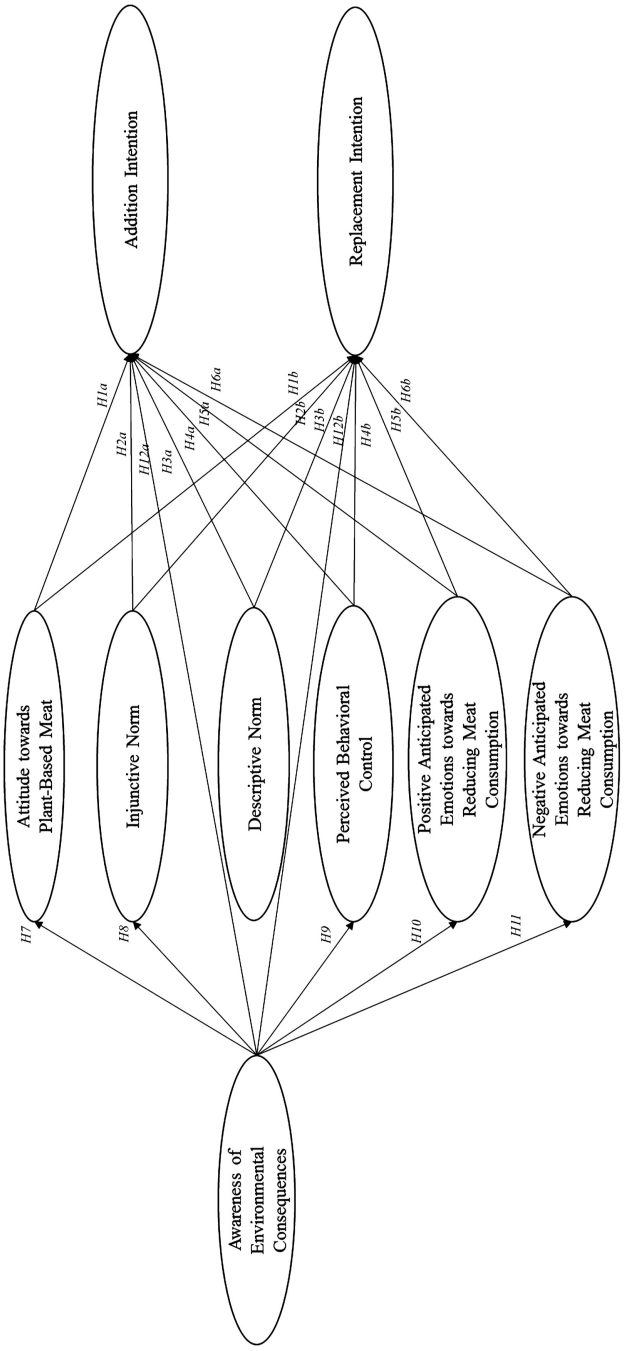

Figure 1.
Integrated theoretical model to explain the addition and replacement intentions to eat plant-based meat

Positive attitude towards eating PBM enhances addition (*H1a*) and replacement intentions (*H1b*).

Injunctive norm enhances addition (*H2a*) and replacement intentions (*H2b*).

Descriptive norm enhances addition (*H3a*) and replacement intentions (*H3b*).

Perceived behavioral control enhances addition (*H4a*) and replacement intentions (*H4b*).

Positive anticipated emotions towards reducing meat consumption enhance addition (*H5a*) and replacement intentions (*H5b*).

Negative anticipated emotions towards reducing meat consumption enhance addition (*H6a*) and replacement intentions (*H6b*).

The awareness of environmental consequences enhances positive attitude towards eating PBM (*H7*), injunctive norm (*H8*), perceived behavioral control (*H9*), positive (*H10*) and negative anticipated emotions towards reducing meat consumption (*H11*), addition (*H12a*) and replacement intentions (*H12b*).

The awareness of environmental consequences indirectly enhances addition and replacement intentions, via positive attitude towards PBM (*H7a* and *H7b*), injunctive norm (*H8a* and *H8b*), perceived behavioral control (*H9a* and *H9b*), positive anticipated emotions towards PBM (*H10a* and *H10b*) and negative anticipated emotions (*H11a* and *H11b*).

Finally, we investigated whether previous PBM consumption would moderate the impact of the other study variables on participants' addition and replacement intention (RQ1).

3.2 Participants and measures

Ethical approval for this study was obtained from the Catholic University of the Sacred Heart (Milan). The application of the *A-priori* Sample Size Calculator for structural equation models (expected effect size = 0.25; p = 0.05; statistical power level = 0.80; Soper, 2021) recommended to involve about 281 participants to test our integrated model (9 latent variables and 28 observed variables) and about 338 participants to test the moderation of past PBM consumption (18 latent variables and 55 observed variables). However, we increased our sample size to enhance the robustness of our findings. Thus, in May 2021 we collected a sample of 550 Italian respondents using Prolific Academic Ltd for recruitment. Participants (F = 269, M = 275, other = 4, not declared = 2; age mean = 28.76, SD = 9.60, age range = 18–65) were mainly single (69.5%), with a medium-high education level (high diploma = 49.6%, university degree = 46.2%).

At the beginning of the online questionnaire, participants provided written consent, and then they completed the measures described below. *Attitude* towards eating PBM was assessed using a seven-point semantic differential scale with five items. All the other latent constructs (*descriptive* and *injunctive norms*, *perceived behavioral control, positive* and *negative anticipated emotions*, *awareness of environmental consequences, addition* and *replacement intentions)* were measured using three items on a seven-point Likert scale. *Past PBM consumption* was measured with the item "How often do you eat vegetable meat? [. . .] from (0) "never" to (6) "more than 3 times a week." All measures collected through the questionnaire were adapted from the studies of Carfora and colleagues (Carfora *et al.*, 2017, 2018). The full list of the items of all latent variables and their composite reliability are reported in Table 1.

3.3 Results

Table 2 reports means and standard deviations of all study variables. Overall, our sample participants ate PBM about once or twice a week, evaluated this food choice positively and stated to have control over its consumption. However, our participants had neither an expectation that others would approve their PBM consumption nor a perception that others ate or wanted to eat PBM. Regarding the participants' beliefs about consuming meat, they

Construct	Items	Λ	CR	AVE
Attitude towards eating plant-based meat (PBM)	Eating PBM is [. . .]		0.88	0.61
	[. . .] disgusting–tasty	0.82		
	[. . .] sad–joyful	0.80		
	[. . .] unpleasant–pleasant	0.90		
	[. . .] fool–wise	0.68		
	[. . .] useless–useful	0.67		
Injunctive norm	Most of the people I know [. . .]		0.82	0.62
	[. . .] think that I should eat PBM	0.92		
	[. . .] would approve if I eat PBM	0.62		
	[. . .] would like me to eat PBM	0.81		
Descriptive norm	Most of the people I know [. . .]		0.84	0.64
	[. . .] eat PBM	0.72		
	[. . .] believe it is right eating PBM	0.81		
	[. . .] would like to eat PBM	0.87		
Perceived behavioral control			0.81	0.60
	Eating PBM is entirely up to me	0.72		
	I can eat PBM when I want	0.61		
	Purchasing PBM is easy	0.95		
Positive anticipated emotions towards reducing meat consumption	If I reduce meat consumption [. . .]		0.95	0.87
	[. . .] I will be proud of myself	0.93		
	[. . .] I will feel secure	0.90		
	[. . .] I will be satisfied	0.96		
Negative anticipated emotions towards reducing meat consumption	If I reduce meat consumption [. . .]		0.93	0.82
	[. . .] I will regret it	0.90		
	[. . .] I will feel worried	0.92		
	[. . .] I will feel dissatisfied	0.90		
Awareness of environmental consequences			0.91	0.76
	Meat production causes environmental pollution	0.90		
	A reduction in meat consumption would contribute to environmental protection	0.86		
	Meat production causes climate change	0.86		
Addition intention	In my diet [. . .]		0.97	0.92
	[. . .] I intend to add PBM	0.97		
	[. . .] I plan to add PBM	0.95		
	[. . .] I will add PBM	0.95		
Replacement intention	In my diet [. . .]		0.97	0.93
	[. . .] I intend to replace animal meat with PBM	0.94		
	[. . .] I plan to replace animal meat with PBM	0.98		
	[. . .] I will replace animal meat with PBM	0.95		

Table 1.
Study 1: results of the measurement model

Note(s): Λ = Standardized factor loading; CR = composite reliability; AVE = average variance extracted

had a low awareness of the environmental consequences of meat production. Moreover, participants reported a low anticipation of negative emotions for not reducing its consumption, even if the anticipation of positive emotions was high. Finally, participants' addition intention was medium, while replacement intention was very low.

3.3.1 Integrated model to explain intentions to eat plant-based meat. To test whether the fit of the integrated model would be higher than the fit of the TPB model and the models including the other variables considered separately, we ran structural equation modeling (SEM) analyses with Mplus software. We assessed the goodness of fit of our models by considering chi-square and incremental fit indices (cut-offs: root mean square error of approximation (RMSEA) ≤ 0.08; standardized root mean squared residual (SRMR) < 0.05,

Table 2. Study 1: means, standard deviations, average variance extracted values and correlations among the study variables

Study variables	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	Mean	SD
1. Attitude towards eating PBM	*0.61*										4.70	1.30
2. Injunctive norm	0.33*	*0.62*									3.28	1.14
3. Descriptive norm	0.33*	0.75*	*0.64*								2.97	1.23
4. Perceived behavioral control	0.15*	0.14*	0.12*	*0.60*							5.00	1.11
5. Positive anticipated emotions	0.56*	0.35*	0.27*	0.18*	*0.87*						5.37	1.48
6. Negative anticipated emotions	0.40*	0.24*	0.21*	0.11*	0.65*	*0.82*					4.83	1.60
7. Awareness of environ. conseq.	0.54*	0.23*	0.18*	0.12*	0.62*	0.45*	*0.76*				3.80	1.66
8. Past PBM consumption	0.34*	0.14*	0.18*	0.28*	0.21*	0.25*	0.17*	–			1.81	1.20
9. Addition intention	0.60*	0.38*	0.35*	0.04	0.53*	0.38*	0.44*	0.43*	*0.92*		4.02	1.82
10. Replacement intention	0.53*	0.39*	0.35*	0.09*	0.53*	0.50*	0.38*	0.37*	0.63*	*0.93*	2.81	1.81

Note(s): SD = standard deviation; PBM = plant-based meat. In the diagonal row, the italic values are the average variances extracted for the latent construct. The numbers below diagonal are the correlation coefficients among the study variables. *p = 0.001

comparative fit index (CFI) and Tucker–Lewis index (TLI) > 0.90; Kline, 2012). Therefore, we first ran a model including all TPB variables, namely attitude, injunctive norm, descriptive norm and perceived behavioral control (H1–H4; Model 1). Then, we ran a model including positive and negative anticipated emotions (H5–H6; Model 2). Then, we included awareness of consequences (H7–H12; Model 3). We used the chi-squared difference test ($\Delta\chi^2$; Satorra and Bentler, 2010) to compare our nested models, where a significant $\Delta\chi^2$ value leads to the conclusion that a model had a better fit than another.

Concerning our measurement model (Table 1), the composite reliability value of each scale was above the cut-off of 0.60, as well as the average variance extracted (AVE) values were above the suggested threshold of 0.50 (Bagozzi and Yi, 1988). Thus, we confirmed the construct validity of our scales. Also, we confirmed the discriminant validity of our scales because the AVE values were larger than the correlation values among the latent variables (Fornell and Larcker, 1981), except for the AVE of injunctive norm and the correlation between injunctive and descriptive norm (Table 2). This last finding may be attributed to the theoretical definition of injunctive and descriptive norms, which are two dimensions of the same subjective norm construct.

Regarding the comparison among models, our findings revealed that the integrated Model 3 (Figure 2) had the highest goodness of fit indices. In addition, the chi-square comparisons among Model 3 and the other models were all significant, confirming that it was significantly better than other models (Model 1 *versus* Model 2 = $\Delta\chi^2(7) = 579.57$; Model 1 *versus* Model 3: $\Delta\chi^2(19) = 1017.12$; Model 2 *versus* Model 3: $\Delta\chi^2(12) = 437.55$; all $p = 0.001$).

As regards the prediction of participants' *addition intention*, attitude towards eating PBM had the highest positive effect on it, followed by injunctive norm. Thus, we confirmed our H1a and H2a. Instead, participants' descriptive norm did not affect addition intention, and their perceived behavioral control had a low and negative effect on intention. Thus, H3a and H4a were not supported. Moreover, positive anticipated emotions for reducing meat consumption positively influenced addition intention, supporting our H5a. Instead, negative anticipated emotions towards not reducing meat consumption did not affect addition intention, disconfirming our H6a. Furthermore, participants' awareness of the environmental consequences of meat production had a direct effect on attitude towards eating PBM, injunctive norm and anticipated positive and negative emotions, but not on perceived behavioral control and addition intention. Thus, these results confirmed H7, H8, H10 and H11, while they disconfirmed H9 and H12a. Finally, the awareness of the environmental consequences of meat production had an *indirect* positive effect on addition intention via attitude, injunctive norm and positive anticipated emotions, but not via perceived behavioral control and anticipated negative emotions. Thus, these results supported our H7a, H8a and H10a, while they disconfirmed H9a and H11a.

As regards the prediction of participants' *replacement intention*, injunctive norm was the strongest positive antecedent of it, followed by positive attitude. Thus, we confirmed H1b and H2b. Descriptive norm had instead a negative effect on replacement intention, disconfirming our H3b. Again, perceived behavioral control had only a low negative influence on replacement intention. Therefore, H4b was not supported. Unlike the case of addition intention, in the case of replacement intention, negative anticipated emotions towards not reducing meat consumption positively influenced replacement intention, while positive anticipated emotions towards reducing meat consumption did not. Thus, we confirmed our H6b and disconfirmed our H5b. Finally, participants' awareness of the environmental consequences of meat production had no direct effect on replacement intention (thus disconfirming our H12b). It did, however, have an *indirect* positive effect on replacement intention via attitude, injunctive norm and negative anticipated emotions (but not via perceived behavioral control and positive anticipated emotions towards PBM). Therefore, we confirmed H7b and H8b, but not H9b and H10b.

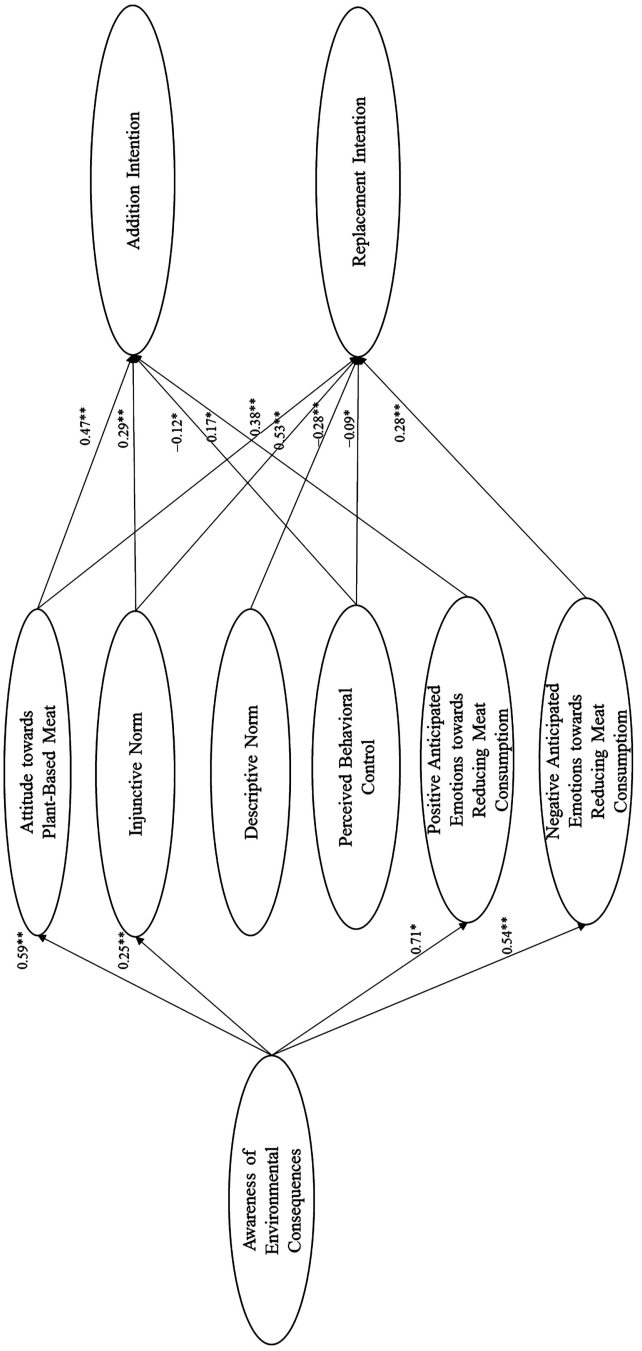

Figure 2.
Results of the integrated model to explain the addition and replacement intentions to eat plant-based meat (Model 3)

3.3.2 Comparison of the integrated model between eaters and noneaters of plant-based meat. To distinguish between participants who already ate PBM and those who did not, we created a group variable named *eaters* versus *noneaters*. The *eaters* included participants with a score equal to or greater than 1 on the past PBM consumption variable. The *noneaters* included participants with a score equal to zero on the past PBM consumption variable. Considering means and standard deviation of the study variables in the two groups, *noneaters* had low addition and replacement intentions. They evaluated this food choice negatively and did not perceive a societal pressure to perform it, although they reported a good control over this food choice. Their anticipated emotions and awareness of the environmental consequences were also low. Differently, *eaters* reported higher values on all variables, even if also in this case their replacement intention was low (Table 3).

To test our research question about the moderating role of past behavior, we run a multigroup SEM analysis to verify if the paths of the Model 3 would differ according to the participants' past PBM consumption (*eaters*: Model 4a, Table 4 and Figure 3; *noneaters*: Model 4b, Table 4 and Figure 4). Then, when a path was significant in at least one group, we used Wald tests to verify its variance between groups. Results showed that the multi-group model had an acceptable fit (Table 4).

Considering the prediction of participants' addition intention, in both *eaters and noneaters*, attitude was a key predictor. Regarding the role of norms, only in *eaters*, the injunctive norm had a significant influence on participants' addition intention. Finally, in *eaters*, awareness of the environmental consequences had a higher effect on anticipated emotions, and only in this group, it has an indirect effect on intention via anticipated positive emotions. The other paths were invariant across groups.

Regarding the explanation of participants' replacement intention, in both *eaters and noneaters*, attitude was an important predictor. However, only in the case of *eaters*, the injunctive norm and negative anticipated emotions were significant antecedents of their replacement intention. Only in the case of *eaters*, negative anticipated emotions predicted participants' intention. In turn, only in this group, the awareness of consequences affected intention via negative anticipated emotions. The other paths did not differ across groups.

3.4 Discussion

Our results show that the antecedents of participants' addition and replacement intentions differ, also according to past PBM consumption. The predominant reason that leads our Italian participants to intend to add PBM in their diet is a positive attitude towards its consumption (i.e. how much eating the PBM is tasty, useful [. . .]). Only for *eaters*, the

Table 3.
Study 1: means and standard deviations of variables in eater and noneater groups

	Eater group (n = 125)		Noneater group (n = 425)	
	M	SD	*M*	SD
Attitude towards eating PBM	5.01	1.16	3.66	1.19
Injunctive norm	3.42	1.11	2.80	1.15
Descriptive norm	3.14	1.19	2.40	1.191
Perceived behavioral control	4.98	1.10	5.05	1.14
Positive anticipated emotions	5.13	1.35	3.78	1.75
Negative anticipated emotions	4.02	1.52	3.13	1.60
Awareness of environmental consequences	5.49	1.25	4.62	1.56
Addition intention	4.58	1.57	2.09	1.85
Replacement intention	3.15	1.84	1.67	1.10

Note(s): PBM = plant-based meat

	Model 1	Model 2	Model 3	Model 4a	Model 4b	Wald test comparing Model 4a and Model 4b
χ^2 (df)	1780.50 (361); $p = 0.001$	1200.93 (354); $p = 0.001$	763.38 (342); $p = 0.001$	724.43 (342) $p = 0.001$	458.54 (342) $p = 0.001$	
RMSEA	0.08	0.07	0.05	0.05	0.05	
CFI	0.90	0.94	0.97	0.96	0.96	
TLI	0.89	0.93	0.96	0.95	0.95	
SRMR	0.25	0.18	0.05	0.05	0.06	
ATT → ADDINT	0.59**	0.49**	0.47**	0.29**	0.42**	$\chi^2(1) = 0.26$
INORM → ADDINT	0.57**	0.26*	0.29*	0.43*	0.61	$\chi^2(1) = 8.37$*
DNORM → ADDINT	−0.32	−0.06	−0.08	−0.22	−0.19	/
PBC → ADDINT	−0.13**	−0.12*	−0.12*	−0.07	−0.33*	$\chi^2(1) = 2.25$
ATT → REPINT	0.49**	0.38**	0.38**	0.25**	0.40**	$\chi^2(1) = 0.01$
INORM → REPINT	0.83**	0.52*	0.53**	0.49**	0.74	$\chi^2(1) = 11.54$**
DNORM → REPINT	−0.55**	−0.28*	−0.28*	−0.27	−0.20	/
PBC → REPINT	−0.11*	−0.10*	−0.09*	−0.05	−0.34*	$\chi^2(1) = 0.56$
POSEMO →ADDINT	–	0.24*	0.17*	0.16*	−0.09	$\chi^2(1) = 16.96$**
NEGEMO → ADDINT	–	0.01	0.01	0.01	0.05	/
POSEMO → REPINT	–	0.07	0.04	0.18	0.09	/
NEGEMO → REPINT	–	0.30**	0.28**	0.31**	0.13	$\chi^2(1) = 66.66$**
AWA → ATT	–	–	0.59**	0.46**	0.52**	$\chi^2(1) = 0.33$
AWA → INORM	–	–	0.25**	0.15**	0.20**	$\chi^2(1) = 0.00$
AWA → PBC	–	–	0.08	0.20*	0.01	$\chi^2(1) = 3.80$*
AWA → POSEMO	–	–	0.71**	0.72**	0.59**	$\chi^2(1) = 3.72$*
AWA → NEGEMO	–	–	0.54**	0.55**	0.38**	$\chi^2(1) = 8.40$*
AWA → ADDINT	–	–	0.05	0.13	−0.05	$\chi^2(1) = 24.58$**
AWA → REPINT	–	–	−0.05	−0.16	−0.03	$\chi^2(1) = 0.16$
AWA → ATT → ADDINT	–	–	0.26**	0.13**	0.22**	$\chi^2(1) = 0.07$
AWA → ATT → REPINT	–	–	0.21**	0.11**	0.20**	$\chi^2(1) = 0.09$
AWA→ INORM→ ADDINT	–	–	0.07**	0.06*	0.12	$\chi^2(1) = 0.16$

(*continued*)

Table 4.
Goodness of fit and standardized coefficients for each nested model

	Model 1	Model 2	Model 3	Model 4a	Model 4b	Wald test comparing Model 4a and Model 4b
AWA→ INORM→ REPINT	–	–	0.13**	0.07*	0.15	$\chi^2(1) = 0.01$
AWA→ PBC→ ADDINT	–	–	−0.01	−0.01	−0.01	/
AWA→ PBC→ REPINT	–	–	−0.01	−0.01	−0.01	/
AWA→ POSEMO → ADDINT	–	–	0.12*	0.12*	0.05	$\chi^2(1) = 3.11$*
AWA→ POSEMO → REPINT	–	–	0.03	0.10	−0.07	/
AWA→ NEGEMO→ ADDINT	–	–	0.00	0.01	0.02	/
AWA→ NEGEMO→ REPINT	–	–	0.15**	0.17**	0.05	$\chi^2(1) = 12.57$**
R^2 ATT	–	–	0.31**	0.21**	0.27**	
R^2 INORM	–	–	0.06*	0.02	0.04	
R^2 PBC	–	–	0.01	0.04	0.00	
R^2 POSEMO	–	–	0.51**	0.53**	0.35**	
R^2 NEGEMO	–	–	0.29**	0.30**	0.14**	
R^2 ADDINT	0.53**	0.50**	0.54**	0.40**	0.36**	
R^2 REPINT	0.49**	0.49**	0.54**	0.51**	0.42**	

Note(s): *$p = 0.05$; **$p = 0.001$; ATT = attitude towards plant-based meat; INORM = injunctive norm; DNORM = descriptive norm; PBC = perceived behavioral control; NEGEMO = negative anticipated emotions towards reducing meat consumption; POSEMO = positive anticipated emotions towards reducing meat consumption; AWA = awareness of environmental consequences; ADDINT = addition intention; REPINT = replacement intention

Table 4.

perception that others support this food choice is a further motivation, followed by the emotional expectation that reducing meat will increase one's positive emotions in the future (e.g. pride and satisfaction).

Instead, predominant motivation to replace animal meat with PBM is different for *eaters* and *noneaters*. While *eaters* primarily based it on the perception of a societal approval of this food choice, followed by its positive evaluation and an anticipation of future negative emotions for not reducing meat consumption (such as guilt or regret), *noneaters* mainly based their replacement intention on the positive evaluation of eating PBM. Interestingly, in the whole sample, the perception that others are not eating PBM seemed to increase participants' replacement intention. However, this effect disappeared when controlling for the moderation of past PBM consumption. Furthermore, an increase of behavioral control over choosing PBM decreases both intentions, and this effect is invariant across *eaters/noneaters*. This finding can be interpreted considering that perceived behavioral control may be referred to both the control over performing and not performing the behavior. Given that in our case participants have low scores on intentions and high scores on perceived behavioral control,

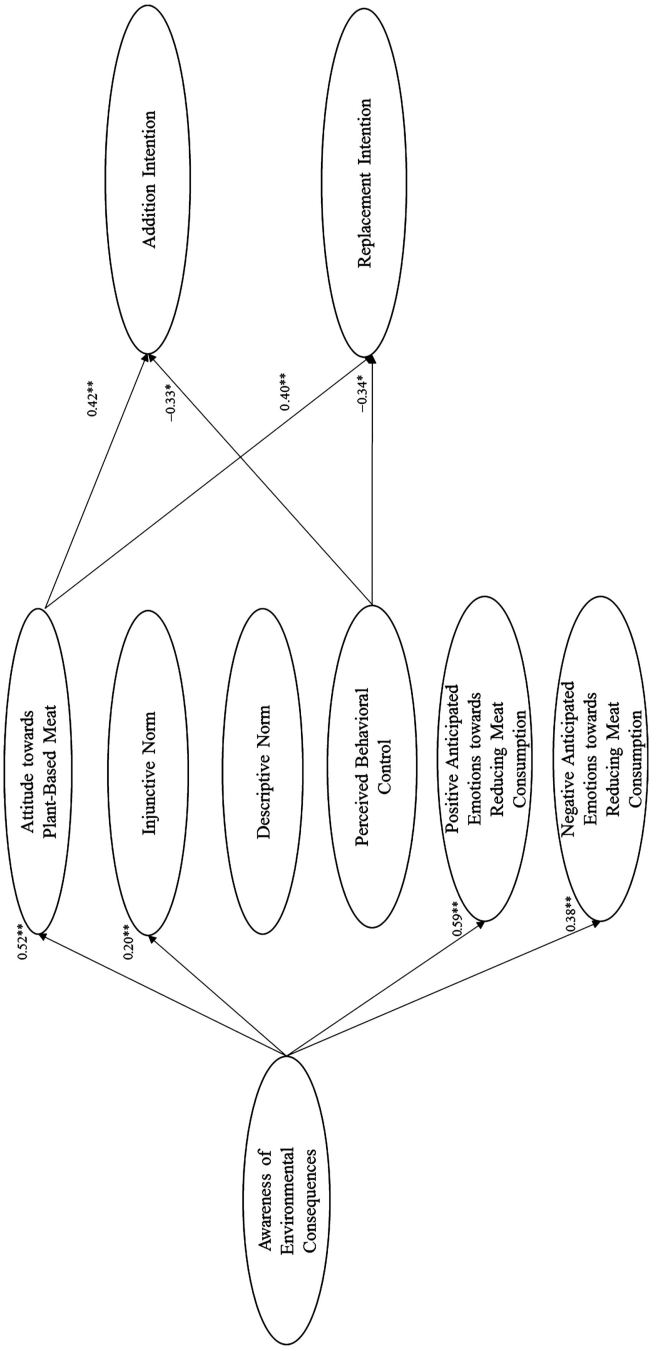

Figure 3.
Eater group: results of the integrated model to explain the addition and replacement intentions to eat plant-based meat (Model 4a)

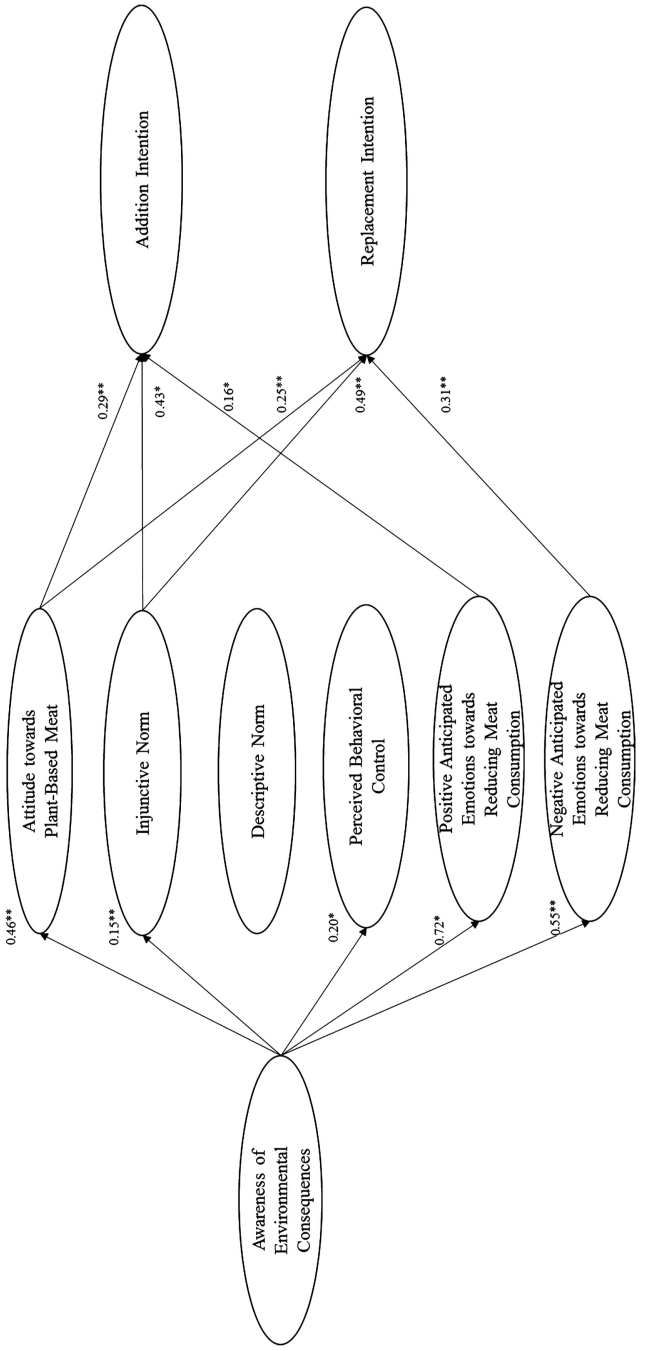

Figure 4.
Noneater group: results of the integrated model to explain the addition and replacement intentions to eat plant-based meat (Model 4b)

the more control they feel over not performing the behavior, the more likely it is that they can act consistently with their intention towards not eating PBM (for details, Yzer, 2012). Finally, all motivations predicting intentions were influenced by the awareness of the environmental consequences associated with meat production, which had an indirect effect on intentions through them.

4. Study 2: intervening to promote PBM consumption

The results of Study 1 showed that addition and replacement intentions are determined by different psychosocial antecedents. Accordingly, to promote PBM consumption, we should consider addition of PBM and replacement of meat with PBM as different food choices. Moreover, the results of Study 1 showed that the awareness of the environmental consequences of meat production has an important impact on people's attitude towards eating PBM, and attitude is in turn the most important proximal antecedent of intentions. Thus, messages aimed to promote PBM consumption should focus on environmental awareness and should aim to increase people's positive attitude towards eating PBM and willingness to pay for a package of PBM. Finally, we observed that diverse factors influence eaters' and noneaters' choice to eat PBM. Consistently, we should expect that exposure to environmental messages has different effects on these two groups of consumers.

Starting from these findings, in Study 2, we assessed whether exposure to messages focusing on the low environmental impact of PBM and promoting either addition of PBM (i.e. addition messages) or replacement of meat with PBM (i.e. replacement messages) would positively influence attitude and willingness to pay for a package of PBM, compared to a no message condition. Given that the literature on messages to promote PBM is scarce, we did not formulate specific hypotheses about the different effects of the environmental messages, but only a series of research questions.

RQ1. To what extent does reading addition or replacement messages influence attitude towards eating PBM?

RQ2. To what extent does reading addition or replacement messages influence willingness to pay for a package of PBM?

RQ3. To what extent does reading addition or replacement messages differentially influence attitude towards eating PBM, and in turn willingness to pay, according to receivers' past PBM consumption?

4.1 Participants, measures and procedure

Ethical approval for this study was obtained from the Catholic University of the Sacred Heart (Milan). Using the *a-priori* Sample Size Calculator with G*Power software (expected effect size = 0.25; $p = 0.05$; statistical power level = 0.80), results recommended to involve about 152 participants to test ANOVA with interactions (df = 2; number of groups = 6). Thus, in June 2021, we collected a sample of 390 Italian respondents in Prolific Academic Ltd ($F = 186$, $M = 197$, other = 3, not declared = 2; age mean = 28.92, $SD = 9.81$, age range = 19–62; single = 69.8%; high diploma = 50.3%, university degree = 45.4%).

At the beginning of the online questionnaire, participants provided written consent and then were randomized to one of three experimental conditions (130 participants in each condition). Participants in the *addition condition* (ADD condition) read an informative message on the environmental consequences of producing meat, plus a statement promoting the addition of PBM to their diet ("Plant-based meat has a lower environmental impact than animal meat. If you add plant-based meat to your diet, you will protect the environment!").

Participants in the *replacement condition* (REP condition) read the same message on the environmental consequences of producing meat, plus a statement promoting the replacement of animal meat with PBM ("Plant-based meat has a lower environmental impact than animal meat. If you replace animal meat with plant-based meat in your diet, you will protect the environment!"). To design both messages, we used a prefactual formulation ("If [. . .] then"), which presents the recommended behavior as connected to a hypothetical future outcome (e.g. Bertolotti *et al.*, 2016, 2020a, b; Carfora *et al.*, 2019b). Participants in the *control condition* did not read any message. Then, all participants completed the scales measuring the relevant variables. *Attitude* and *past PBM consumption* were measured using the same scales employed in Study 1. *Willingness to pay* for a package of PBM was measured through the item: "Imagine you are in the place where you usually buy food. Considering that a 150 g package of plant-based meat (e.g. burger) has an average price of 4 €, how much would you be willing to pay to buy it? . . . (1) "€ 2.00", (2) "€ 2.50", (3) "€ 3.00", (4) "€ 3.50", (5) "€ 4.00", (6) "€ 4.50", (7) "€ 5.00", (8) "€ 5.50", (9) "€ 6.00 or more."

4.2 Results

4.2.1 Effects of messages on attitude and willingness to pay. To answer our RQ1 and RQ2, we compared the effects of message conditions on attitude and willingness to pay with two ANOVAs. Results showed that the condition did not affect attitude, $F(1,387) = 0.98$; $p = 0.38$, $\eta p2 = 0.00$, but influenced willingness to pay, $F(1,387) = 6.16$; $p = 0.002$, $\eta p2 = 0.03$. The Tukey test showed that participants had a greater willingness to pay in the REP condition as compared to both the ADD and the control conditions (Table 5).

We then investigated our RQ3 and tested whether the effects of message conditions were moderated by past PBM consumption. As in Study 1, we created a categorical *eater/noneater* variable to distinguish between participants who did not eat PBM and those who did. We then conducted two ANOVAs with message condition, the *eater/noneater* group and their interaction as independent variables and attitude and willingness to pay as dependent variables.

In the case of attitude as the dependent variable, results showed no significant effect of condition ($F(2,384) = 2.39$; $p = 0.09$, $\eta p2 = 0.01$), while there was a main effect of *eater/noneater* group ($F(1,384) = 64.94$; $p = 0.001$, $\eta p2 = 0.14$) and an interaction effect between condition and *eater/noneater* group ($F(2,384) = 3.12$; $p = 0.04$, $\eta p2 = 0.02$). Pairwise comparisons showed that *noneaters* had a more positive attitude towards PBM both in the ADD and REP conditions as compared to control. In the case of *eaters,* the difference among conditions was instead not significant (Table 5).

In the case of willingness to pay as the dependent variable, results showed a significant effect of condition ($F(2,384) = 4.72$; $p = 0.01$, $\eta p2 = 0.02$) and *eater/noneater* group, ($F(1,384) = 15.27$; $p = 0.001$, $\eta p2 = 0.04$), while their interaction was not significant ($F(2,384) = 0.02$; $p = 0.97$, $\eta p2 = 0.00$). Pairwise comparisons showed that participants had greater willingness to pay in the REP condition than in the ADD or control conditions, independent on their past PBM consumption (Table 5).

Then, we verified whether the *eater/noneater* group would moderate the mediating impact of positive attitude between condition and willingness to pay. To do so, we run a moderated mediation model including two multiple regression analyses (Model 7 of the PROCESS macro for SPSS; Hayes and Preacher, 2013).

In the first regression analysis (Table 6), the proposed mediator (attitude towards eating PBM) was regressed on conditions (ADD condition = 1; control and REP conditions = 0; REP condition = 1; control and ADD conditions = 0) and *eaters/noneaters*. Compared to control, the ADD and REP conditions resulted in a more positive attitude towards eating PBM,

	Addition condition (n = 130)		Replacement condition (n = 130)		Control condition (n = 130)		Total (N = 390)	
	Attitude towards PBM M (SD)	WTP for a package of PBM M (SD)	Attitude towards PBM M (SD)	WTP for a package of PBM M (SD)	Attitude towards PBM M (SD)	WTP for a package of PBM M (SD)	Attitude towards PBM M (SD)	WTP for a package of PBM M (SD)
Eaters (n = 281)	4.72 (1.44)	3.04 (1.56)	4.89 (1.40)	3.74 (1.90)	4.87 (1.07)	3.16 (1.75)	4.83 (1.31)	3.32 (1.76)
Noneaters (n = 109)	3.83 (1.18)	2.35 (1.72)	3.91 (1.36)	2.97 (1.38)	3.16 (1.30)	2.38 (1.59)	3.63 (1.32)	2.56 (1.58)
Total (N = 390)	4.47 (1.43)	2.85 (1.63)	4.63 (1.45)	3.54 (1.80)	4.38 (1.37)	2.94 (1.74)	4.49 (1.42)	3.11 (1.75)

Note(s): PBM = plant-based meat; WTP = willingness to pay

Table 5.
Study 2: means and standard deviations of variables in eater and noneater groups

	b	SE	*t*	*p*	95% CI	*F*	df	*p*	R^2
Dependent variable = attitude towards eating PBM						14.80	5,382	0.001	0.16
Addition condition	0.67	0.30	2.23	0.02	[0.07, 1.27]				
Replacement condition	0.75	0.31	2.49	0.01	[0.15, 1.35]				
Noneaters versus eaters	1.71	0.25	6.73	0.001	[1.21, 2.21]				
Addition condition × eaters/noneaters	−0.82	0.36	−2.27	0.02	[−1.53, −0.11]				
Replacement condition × eaters/noneaters	−0.73	0.36	−2.01	0.05	[−1.44, −0.02]				
Conditional effects of conditions at the values of moderator						3.64	2,382	0.03	
Noneaters									
Addition condition	0.67	0.30	2.19	0.03	[0.07, 1.27]				
Replacement condition	0.75	0.31	2.44	0.01	[0.14, 1.36]				
Eaters									
Addition condition	−0.15	0.19	−0.79	0.43	[−0.53, 0.22]				
Replacement condition	0.03	0.19	0.12	0.90	[−0.35, 0.40]				
Dependent variable = WTP for a package of PBM						9.57	3,384	0.001	0.07
Attitude towards eating PBM	0.24	0.06	3.93	0.001	[0.12, 0.36]				
Addition condition	−0.13	0.21	−0.62	0.53	[−0.54, 0.28]				
Replacement condition	0.24	0.06	3.93	0.001	[0.12, 0.36]				

Addition condition → Attitude towards eating PBM → WTP for a package of PBM	Index of mediation	Boot SE	95% CI
Noneaters	0.16	0.08	[0.02, 0.36]
Eaters	−0.03	0.05	[−0.14, 0.06]

Index of moderated mediation	Boot SE	95% CI
−0.20	0.10	[−0.42, −0.04]

Replacement condition → Attitude towards eating PBM → WTP for a package of PBM	Index of mediation	Boot SE	95% CI
Noneaters	0.18	0.09	[0.02, 0.37]
Eaters	0.00	0.05	[−0.08, 0.11]

Index of moderated mediation	Boot SE	95% CI
−0.17	0.09	[−0.38, −0.01]

Note(s): PBM = plant-based meat; WTP = willingness to pay; SE = standard error; CI = confidence interval

Table 6.
Study 2: moderated mediation regression output

consistent with the ANOVA results. Moreover, past PBM consumption influenced attitude as well as significantly interacted with both conditions in the case of *noneaters*.

In the second regression analysis (Table 6), willingness to pay was regressed on the proposed mediator (attitude towards eating PBM) and condition. The results showed that the higher the participants' attitude the higher their willingness to pay. Furthermore, the REP condition predicted higher levels of willingness to pay, while the ADD condition did not. Finally, the index of moderated mediation was significant. There was a total moderated mediation, showing that in the case of *noneaters*, higher levels of attitude towards eating PBM fully explained higher levels of willingness to pay, both in the ADD and REP conditions. Thus, *noneaters'* willingness to pay in ADD and the REP conditions was higher as compared

to control only when both message conditions also influenced participants' attitude towards eating PBM. Instead, *eaters'* willingness to pay was higher only in REP condition as compared to the other conditions and independent from their levels of attitude towards PBM.

4.3 Discussion

To sum up, the results of Study 2 showed that the effects of the messages to promote PBM consumption were partially different according to the receivers being PBM eaters or noneaters. In the case of *PBM noneaters,* their positive attitude towards eating PBM was increased both by a message that suggested adding PBM to the diet and by a message that suggested replacing animal meat with PBM. In turn, this increased positive attitude increased their willingness to pay for a package of PBM compared to control. Instead, in the case of *eaters*, only the message promoting to replace animal meat with PBM was more effective than control in increasing willingness to pay for PBM. This was not the case for the message simply promoting the addition of PBM. Finally, this effect was independent of the level of past PBM consumption and was not mediated by a favorable attitude towards this consumption.

5. General discussion

In the present research, we investigated both the psychosocial antecedents of the intentions to add PBM to one's diet or to replace meat with PBM, and how to increase these intentions using environmental messages.

Overall, people's intentions to add PBM to one's diet or replace animal meat with PBM were low. The predominant reasons that led to an increased intention to eat PBM were a positive attitude towards PBM and a high awareness of the environmental consequences of meat production. However, the role of the psychosocial antecedents of intention to consume PBM varied according to addition vs replacement intention and to participants being PBM eaters or not. In the case of the addition intention, the perception that others supported this food choice was a further motivation only for PBM *eaters*, and the same was the case for the expectation that reducing meat would elicit positive emotions (e.g. pride and satisfaction). In the case of the replacement intention, again the perception that PBM consumption is socially approved was a strong motivation only for eaters, accompanied by the expectation of future negative emotions for not reducing meat (e.g. guilt and regret).

These results are in line with past studies, showing that attitude is the strongest predictor of intention to eat PBM (Kopplin and Rausch, 2021). Unlike past studies (Kopplin and Rausch, 2021), however, our findings show that the intention to eat PBM is influenced by societal expectations also when people already eat PBM. In addition, they suggest that social pressure can reinforce PBM consumption when such consumption is already a dietary pattern, while does not seem to motivate PBM consumption when people have never tried it. Moreover, as already confirmed in the case of meat reduction (Carfora *et al.*, 2020), we found that the anticipation of future emotions influences intentions to eat PBM. However, this is the first study showing that different anticipated emotions determine different food strategies (i.e. addition or replacement) according to their positive/negative valence and only when people are already performing the behavior in question. Finally, as shown by previous studies (e.g. Carfora *et al.*, 2020), environmental awareness is the first step in opting for more sustainable food choices.

Our Study 2 is the first scientific attempt to evaluate the effects of messages focusing on addition or replacement food strategies. Our studies showed that, in the case of PBM *noneaters*, both addition and replacement messages are effective in increasing positive attitude toward eating PBM, and in turn in motivating them to pay more for a package of PBM, compared to control. Instead, in the case of PBM *eaters,* only the replacement message

is more effective than control in increasing willingness to pay, and this effect does not require an increased positive attitude towards PBM consumption.

5.1 Limitations and future directions

Although this study offers several insights into the main drivers of Italians' intention to eat PBM and how this food choice can be promoted, it is not exempt from some limitations. First, both samples were large and well balanced for gender, but they were not representative of the general Italian population because they were not fully balanced in terms of other sociodemographic variables (e.g. age, level of education and marital status). Our data should therefore be generalized with caution, and future studies could usefully test the predictivity of this model in other populations. The effectiveness of our environmental messages should also be further evaluated in other populations. Second, in our studies, we did not control for the role of sociodemographic variables and individual characteristics (e.g. meat identity and religion), as well as other variables regarding sensory aspects of food (e.g. taste and price) as predictors of intention to consume PBM or moderators of the observed relationships. Third, although the choice of plant-based food may be driven by different motivations (e.g. health, animal welfare and environment), the messages used in our Study 2 only focused on the environmental consequences of PBM consumption. Future studies could usefully compare different message contents (e.g. environment *versus* health *versus* animal welfare) to evaluate whether the effectiveness of such messages differs, also taking into consideration individual differences among the receivers (e.g. self-interest vs altruism). Finally, we collected data in a single time for both the studies, limiting our analyses on intentions/willingness to pay and past behavior. Future studies could consider adopting a longitudinal design with two times, including a behavioral measurement at Time 2 and considering to what extent the observed intention and willingness to pay are translated into actual behavior.

5.2 Practical implications

As to the practical implications deriving from our findings, the present research offers at least four important insights for future public actions and campaigns aimed at promoting a higher consumption of alternative proteins to animal meat.

First, we found that intention to eat PBM is still low and mainly guided by a cognitive evaluation of this food choice. In light of this result, policymakers should focus on how to increase a positive attitude towards selecting alternative proteins. This could be achieved by providing information on how to include these proteins in a balanced diet. For example, future public campaigns might propose alternative dishes and recipes to reduce animal products and replace them with plant-based food choices. Moreover, institutions might make food containing alternative proteins more accessible by reducing taxation on it or recommending its introduction in school or work canteens.

Second, we found that the social context and related expectations increase the intention to add this product to daily diet when other people already eat PBM. This finding might be partially linked to Italian cultural heritage regarding eating habits, which is deeply rooted in commensality (i.e. the act of eating with other people) and conviviality (i.e. the pleasure associated to shared meals; Pull *et al.*, 2015). Anyhow, this result suggests that policymakers could leverage on the pleasure of sharing PBM dishes, at the same time highlighting how these common choices may support environmental protection.

Third, we found that our environmental messages were effective in promoting PBM consumption with both eaters and noneaters. This result can be usefully applied to future campaigns aimed at convincing a heterogeneous group of people to adopt a sustainable diet, independent of their meat attachment and meat-eating habits. For instance, to promote plant-

based diets, public campaigns may leverage on environmental information rather than disseminate information (e.g. messages on animal welfare and protection) that might be counterproductive with individuals who are more attached to eating meat (Rothgerber and Rosenfeld, 2021).

Finally, our results demonstrated that, according to past PBM consumption, psychosocial factors driving the choice of PBM differ, as well as the effectiveness of messages aimed to promote PBM consumption. Interventions and communications should therefore be tailored accordingly to maximize their effect on promoting PBM consumption. A focus on the addition strategies to include PBM in one's diet could be a promising approach with people who do not usually eat PBM. It would enhance positive attitudes towards eating PBM and in turn increase willingness to pay for this product. In the case of people who already eat PBM, communication could instead directly leverage on proposing a replacement of animal meat with its plant-based counterpart. Evidently, people who have already tried adding this product to their diet are more ready to use it as an alternative to meat.

6. Conclusion

The present research contributes to our understanding of the psychosocial drivers associated with the intention to eat PBM. In general, participants' positive cognitive evaluations (attitude, injunctive norm and awareness of consequences) explain addition and replacement intentions in a similar way. Instead, participants' emotional evaluations explain the two intentions in a different way. Positive anticipated emotions predict intention to add PBM while negative anticipated emotions predict intention to replace meat with PBM. Furthermore, the antecedents of PBM choice in eaters and noneaters partially differ, and these groups differ also in terms of reaction to environmental messages. This confirms the opportunity to personalize messages according to the past eating habits of the recipients.

References

Ajzen, I. (1991), "The theory of planned behavior", *Organizational Behavior and Human Decision Processes*, Vol. 50 No. 2, pp. 179-211.

Bagozzi, R.P. and Yi, Y. (1988), "On the evaluation of structural equation model", *Journal of Academy of Marketing Science*, Vol. 16 No. 1, pp. 74-94.

Baroni, L., Cenci, L., Tettamanti, M. and Berati, M. (2007), "Evaluating the environmental impact of various dietary patterns combined with different food production systems", *European Journal of Clinical Nutrition*, Vol. 61, pp. 279-286.

Bertolotti, M., Chirchiglia, G. and Catellani, P. (2016), "Promoting change in meat consumption among the elderly: factual and prefactual framing of health and well-being", *Appetite*, Vol. 106, pp. 37-47.

Bertolotti, M., Carfora, V. and Catellani, P. (2020a), "Different frames to reduce red meat intake: the moderating role of self-efficacy", *Health Communication*, Vol. 35 No. 4, pp. 475-482.

Bertolotti, M., Carfora, V. and Catellani, P. (2020b), "Regulatory focus and the effect of nutritional messages on health and well-being: the case of red meat intake", *Applied Psychology: Health and Well-Being*, Vol. 12 No. 1, pp. 212-230.

Bianchi, F., Dorsel, C., Garnett, E., Aveyard, P. and Jebb, S.A. (2018), "Interventions targeting conscious determinants of human behaviour to reduce the demand for meat: a systematic review with qualitative comparative analysis", *International Journal of Behavioral Nutrition and Physical Activity*, Vol. 15, pp. 1-25.

Carfora, V., Caso, D. and Conner, M. (2017), "Randomised controlled trial of a text messaging intervention for reducing processed meat consumption: the mediating roles of anticipated regret and intention", *Appetite*, Vol. 117, pp. 152-160.

Carfora, V., Caso, D., Palumbo, F. and Conner, M. (2018), "Promoting water intake. The persuasiveness of a messaging intervention based on anticipated negative affective reactions and self-monitoring", *Appetite*, No. 130, pp. 236-246, doi: 10.1016/j.appet.2018.08.017.

Carfora, V., Bertolotti, M. and Catellani, P. (2019a), "Informational and emotional daily messages to reduce red and processed meat consumption", *Appetite*, Vol. 141 No. 104331.

Carfora, V., Catellani, P., Caso, D. and Conner, M. (2019b), "How to reduce red and processed meat consumption by daily text messages targeting environment or health benefits", *Journal of Environmental Psychology*, Vol. 65 No. 101319.

Carfora, V., Conner, M., Caso, D. and Catellani, P. (2020), "Rational and moral motives to reduce red and processed meat consumption", *Journal of Applied Social Psychology*, Vol. 50 No. 12, pp. 744-755.

Carfora, V., Cicia, G. and Conner, M. (2021), "Mind the sustainable food: new insights in food psychology", *Frontiers in Psychology*, Vol. 12.

Cheah, I., Shimul, A. S., Liang, J. and Phau, I. (2020), "Drivers and barriers toward reducing meat consumption", *Appetite*, Vol. 149 No. 104636.

Coop (2021), "Rapporto Coop 2021: consumi e stili di vita degli italiani di oggi e di domani", available at: https://www.italiani.coop/rapporto-coop-2021-anteprima-digitale/ (accessed 17 December 2021).

de Boer, J., Schösler, H. and Aiking, H. (2014), "Meatless days" or "less but better"? Exploring strategies to adapt Western meat consumption to health and sustainability challenges", *Appetite*, Vol. 76, pp. 120-128.

Eurispes (2021), "Risultati del rapporto Italia 2021", available at: https://eurispes.eu/news/risultati-del-rapporto-italia-2021/ (accessed 17 December 2021).

Fornell, C. and Larcker, D. (1981), "Evaluating structural equation models with unobservable variables and measurement error", *Journal of Marketing Research*, Vol. 18 No. 1, pp. 39-50.

Harguess, J.M., Crespo, N.C. and Hong, M.Y. (2020), "Strategies to reduce meat consumption: a systematic literature review of experimental studies", *Appetite*, Vol. 144 No. 104478.

Hayes, A.F. and Preacher, K.J. (2013), "Conditional process modeling: using structural equation modeling to examine contingent causal processes", Hancock, G.R. and Mueller, R.O. (Eds), *Quantitative Methods in Education and the Behavioral Sciences: Issues, Research, and Teaching. Structural Equation Modeling: A Second Course*, Information Age Publishing, Charlotte, NC, pp. 219-266.

Kline, R.B. (2012), "Assumptions in structural equation modeling", in Hoyle, R.H. (Ed.), *Handbook of Structural Equation Modeling*, The Guilford Press, New York, pp. 111-125.

Kopplin, C.S. and Rausch, T.M. (2021), "Above and beyond meat: the role of consumers' dietary behavior for the purchase of plant-based food substitutes", *Review of Managerial Science*, pp. 1-30.

Loughnan, S., Bastian, B. and Haslam, N. (2014), "The psychology of eating animals", *Current Directions in Psychological Science*, Vol. 23, pp. 104-108.

Martin, C., Lange, C. and Marette, S. (2021), "Importance of additional information, as a complement to information coming from packaging, to promote meat substitutes: a case study on a sausage based on vegetable proteins", *Food Quality and Preference*, Vol. 87 No. 104058.

Palomo-Vélez, G., Tybur, J.M. and Van Vugt, M. (2018), "Unsustainable, unhealthy, or disgusting? Comparing different persuasive messages against meat consumption", *Journal of Environmental Psychology*, Vol. 58, pp. 63-71.

Phull, S., Wills, W. and Dickinson, A. (2015), "Is it a pleasure to eat together? Theoretical reflections on conviviality and the Mediterranean diet", *Sociology Compass*, Vol. 9, pp. 977-986.

Rothgerber, H. and Rosenfeld, D.L. (2021), "Meat-related cognitive dissonance: the social psychology of eating animals", *Social and Personality Psychology Compass*, Vol. 15 No. e12592.

Satorra, A. and Bentler, P.M. (2010), "Ensuring positiveness of the scaled difference chi-square test statistic", *Psychometrika*, Vol. 75 No. 2, pp. 243-248.

Schmidt, C.V. and Mouritsen, O.G. (2020), "The solution to sustainable eating is not a one-way street", *Frontiers in Psychology*, Vol. 11.

Smart Protein (2021), "Plant-based foods in Europe: how big is the market?", available at: https://smartproteinproject.eu/plant-based-food-sector-report (accessed 17 December 2021).

Sobal, J., Bisogni, C.A., Devine, C.M. and Jastran, M. (2006), "A conceptual model of the food choice process over the life course", in Sherperd, R. and Raats, M. (Eds), *The Psychology of Food Choice*, CABI, Oxfordshire, pp. 1-18.

Soper, D. (2021), "Calculator: a-priori sample size for structural equation modes", available at: https://www.danielsoper.com/statcalc/calculator.aspx?id=89 (accessed 20 July 2021).

Statista (2020), "Meat trends in europe", available at: https://www.statista.com/study/70192/meat-trends-in-europe/ (accessed 17 December 2021).

The Good Food Institute (2019), *Plant-based Meat for a Growing World*.

Tilman, D. and Clark, M. (2014), "Global diets link environmental sustainability and human health", *Nature*, Vol. 515, pp. 518-522.

Tso, R. and Forde, C.G. (2021), "Unintended consequences: nutritional impact and potential pitfalls of switching from animal-to plant-based foods", *Nutrients*, Vol. 13 No. 2527.

Twine, R. (2021), "Emissions from animal agriculture—16.5% is the new minimum figure", *Sustainability*, Vol. 13 No. 6276.

Van Loo, E.J., Caputo, V. and Lusk, J.L. (2020), "Consumer preferences for farm-raised meat, lab-grown meat, and plant-based meat alternatives: does information or brand matter?", *Food Policy*, Vol. 95, 101931, doi: 10.1016/j.foodpol.2020.101931.

Weibel, C., Ohnmacht, T., Schaffner, D. and Kossmann, K. (2019), "Reducing individual meat consumption: an integrated phase model approach", *Food Quality and Preference*, Vol. 73, pp. 8-18.

Wolstenholme, E., Carfora, V., Catellani, P., Poortinga, W. and Whitmarsh, L. (2021), "Explaining intention to reduce red and processed meat in the UK and Italy using the theory of planned behaviour, meat-eater identity, and the Transtheoretical model", *Appetite*, Vol. 166 No. 105467.

Ye, T. and Mattila, A.S. (2021), "The effect of ad appeals and message framing on consumer responses to plant-based menu items", *International Journal of Hospitality Management*, Vol. 95 No. 102917.

Yzer, M. (2012), "Perceived behavioral control in reasoned action theory: a dual-aspect interpretation", *The Annals of the American Academy of Political and Social Science*, Vol. 640 No. 1, pp. 101-117.

Zur, I. and Klöckner, C.A. (2014), "Individual motivations for limiting meat consumption", *British Food Journal*, Vol. 166 No. 4, pp. 629-642.

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