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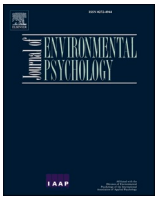

The role of psychological food involvement in explaining the intention to reduce meat consumption

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ABSTRACT

Meat overconsumption has increased significantly over the last few years. However, it has detrimental consequences for the environment, human health, and the well-being of animals. To address these issues, research that delves into the motivations behind reducing meat consumption is essential. Recent studies have revealed that food is acquiring symbolic value, making it even more crucial to explore this area. Thus, a new construct called Psychological Food Involvement (PFI) has been developed and validated to map the symbolic value people attribute to food. Although previous research has demonstrated that PFI predicts sustainable consumption behaviours, there is a lack of studies investigating its association with the intention to reduce meat consumption. To bridge this gap, the current study collected data by administering a questionnaire to 1007 participants, representative of the Italian population, with considerations for sex, age, profession, center size, and geographical area using stratified sampling. Employing descriptive statistics and a hierarchical regression model that accounted for socio-demographic and attitudinal variables, such as concerns for personal health, the environment, and animal welfare, the results revealed that PFI plays a pivotal role in understanding the intention to reduce meat consumption. Consumers who use food to control their public image and create a positive impression on others are more inclined to reduce their meat intake. On the other hand, those who utilize food to strengthen social bonds and achieve positive emotions are less likely to cut down on meat consumption. This study emphasizes the importance of considering cultural, social, and personal values associated with meat consumption while formulating future dietary recommendations and conducting research to foster healthy and sustainable eating habits.

1. Introduction

Total global meat production and consumption have increased over the last 60 years (Whitton et al., 2021). In Italy, this trend has been even stronger, with meat consumption tripling in the last 50 years, causing significant changes in the traditional Mediterranean dietary patterns (FAOSTAT, 2017). Compared to other European countries, Italy ranks medium-high for both overall meat and processed meat consumption (EFSA, 2017), with an average of about 80.28 kg per person compared to a global average of 49 kg (Lanfranchi & Giannetto, 2021; Wisevoter, 2022). However, the overconsumption of meat negatively impacts the environment, human health, and animal living conditions and well-being (Godfray et al., 2018). Regarding human health, many studies have observed a link between the overconsumption of meat products and serious health risks, such as an increased risk of cardiovascular diseases, colon cancer, and type 2 diabetes (Domingo & Nadal, 2017; Givens, 2018). Furthermore, the Food and Agriculture Organisation of the United Nations (FAO) published a report that showed how the livestock industry greatly impacts environmental degradation (FAO, 2019). The report affirms that the livestock sector is the largest contributor to the most serious environmental problems. Global livestock production occupies one-third of the world's land area and contributes to 14% of all human-induced greenhouse gas emissions. Despite the implementation of the latest technologies and mitigation strategies, it is estimated that environmental impacts related to livestock production will only be reduced by 20% (Bianchi et al., 2018). In light of this, many authors have suggested that reducing meat consumption is a possible way to mitigate these problems (Hielkema & Lund, 2021; Seffen

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& Dohle, 2023).

Consequently, to develop effective strategies that lead to a decrease in meat consumption, research that delves into the hidden motivations related to this intention, going beyond socio-demographic characteristics and pro-environmental, animal, and health attitudes, is required (Graça et al., 2019). Indeed, recent research has shown how food is acquiring a symbolic value, resulting in food choices that are strongly based on consumers' needs and values (Dagevos & van Ophem, 2013). Given this evidence, recent studies have explored the concept of Psychological Food Involvement (PFI), defined as the deep symbolic relationship between consumer and food (Castellini et al., 2023; Castellini & Graffigna, 2022b). Delving into how this variable is associated with meat consumption reduction becomes crucial since some studies have shown that it has a strong influence on sustainable food consumption, such as "green" consumption (Gilal et al., 2020) and the purchase of organic products (Chen, 2007; Teng & Lu, 2016). However, to the best of our knowledge, there are no studies that deepen the role of Psychological Food Involvement in explaining the intention to reduce meat consumption. Given these premises, the study aims to (I) explore how the addition of the Psychological Food Involvement construct, alongside socio-demographic and attitudinal variables frequently used in past research, increases understanding of the intention to reduce meat consumption (II) understand how the different motivations related to Psychological Food Involvement are associated with the intention to reduce meat consumption. Based on these findings, the final goal of the research will be to provide possible insights to implement future interventions able to encourage the intention to reduce the consumption of meat.

2. Theoretical background and research hypotheses

Research conducted in the international context provides a clear picture of the main reasons that impact the intention to reduce meat consumption. Despite some cultural differences, the main variables influencing such intention are related, in increasing order of importance, to socio-demographic factors and concerns about the environment, animals, and health (Clonan et al., 2015; Seffen & Dohle, 2023). However, recent research showed that the intention to reduce meat consumption is also strongly related to the symbolic, identity, and social value given to food (Randers et al., 2021; Randers & Thøgersen, 2023).

2.1. Sociodemographic and attitudinal factors

Regarding sociodemographic variables, some studies argued that age, gender, and socioeconomic status impact the intention to reduce meat consumption (Stoll-Kleemann & Schmidt, 2017; Vandermoere et al., 2019). Considering gender, previous studies showed that males tend to increase meat consumption and are unwilling to change their diets, whereas females consume a lower quantity of meat and are more open to decreasing meat consumption in favor of plant-based meals (Neff et al., 2018; Pfeiler & Egloff, 2018; Çoker & van der Linden, 2022). Considering age, the studies are more contradictory than for gender. However, some studies found that younger participants tend to be more positive towards reducing meat consumption (Pfeiler & Egloff, 2018). As for education and income variables, the studies showed that higher education and higher income positively impact the intention to reduce meat consumption (Graça et al., 2019; Klink et al., 2022). Based on the above discussion, Hypotheses 1, 2, 3, and 4 are stated as follows.

H1. Females will show higher levels of intention to reduce meat consumption.

H2. Young people will show higher levels of intention to reduce meat consumption.

H3. People with high income will show higher levels of intention to reduce meat consumption.

H4. People with a high educational level will show higher levels of intention to reduce meat consumption.

Considering the attitudes that impact the intention to reduce meat consumption, a study carried out by Lentz et al. (2018) showed that individuals prone to reduce their meat consumption are mainly motivated by health reasons, even though for abstainers, environmental concerns and animal welfare seem to be most important (Seffen & Dohle, 2023). Some Italian studies recently conducted found that consumers primarily avoid meat because of environmental and health concerns (Bimbo, 2023; Farchi et al., 2017). Similarly, another recent study carried out by Dijkstra and Rotelli (2022) found that the Italians' main reasons related to the intention to reduce meat consumption were concerns regarding animal welfare, health, and environmental protection. Finally, some studies have shown that attitudinal variables (i.e., concerns for own health, animal welfare, and environment) play a more important role in explaining the intention to reduce meat consumption than socio-demographic variables (Graça et al., 2019; Seffen & Dohle, 2023). Based on the above discussion, Hypotheses 5, 6, 7, and 8 are stated as follows.

H5. Concerns for own health, animal welfare, and environment will explain differences in the intention to reduce meat consumption after accounting for socio-demographic characteristics (i.e., gender, age, and socioeconomic status).

H6. Concern for own health is positively associated with the intention to reduce meat consumption.

H7. Concern for the environment is positively associated with the intention to reduce meat consumption

H8. Concern for animal welfare is positively associated with the intention to reduce meat consumption

2.2. Symbolic value of food: the construct of psychological food involvement

Nowadays, food choices are increasingly determined by inner motivations related to our identity and social values. Indeed, some studies have shown that the symbolic value given to food plays a significant role in determining our purchasing choices (Costa et al., 2019; Qasim et al., 2019). However, it is challenging to comment on the validity of results from research aimed at evaluating the symbolic value assumed by food as the measures implemented are based on completely different approaches and theoretical paradigms (Castellini & Graffigna, 2022a; Lee et al., 2019). Recent studies have explored the concept of Psychological Food Involvement (PFI) (Castellini et al., 2023; Castellini & Graffigna, 2022a, 2022b) to create a clear and reliable measure of the symbolic value assumed by food. The PFI measures the importance that food has in people's lives and identifies four symbolic meanings that it can cover (Castellini et al., 2023). Specifically, food can be considered as a means to achieve psycho-physical well-being, express one's personality, be accepted by others, and strengthen ties with loved ones. This construct has been used in previous studies that aimed to map certain sustainable consumption behaviours, showing good reliability (Castellini et al., 2023). However, it has never been used to understand the intention to reduce meat consumption, even though this intention is strongly related to the symbolic, identity, and social value given to food (Costa et al., 2019; Salmen & Dhont, 2023). Specifically, the pleasantness of eating, cultural tradition, and the social dimension act as barriers to the intention to reduce meat consumption (Jahn et al., 2021; Macdiarmid et al., 2016). Participants stated that the positive emotions derived from eating and the traditional value of certain foods, such as meat, which characterize personal cultural identity, are important obstacles to the intention to change diets (Adamczyk et al., 2022; Cheah et al., 2020). In addition, family food choices impact the intention to reduce meat consumption. Participants stated that if family members are unwilling to decrease the consumption of meat, this negatively affects the intention

to change eating habits as it limits the opportunities for commensality, namely social and sharing moments through the consumption of the same food (Macdiarmid et al., 2016; Sahakian et al., 2020). However, reducing the consumption of meat is considered a desirable and virtuous social change that allows people to make a good impression on others and present themselves in a favorable light, motivations that incentivize the intention to reduce meat consumption (Cheah et al., 2020; Randers et al., 2021; Vartanian, 2015).

Based on the above discussion, Hypotheses 9, 10, 11, 12, and 13 are stated as follows.

H9. The Psychological Food Involvement construct will explain differences in the intention to reduce meat consumption after accounting for sociodemographic characteristics (i.e., gender, age, and socioeconomic status) and attitudinal variables (i.e., concerns for own health, animal welfare, and environment).

H10. People that use food to achieve psycho-physical well-being are less willing to reduce meat consumption.

H11. People that use food to express their personality are less willing to reduce meat consumption.

H12. People that use food to be accepted by others are more willing to reduce meat consumption.

H13. People that use food to strengthen ties with loved ones are less willing to reduce meat consumption.

3. Materials and methods

Data were collected via a questionnaire survey using a CAWI (Computer Assisted Web Interviewing) methodology between 20th-25th of February 2023. This study was implemented in full compliance with the American Psychological Association (APA) guidelines on the conduct of research involving human subjects and with the Declaration of Helsinki, and it has been approved by an independent ethics committee, Commissione Etica per la Ricerca in Psicologia (CERPS), of Università Cattolica del Sacro Cuore in Milan. Participants were fully informed about the general aims of the study, and their anonymity was guaranteed; all participants provided informed consent.

3.1. Participants and design

The questionnaire was filled out by 1007 participants, representative of the Italian population, with sex, age, profession, size of the center, and geographical area extracted by stratified sampling. Survey weights were used to assure representativeness for the stratification variables. Participants were randomly selected from the consumer panel managed by Norstat srl (https://norstat.it/) using random digit dialing, which is a technique for drawing a sample of households from the frame or set of telephone numbers. As the main measure of intention concerned the reduction in meat consumption, participants who were already following diets that did not involve meat consumption (e.g., vegetarians) were excluded from the analyses, resulting in 963 valid responses. The sample size was estimated by carrying out a priori power analysis using G*Power version 3.1.9.4 (Faul et al., 2007) considering 11 predictors. Given that there are no similar studies that can be used to define the effect size relating to the analyses performed, we set a small effect size (f^2) = 0.02, considering the general guidelines defined by Cohen (1988). With a significance criterion of $\alpha = 0.05$ and power = 0.90, the minimum sample size needed with this effect size is N = 922 for hierarchical regression. However, keeping in consideration a potential dropout, we decided to increase the number of participants by adding about a hundred subjects. Based on these considerations, the obtained sample is more than adequate to test the study's aims.

3.2. Measures

First, the respondents indicated their socio-demographic features, such as age, gender, and educational level. Next, they were asked to indicate their intention to reduce meat consumption, and they completed some questions related to the concern for own health, environment, and animal welfare. The complete questionnaire, composed of 55 questions, is presented in Supplementary Material B.

3.2.1. Intention to reduce meat consumption

Participants were asked to rate their intention to reduce the consumption of three different types of meat (red meat, white meat, and cold cuts) in the next six months on a 7-point scale ranging from "very unlikely" to "very likely." An option "I do not consume these products" was added to exclude participants who already did not consume meat. This item was used in previous research conducted by Çoker and van der Linden (2022).

3.2.2. Concerns for own health, environment, and animal welfare

All the scales used to assess concerns for own health, environment, and animal welfare were drawn from the literature. Concerns for the environment and nature were measured using a reduced five-item version of the New Environmental Paradigm (NEP) scale (Dunlap, 2008), which was also used in other studies (de Barcellos et al., 2013; Krystallis et al., 2012). In these past studies this scale showed good reliability (Cronbach's $\alpha = 0.68$). All items were measured on seven-point Likert-type agreement scales from 1 = 'strongly disagree' to 7 = 'strongly agree'. An example of an item is "Humans are severely abusing the environment." High scores on this scale identify a strong concern for environmental issues.

Concern for animal welfare was measured using two subscales formerly applied by Cembalo et al. (2016), namely "Animal welfare in food choice" by Lindeman and Väänänen (2000) and the "Animal treatment scale" by Kendall et al. (2006). These items were widely used in recent research (Krystallis et al., 2012; Marcus et al., 2022) in which they showed good reliability (Cronbach's $\alpha = 0.85$). All items were measured on seven-point Likert-type agreement scales from 1 = 'strongly disagree' to 7 = 'strongly agree'. An example of an item is "In general, humans have too little respect for the quality of life of animals". High scores on this scale identify a strong concern for animal welfare.

Concern for own health was measured using the validated Health Consciousness Scale composed of 11 items (Hong, 2009, p. 212). This scale was widely used in previous research (Nagaraj, 2021; Siegrist & Hartmann, 2019) in which it showed good reliability (Cronbach's $\alpha = 0.98$). All items were measured on seven-point Likert-type agreement scales from 1 = 'strongly disagree' to 7 = 'strongly agree'. An example of an item is "I'm very self-conscious about my health". High scores on this scale identify a strong interest in one's health.

3.2.3. Psychological food involvement

The Psychological Food Involvement Scale (PFIS) (Castellini et al., 2023) was used to measure the motivations that determine psychological involvement in food. This scale was created based on a systematic review, which showed a lack of scientific agreement on the essential dimensions of Food Involvement and the measurement scales useful for evaluating it (Castellini & Graffigna, 2022a). To explore the personal meanings that consumers attribute to Food Involvement and to detect the psychological domains that characterize this experience, a qualitative study was carried out, conducting 14 in-depth interviews (Castellini & Graffigna, 2022b). This qualitative study allowed the identification of the four psychological dimensions of the involvement in food, which have been validated through the construction of the PFIS. This scale consists of 19 items, grouped into 4 factors, namely the psychological factors that characterize the PFI: Emotional Balance, Self-Realization, Social Affirmation, and Social Bonding. The first factor (Emotional Balance) measures the degree to which people use food to achieve

psycho-physical well-being, the second factor (Self-Realization) measures how much food is considered an important means of expressing one's personality, the third factor (Social Affirmation) investigates the degree to which food is perceived as an important means of being accepted by others, and the last factor (Social Bonding) measures the degree to which food is used to strengthen ties with loved ones. The validation study of the scale showed good reliability for the four factors (Emotional balance Cronbach's $\alpha = 0.916$; Self-realization Cronbach's $\alpha = 0.943$; Social-affirmation Cronbach's $\alpha = 0.891$; Social bounding Cronbach's $\alpha = 0.928$) (Castellini et al., 2023). All items were measured on seven-point Likert-type agreement scales from 1 = 'strongly disagree' to 7 = 'strongly agree'. An example of an item is "Choosing what to eat tells something about me". High scores on this scale identify people with a high level of Food Involvement.

3.3. Data analysis

Data were analysed using descriptive statistics, calculating frequencies, percentages, averages, and standard deviations for each variable measured, considering the total sample (n = 963). After that, the hierarchical regression model was conducted. From the total sample, 17 participants were eliminated after checking the assumptions to carry out a reliable regression model. Before carrying out this model, data were tested using 3 tests: Normality test, Autocorrelation test, and Multicollinearity test (for more details see Supplementary Material A). Finally, the reliability of the scales used in the regression model was analysed using Omega values, and Confirmatory factor analyses (CFA) were conducted with Mplus 8.0. The models were estimated using Maximum Likelihood. Scales with Omega values greater than 0.70 were considered reliable, as suggested by Hayes and Coutts (2020). Model fit was assessed using the comparative fit index (CFI) > 0.90, Tucker–Lewis index (TLI) > 0.90, and root mean square error of approximation (RMSEA) < 0.08 (Hu & Bentler, 1999).

The hierarchical regression model was conducted on 946 participants. In the first block, the socio-demographic characteristics were added, including age, gender (1 = male; 2 = female), level of education (1 = non-graduates; 2 = graduates), and income (1 = below 1800€; 2 = above 1801€). Missing values on the income question were replaced with median values and categorized as previously indicated. Subsequently, in the second block, the questions regarding concerns for own health, environment, and animal welfare were inserted. The third block is related to the symbolic psychological dimension that groups questions regarding the involvement in food. To assess how well the regression model fits the data, the coefficient of determination R^2, the Adjusted R^2, and the F-statistics were considered and commented upon. Additionally, to test the regression coefficients, the unstandardized regression coefficients β were consulted, considering a 0.05 level of significance. The presented analyses incorporated Norstat's provided survey weights to present nationally representative results. All analyses have been carried out with IBM SPSS 20 (release 20.0.0.0).

4. Results

4.1. Description of the sample

Out of the 963 participants, 481 (50%) were male, aged between 18 and 70 years (M = 45.11, SD = 13.8). The demographic profile is presented in detail in Table 1.

4.2. Descriptive statistics

The results (Table 2) showed that 43.8% of Italians had little intention of reducing meat consumption, while 24.6% were neutral. Italians seemed to be more likely to decrease the consumption of red meat (44.1%) and cold cuts (38.6%) than white meat (31.5%). Regarding the concern for own health, animals, and the environment, most people declared that they were attentive to these issues. Moreover, Italians stated that they were strongly involved in food, mainly using it to strengthen ties with loved ones (70.8%) and to achieve psycho-social well-being (69.5%). Fewer Italians (33.2%) used food to be accepted by a target group (see Table 3).

Table 1
Demographic profiles of the sample (n = 963).

	n	% Weighted	% Unweighted	% Population
1. Gender				
Male	481	50.0	49.7	49.3
Female	482	50.0	50.3	50.7
2. Age				
18–24	98	10.2	7.4	10.0
25–34	158	16.3	14.2	16.3
35–44	206	21.4	21.0	21.5
45–54	215	22.4	22.9	22.7
55–59	105	10.9	8.4	10.8
60–72	181	18.8	26.1	18.8
3. Education				
Elementary-Junior high	127	–	13.2	–
Senior high	562	–	58.4	–
College or university	274	–	28.4	–
4. Geographic area				
North-West	248	25.8	26.6	26.3
North-East	175	18.2	17.9	18.6
Centre	189	19.6	19.1	19.7
South and Islands	351	36.4	36.4	35.5
5. Inhabited centre size				
Until 10,000 inhabitants	302	31.3	32.5	32.1
10/100.000 inhabitants	424	44.1	43.7	44.0
100/500.000 inhabitants	105	10.9	9.7	10.9
More than 500.000	122	12.7	13.3	12.9
I do not know	10	1.0	1.0	–
6. Profession				
Entrepreneur/freelancer	116	12.0	11.9	12.4
Manager/middle manager	35	3.6	1.9	3.8
Employee/teacher/military	187	19.4	34.0	19.2
Worker/shop assistant/ apprentice	210	21.8	13.7	21.0
Housewife	147	15.3	10.9	15.0
Student	51	5.3	6.7	5.3
Retired	74	7.7	11.6	7.9
Unoccupied	143	14.9	9.2	15.4
7. Household net monthly income level				
Up to 600 €	39	–	4.0	–
601-900 €	38	–	3.9	–
901-1200 €	86	–	8.9	–
1201-1500 €	122	–	12.7	–
1501-1800 €	99	–	10.3	–
1801-2500 €	166	–	17.2	–
2501-3500 €	152	–	15.8	–
More than 3501 €	106	–	11.1	–
Missing	155	–	16.1	–

4.3. Hierarchical regression model

After testing the assumptions (see Supplementary Materials A), the hierarchical regression model was conducted to identify the determinants of the intention to reduce meat consumption. Model 1 yielded nonsignificant results ($F_{(4,\ 945)} = 2.290$, $p = 0.076$, $R^2 = 0.010$, R^2Adjusted = 0.005), suggesting that sociodemographic variables were not significantly associated with the intention to reduce meat consumption. However, once the attitudes related to the concern for animals, health, and the environment were included in model 2, the explained variance increased by 6.4%, making a significant contribution to the explanation of the intention to reduce meat consumption ($p < 0.001$).

In the final model (model 3), the variables related to involvement in food (Emotional Balance, Self-Realization, Social Affirmation, and Social Bonding) were added. This addition improved the model's ability to explain the intention to reduce meat consumption by 11.2% ($p < 0.001$).

Table 2
Descriptive statistics of variables.

	n	%	Mean (±SD)
Intention to reduce meat consumption (n = 963)			3.79 (±1.74)
Very unlikely *(1–3)*	422	43.8	
Neutral *(4)*	237	24.6	
Very likely *(5–7)*	304	31.6	
Intention to reduce white meat consumption (n = 950)			3.52 (±1.93)
Very unlikely *(1–3)*	448	47.1	
Neutral *(4)*	203	21.4	
Very likely *(5–7)*	299	31.5	
Intention to reduce red meat consumption (n = 927)			4.00 (±1.95)
Very unlikely *(1–3)*	351	37.9	
Neutral *(4)*	167	18.0	
Very likely *(5–7)*	409	44.1	
Intention to reduce cold cuts consumption (n = 947)			3.85 (±1.91)
Very unlikely *(1–3)*	360	38.0	
Neutral *(4)*	221	23.4	
Very likely *(5–7)*	366	38.6	
Health consciousness (n = 963)			5.23 (±0.92)
Low *(1–3)*	67	7.0	
Medium *(4)*	286	29.6	
High *(5–7)*	610	63.4	
Concern for Animal welfare (n = 963)			5.21 (±1.02)
Low *(1–3)*	78	8.1	
Medium *(4)*	356	36.9	
High *(5–7)*	529	55.0	
Concern for Environment (n = 963)			5.24 (±1.13)
Low *(1–3)*	92	9.5	
Medium *(4)*	322	33.5	
High *(5–7)*	549	57.0	
Psychological Food Involvement (n = 963)			
Emotional Balance			5.45 (±1.12)
Low *(1–3)*	75	7.7	
Medium *(4)*	219	22.8	
High *(5–7)*	669	69.5	
Self-Realization			5.04 (±1.36)
Low *(1–3)*	156	16.2	
Medium *(4)*	235	24.4	
High *(5–7)*	572	59.4	
Social Affirmation			3.96 (±1.61)
Low *(1–3)*	422	43.8	
Medium *(4)*	221	23.0	
High *(5–7)*	320	33.2	
Social Bonding			5.51 (±1.24)
Low *(1–3)*	78	8.1	
Medium *(4)*	204	21.1	
High *(5–7)*	681	70.8	

Note: (1) SD= Standard Deviation; (2) the numbers in brackets in italic represent the points of Likert scale that were grouped together to simplify the reading.

The final model was highly significant ($F_{(11, 945)} = 19.9451$, $p = 0.000$, $R^2 = 0.186$, R^2Adjusted $= 0.177$) and accounted for 18.6% of the variance related to the intention to reduce meat consumption. Specifically, individuals who were highly attentive to their own health and animal welfare expressed a greater intention to reduce meat consumption in the next six months, while the concern for environmental issues was not significantly associated with such behaviour. Regarding psychological variables related to involvement in food, the results showed that those who used food to adhere to a social model and feel accepted by a reference group were more likely to reduce meat consumption. This variable was the most strongly associated with this intention ($\beta = 0.352$). In contrast, those who used food to achieve psycho-physical well-being or strengthen their bond with loved ones were less willing to decrease meat consumption.

5. Discussion

The purpose of this study was to investigate the role of psychological variables in explaining the intention to reduce meat consumption, going beyond the use of socio-demographic and income variables often employed to explain this consumption orientation (Kwasny et al., 2022). Among the psychological variables considered, attitudes toward health, sustainability, and animal welfare are established constructs related to the intention to reduce meat (Cheah et al., 2020; Harguess et al., 2020; Herchenroeder et al., 2022). However, the present study has introduced a new psychological variable, Psychological Food Involvement, with the aim of understanding how the symbolic value given to food may improve the explanation of the intention to reduce meat consumption.

Regarding the descriptive data, this study showed that only one-third of the Italians plan to reduce meat consumption in the next months. They are more intent on reducing red meat and cold cuts consumption than white meat. This first finding is corroborated by past research which showed that consumers are more likely to reduce red meat and cold cuts because they are perceived as foods that can increase the likelihood of contracting a health disease (Shan et al., 2017). Moreover, Italians declared to be more interested in their own health and less in environmental issues and animal welfare, even though the latter are equalizing the concern for own health. As claimed by past research, in recent years, consumers' concern for environmental and animal welfare has increased since they have become strongly aware of the interconnection between these issues and their own health, a consciousness that has strengthened during the COVID-19 pandemic (Castellini et al., 2021). Finally, the study showed that Italians are highly involved in food. This involvement is mainly determined by the fact that food is considered a means through which to achieve psycho-social well-being and take care of loved ones, as amply demonstrated by past research (Wongprawmas et al., 2021).

Regarding the association of independent variables with the intention to reduce meat consumption, the results showed that socio-demographic variables are not associated with consumption intention, disconfirming the initial hypotheses (from 1 to 4). However, recent studies on sustainable food consumption claimed that the sensitivity to this topic is determined by a cultural and value change that is affecting the entire population regardless of socio-demographic features (Chekima et al., 2016; Kwasny et al., 2022). In addition, it is interesting to note that there are no gender differences with respect to the intention to reduce meat consumption, despite the consistent literature supporting the opposite. A recent study conducted by De Backer et al. (2020) argued that it is no longer sufficient to consider only biological gender when studying or promoting the intention to reduce meat consumption, but it is important to consider socially and culturally determined gender differences. The study pointed out that to date there are different forms of masculinity that depend on group level cultural beliefs about gender norms. The findings underlined that men showed less attachment to meat and a greater inclination to decrease meat consumption the more they identified with a nontraditional form of masculinity, questioning

Table 3
- Hierarchical regression analysis about the intention to reduce meat consumption (n = 946).

Variable	Model 1				Model 2				Model 3				
	B (se)		β	p-value	B (se)		β	p-value	B (se)		C·I. (L; U)	β	p-value
Gender	0.287	(0.112)	0.083	0.011	0.054	(0.113)	0.016	0.634	0.154	(0.107)	−0.056; 0.363	0.045	0.151
Education	0.170	(0.126)	0.045	0.177	0.161	(0.123)	0.042	0.189	0.126	(0.116)	−0.101; 0.353	0.033	0.276
Age	0.003	(0.004)	0.024	0.467	−0.002	(0.004)	−0.016	0.628	0.003	(0.004)	−0.005; 0.010	0.023	0.460
Income	−0.086	(0.115)	−0.024	0.455	−0.048	(0.112)	−0.014	0.672	−0.002	(0.106)	−0.210; 0.205	−0.001	0.985
Health consciousness					0.167	(0.066)	0.087	0.011	**0.213**	**(0.067)**	**0.080; 0.345**	**0.111**	**0.002**
Animal welfare concern					0.470	(0.072)	0.279	0.000	**0.452**	**(0.069)**	**0.317; 0.587**	**0.268**	**0.000**
Environment-friendly concern					−0.221	(0.061)	−0.144	0.000	−0.047	(0.060)	−0.165; 0.070	−0.031	0.432
Emotional balance									**−0.229**	**(0.071)**	**−0.369; -0.089**	**−0.147**	**0.001**
Self-realization									0.005	(0.067)	−0.126; 0.136	0.004	0.937
Social affirmation									**0.381**	**(0.043)**	**0.297; 0.464**	**0.352**	**0.000**
Social bonding									**−0.121**	**(0.061)**	**−0.241; -0.001**	**−0.083**	**0.049**
Constant	3.175 (0.348)			0.000	1.532 (0.459)			0.001	0.449 (0.466)		−0.465; 1.363		0.335
Model value	$F_{(4, 945)} = 2.290$, $p = 0.076$, $R^2 = 0.010$, $R^2_{Adjusted} = 0.005$)				$F_{(7, 945)} = 10.700$, $p = 0.000$, $R^2 = 0.074$, $R^2_{Adjusted} = 0.067$)				$F_{(11, 945)} = 19.9451$, $p = 0.000$, $R^2 = 0.186$, $R^2_{Adjusted} = 0.177$)				
Variation (ΔR^2; p-value)	0.010; 0.058				0.064; 0.000				0.112; 0.000				

Notes: I·C: 95% Confidence Interval; L:lower; U:upper; se: standard error.

the belief that "real men eat meat" (Rothgerber, 2013; Schösler et al., 2015). Only men who do not identify as much with contemporary masculinity have a stronger attachment to meat and a less favorable view of vegetarians.

Considering the addition of attitudinal variables in the model, the results showed that concerns for own health, the environment, and animal welfare improve the understanding of the intention to reduce meat consumption, supporting Hypothesis 5. These findings are supported by past research that argues that the way of considering consumption choices is changing. Indeed, they are no longer being evaluated exclusively in terms of "objective" features and functionality of the foods selected but are being assessed based on consumers' feelings and concerns (Dagevos & van Ophem, 2013). In particular, the ethical consideration about how food is produced (e.g., respecting animals or the environment) is a fundamental aspect that affects consumers' choices and their evaluation (Yiridoe et al., 2005). Specifically, this study showed that the interest in own health and concern for animal welfare are positively associated with the intention to reduce meat consumption, supporting Hypotheses 6 and 8. These findings are in line with past research which has shown that the intention to reduce meat consumption is primarily motivated by avoiding severe diseases, such as cancer or heart diseases (Cheah et al., 2020; Xie et al., 2022) and animal suffering (Mathur et al., 2020). Indeed, a recent study has shown that people who have reduced meat consumption experienced negative sensations during the purchase of this product as they thought about the suffering and mistreatment that the animal may have undergone during growth and slaughter (Cheah et al., 2020). However, no association was found between concern for the environment and the intention to reduce meat consumption, not confirming Hypothesis 7. These results can be explained considering the study by Macdiarmid et al. (2016), which showed that although many people were concerned about environmental issues, they were unwilling to reduce meat consumption as they were unaware of the association between it and environmental issues and perceived that personal meat consumption played a minimal role in the global context.

Considering the addition of the variables related to Psychological Food Involvement alongside socio-demographic and attitudinal ones, the results showed that they improved the understanding of the intention to reduce meat consumption, supporting Hypothesis 9. These results underline how the symbolic meaning related to food is becoming an increasingly impactful dimension on food choices. A recent study stated that whatever elusive and ephemeral symbolic and moral meanings given to food may be, it has a powerful and overt impact on consumers' choices (Dagevos & van Ophem, 2013). Those who are involved in food as a means through which to achieve psycho-physical well-being are less likely to reduce meat consumption, supporting Hypotheses 10. This agrees with the results of previous studies that underlined how emotion is one of the major barriers to meat consumption (Circus & Robison, 2019). In particular, the attachment to meat is discussed almost interchangeably with enjoyment of meat, and the study by Hunter and Röös (2016) claimed that the reduction of meat consumption has a high emotional cost for consumers. However, the study did not show a significant association between the intention to reduce meat consumption and being involved in food as a means through which to express oneself, Hypothesis 11. This result could be explained by the fact that the intention to reduce meat consumption in favor of sustainable eating styles is more determined by the (positive) social impact that it can determine rather than by the need to express oneself (Plante et al., 2019). Some studies show that vegetarian people have decided to change their eating style since the perception of the self as a vegetarian served as a social representation more than a way to express oneself (Nezlek & Forestell, 2020). In addition, the model showed that the variable most associated with the reduction of meat consumption is social-affirmation, confirming Hypothesis 12. This means that those who use food to adhere to a food model to be accepted by a target group are more willing to reduce meat consumption. According to Cheah et al. (2020), adhering to a particular eating pattern, such as sustainable food consumption, allows individuals to enhance affiliation with a social group and be liked, confirming that one is behaving correctly. People are motivated to follow a sustainable diet to distinguish themselves, control their public image, and make a positive impression on others (Nezlek & Forestell, 2020; Plante et al., 2019). Therefore, reducing meat consumption as a dietary behaviour can be seen as an opportunity to be accepted by others, reinforcing one's positive self-perception. Finally, those who use food to strengthen ties with loved ones and take care of them are less likely to reduce meat consumption, supporting Hypothesis

13. Meat is the main food used when barbecuing with friends and sharing with loved ones (Collier et al., 2021; Palmieri et al., 2021). The barbecue is considered a classic example of meat-centered social bonding among people (Nath, 2011). As shown by previous studies on commensality (Giacoman, 2016), consuming the same food has a strong social function since hosts and guests reproduce a gifts and counter-gifts dynamic that strengthens social ties among the subjects of a meal. Consequently, reducing meat consumption is perceived as a behaviour that threatens the relationship with loved ones who do not have the same diet, as this dietary pattern would force people to give up some opportunities for exchanging and sharing with others (Sahakian et al., 2020). However, the relationship between meat reduction and social bonding is less strong than the others. This could be explained by the fact that this dimension may be a barrier or facilitator to reducing meat consumption, depending on the loved ones' eating habits. If they consider meat as a centerpiece for special occasions, as most Italians do, this variable will become a barrier to meat reduction.

However, this study is not without limitations. One of these is the cross-sectional design, which precludes the establishment of a definite cause-and-effect relationship between variables. However, our results provide interesting starting points for experimental and longitudinal studies. Additionally, this research focused on understanding the intention to reduce meat consumption and not on the behaviour of buying or consuming meat. However, as shown by several studies, intention to consume can be considered a proxy of behaviour that well predicts it (Ajzen, 2015). Furthermore, the study did not include all possible variables already tested in previous studies that impact the intention to reduce meat consumption, but it is limited to considering the most studied and most impactful ones. However, our study did not aim to create a comprehensive model explaining the intention to reduce meat consumption. The main objective was to understand how the symbolic value given to food and the motivations behind food involvement could better explain this phenomenon than the most studied variables (e.g., socio-demographic features and concerns for own health, environment, and animal welfare). Moreover, the study was conducted in Italy, where it is known that the involvement in food is different from other populations. Therefore, these results could be influenced by the typical Italian food culture and may not be reproducible in other nations. Italy has a very particular food culture, mainly characterized by the Mediterranean diet, which is not only considered a way of eating but also a way of living, corresponding to the modern concept of "lifestyle" (Lăcătușu et al., 2019). Food is not only a means of feeding but a way to express one's roots, identity, and culture, characterized by rituals and symbols (Medina, 2021). Specifically, some authors argue that commensality, namely the idea of sharing food around a table and eating together, giving food a social role, is considered one of the most important pillars of the Mediterranean diet (Medina, 2021; Phull et al., 2015). Finally, the health consciousness scale and the animal welfare attitude scale showed mediocre fit indexes.

Given these limitations, it is essential that future studies evaluate consumer behaviours and understand how the PFI construct may impact them using experimental or longitudinal designs to test the causality of the relationships between the variables described here. For instance, conducting experimental research that asks subjects to choose among a few dishes containing different percentages of meat by understanding whether these choices change based on individual PFI profile, could be an interesting study that tests the relationship between PFI and the reduction of meat consumption. Additionally, we suggest implementing the PFI construct within more structured and complex models aimed at comprehensively explaining the phenomenon of meat consumption reduction. For example, attitudes toward meat, knowledge of the impacts that meat consumption may have on health, the environment, and animals, disgust or empathy emotions, and self-efficacy in being able to decrease meat consumption in favor of other foods are all variables that could be introduced into a future model to better understand the reduction of meat consumption (Graça et al., 2019; Harguess et al., 2020; Kemper, 2020). As suggested by past studies, consumption behaviours must be measured objectively, avoiding the use of self-report items as they are often inaccurate (Lange et al., 2023). In this sense, it might be interesting to measure meat consumption behaviour by carrying out observational studies to record meat purchases and to understand how these behaviours change according to the different psycho-social characteristics of the subjects. Moreover, to better investigate the role of Psychological Food Involvement in explaining the reduction of meat consumption, it would be interesting to reproduce research already carried out by including factors related to Psychological Food Involvement among the independent variables to understand the real contribution of this construct. It is also important to understand whether this construct may be useful in explaining sustainable consumption behaviours in other cultures. Finally, the results of this study highlighted how the dimension of appearance and social influence is strongly associated with sustainable consumption patterns. This result requires further insights to understand how the adoption of sustainable food consumption models is supported by intrinsic values rooted in consumer beliefs or if they are mainly guided by fashion trends.

6. Possible insights for practical applications

This research offers some potential practical implications for policymakers and food and health experts, which, however, need further investigation through field research (Weingarten et al., 2022). The study findings may provide insights for better stratifying and profiling consumer targets, by understanding their inner motivations towards food consumption and how they differ across individuals. This evidence thus offers possible insights for better designing communication and preventive campaigns that can effectively change the behaviour of their target audience.

The study results suggest that it might be important to create communication campaigns that highlight how the overconsumption of meat poses a threat to one's health and animal welfare in order to increase the intention to reduce meat consumption. Moreover, it may be necessary to monitor and use the motivations that determine Psychological Food Involvement as levers for change. Specifically, it could be relevant to present alternatives to meat consumption that emotionally generate the same positive feelings currently attached to meat. For example, it could be essential to redefine and revise how meat alternatives are presented to ensure they activate positive emotions, reducing the perception that giving up meat comes at a high emotional cost.

Furthermore, the results speculate that the social dimension of Psychological Food Involvement could be associated with the intention to reduce meat consumption. The finding that consumers' propensity to adhere to a "popular" and accepted dietary pattern results in a higher likelihood of reducing meat consumption could be an initial insight that highlights how this psychological inclination could be used as a lever for change. For example, emphasizing group membership and improving communication with consumers to induce social affirmation could increase the likelihood of consumer change. Additionally, stressing that "most" other consumers prefer to give up meat and presenting such dietary patterns as ones that allow consumers to control their public image and make a positive impression on others can be an effective strategy in increasing the likelihood of reducing meat consumption.

7. Conclusion

The reduction of meat consumption is crucial to address environmental and health issues (Steinfeld et al., 2006). Individual choices for diets low in meat are urgently needed, according to the latest scientific evidence (Willett et al., 2019). To promote this dietary shift and move people towards more sustainable consumption, it is essential to understand the main motivations and variables associated with it. In this regard, this study showed that socio-demographic variables are not sufficient to explain the intention to reduce meat consumption, and the

addition of variables related to health and animal concerns is needed to significantly improve the understanding of this phenomenon. However, it is the consideration of Psychological Food Involvement that leads to a significant improvement in understanding this phenomenon, highlighting how the symbolic value given to food is strongly associated with the intention to reduce meat consumption. Specifically, the results showed that consumers who use food to strengthen social ties are more likely to reduce meat consumption when it is accepted and shared by their in-group primary members (social bonding). Furthermore, those who use food to be accepted by a target group and control their public image (social affirmation) are more likely to reduce meat consumption if this behaviour is preferred by a large majority of consumers, as it enhances their self-views. Finally, those who are involved in food as a means to achieve psycho-physical well-being are less likely to reduce meat consumption, as they perceive this change as a high emotional cost. This study underscores the need for future dietary recommendations and studies that consider the cultural, social, and personal values related to meat consumption to promote sustainable eating. These findings suggest creating communication campaigns that emphasize the impact of excessive meat consumption on animal welfare and personal health, while also proposing alternatives to meat consumption that emotionally engage consumers by highlighting how this eating style is widespread in the population and is a model to aspire to in order to improve self-image. However, these results and insights need further investigation through future research, especially through the implementation of experimental and longitudinal study designs.

CRediT authorship contribution statement

This paper derives from a collaboration of the authors.

G. C.: Conceptualization, Methodology, Data Curation, Formal analysis, Writing - Original Draft; **M.S.:** Writing - Review and Editing, Supervision; **G.G.:** Writing - Review and Editing, Supervision. All authors have approved the final article.

Ethical Statement

This study has been performed in accordance with the Declaration of Helsinki and Ethical approval for the involvement of human subjects and was approved by University Research Ethics Committee (CERPS), Reference number 38–22.

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Data statement

The full dataset and analysis syntax for this study are available upon request to the first author.

Declaration of competing interest

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

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jenvp.2023.102176.

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