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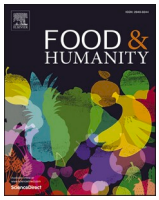

Legume beliefs among culinary art students: A cluster analysis based on meat attachment

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ABSTRACT

Despite their health and environmental benefits, the share of legumes in the diets of many developed countries remains low. To support eaters towards rebalancing animal and plant proteins in their diet, catering professionals have an important role to play. The project's objective is to explore culinary students' beliefs toward legumes, taking into account their attachment to meat, which is still the reference source of protein. For this purpose, a quantitative survey was conducted on 102 culinary students. Overall, culinary students have a favourable view of legumes in terms of the environment, nutrition, restaurant operations, or consumer expectations. Two groups of students were identified based on their level of attachment to meat. Positive beliefs toward legumes are more strongly present among students with a weaker attachment to meat (36 % of the sample) than among students with a stronger attachment to meat (64 % of the sample). The results shed light on the profiles of future actors in the restaurant industry and their representations of legumes in relation to their psychological relationship with meat.

1. Introduction

In the context of population growth, one of the possible ways to meet the food needs of the world population while preserving the planet consists of promoting plant-rich diets based on fruits, vegetables, seeds and legumes and less in diets based on animal sources (Springmann et al., 2018; Willett et al., 2019). Legumes, which include dried beans, peas, lentils, beans or chickpeas, are important sources of plant proteins, rich in vitamins, fibers, minerals, and amino acids while they are low in saturated fat. They are known for their benefits regarding health and the environment (Schneider & Huyghe, 2015). Therefore, some authors argue that a healthy and sustainable universal diet should incorporate approximately 18 kg of legumes per year per inhabitant (Willett et al., 2019). However, the proportion of legumes in the diet of many developed countries remains limited. France, in particular, records an exceptionally low consumption level, with an average consumption per inhabitant of 2 kg per year, compared to an average of nearly 4 kg in other European countries (Magrini et al., 2021).

Chefs and food service professionals play a significant role in supporting consumers in increasing legume consumption (Jallinoja et al., 2016; Magrini et al., 2021). Indeed, food service, which accounts for a substantial portion of meals consumed, reflects and shapes our dietary habits. Thus, the gastronomic promotion of legumes, enhancing the product's desirability by offering creative dishes and providing a novel sensory or textural experience, could be a promising lever to promote legume consumption (Batat, 2020). While some prominent chefs have recently gained recognition by removing meat from their menus and offering entirely vegetarian options, meat remains deeply rooted in culinary traditions, and the widespread availability of legume-based dishes in food service is still limited (Magrini et al., 2021). Some recent research on the perceptions of sustainable cuisine among French chefs has shown that they do not associate reducing meat consumption with sustainability, preferring to focus on local sourcing, seasonality, or reducing food waste (Lamy et al., 2023). Other studies have analyzed the attitudes of restaurant managers in the city of Porto Rico toward vegetarian cuisine. They point out that chefs may recognize the nutritional and taste values of vegetarian dishes but acknowledge barriers to their use in terms of profitability, financial costs, and the difficulty of recruiting staff with "adequate skills to prepare vegetarian items" (Rivera & Shani, 2013). This last point highlights that culinary school students are interesting subjects to study, as they represent the future generation of chefs, and their training must incorporate the knowledge

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and skills needed to meet the profession's demands.

While little is known about the representations of legumes among foodservice professionals, a substantial body of research has focused on individuals' motivations and barriers to legume consumption. On a cognitive level, knowledge, beliefs, and attitudes about legumes can be very heterogeneous across people (Melendrez-Ruiz et al., 2020). Consumers consider legumes as good sources of protein and fiber, tasty and healthy foods, and a more environmentally friendly and ethical alternative to meat (Szczebyło et al., 2020). For non-consumers, barriers to consumption include taste, unpleasant digestive sensations, lack of knowledge about preparation and family preferences (Szczebyło et al., 2020). At the same time, legumes are symbolically associated with lightness and femininity (Melendrez-Ruiz et al., 2019), while meat is valued at the top of the hierarchy of food products (Dagevos & Voordouw, 2013) and conveys various symbolic meanings, such as that of a festive food or an archetypal food of strength and virility (Fiddes, 1991; Ruby & Heine, 2011). Thus, legumes are considered a peripheral food, while meat is very often at the centre of the dish and considered a central food in a meal composition (Melendrez-Ruiz et al., 2019). For the French population, meat is deeply rooted in gastronomy and cultural identity (Ruby et al., 2016).

Both psychological factors and the characteristics of the meat itself influence meat consumption. Consumer attitudes towards meat are shaped by the sensory aspects of meat (e.g., appearance, texture, flavour), type of meat (red or white), marketing factors (e.g., price, label), and health and ethical concerns (Font-i-Furnols & Guerrero, 2014; Graça et al., 2015; Possidónio et al., 2021). To understand why we eat meat consistently and in large quantities, the concept of meat attachment, defined as a positive bond towards meat consumption, is highlighted. The work of Graça et al. revealed four psychological dimensions related to each other to encompass this concept (Graça et al., 2015): hedonism (referring to meat represented as a source of pleasure), affinity (indicative of affinity towards meat consumption), entitlement (referring to feelings of entitlement towards meat consumption); dependence (indicating feelings of dependence on meat consumption). Attachment to meat may play a role in the representational system of legume practices and use: high attachment to meat reduces willingness to adopt a more plant-based diet (Circus & Robison, 2019; Graça et al., 2015).

This study aims to explore the representations of legumes among future actors in the restaurant industry. More precisely, we designed a survey to assess how attitudinal beliefs may vary according to the level of meat attachment among students of a culinary arts school who are training to become chefs or restaurant managers.

From a theoretical perspective, considering the degree of attachment to meat provides a valuable and novel insight into individuals' psychological relationship with meat and its potential influence on the motivational determinants of legume usage in a professional context. From a managerial standpoint, our findings focused on future chefs and restaurant industry managers, contribute to identifying and designing priority educational strategies to enhance the skills of future leaders for a more sustainable food service industry.

2. Materials and methods

2.1. Participants and procedure

An online survey was conducted among undergraduate students at the Institut Paul Bocuse in France, who were enrolled in either the Culinary Management or Hospitality Management programs. The study was introduced via a recruitment notice, and the survey was available in both French and English. Of the 127 students who began the survey, 102 completed it, yielding a high completion rate of 82 %. The participants ranged in age from 18 to 48 years, with a mean age of 26.5 years, and the majority were women (57.8 %).

2.2. Measurements

We developed a survey using a set of psychometric scales adapted to our case study: beliefs toward legumes perceived culinary characteristics of legumes and attachment to meat.

Adapted from Rivera & Shani's work on restaurant decision-makers' attitudes toward vegetarian foods (Rivera & Shani, 2013), participants rated legume characteristics on a Likert scale (from 1 - strongly agree to 5- strongly disagree[1]). Beliefs focused on the environment, nutrition, food service operations, perceived consumers demand and perceived culinary attributes of 5 popular legumes (e.g., [lentils, dried beans, chickpeas, split peas, broad beans] have gustative interests). For the analyses, the 5 legumes were grouped by perceived culinary characteristics (Cronbach's alpha between 0.67 and 0.79).

A scale was included to measure to what extent people feel attached to meats in terms of hedonism (2 items), affinity (3 items), entitlement (3 items) and dependence (3 items) (Circus & Robison, 2019; Graça et al., 2015) .[2] Participants rated the 11 statements on a scale from 1 (strongly agree) to 5 (strongly disagree).

The last part of the questionnaire identified sociodemographic variables (age, gender, nationality), diet (Flexitarian, Vegetarian, Vegan, Gluten-free, or specify if others) as well as courses at the Paul Bocuse Institute (Hospitality Management or Culinary Management).

2.3. Data analysis

First, the structure of the meat attachment scale was examined using principal component analysis with varimax rotation (see Appendix 1). The Kaiser-Meyer-Olkin (KMO) index (0.828) and Bartlett's test of sphericity were highly significant ($p < .000$), indicating that the data matrix was suitable for factor analysis. Once one item was removed due to cross-loading (*item 4 Eating meat is an unquestionable right of every person*), a 3-factor solution emerged, totalling 66 % of the overall variance of the meat attachment. This result diverged from the theoretical 4-factor structure of the scale. Indeed, the three items supposed to reflect the personal dependence (items 1, 2, 4) and the two items that measured the hedonic dimension (items 3, 5) were all positioned on the same first factor. This can be explained by the fact that these five items have been reworded in our questionnaire in order to better fit the specific context of the food service sector. Considering this result, the first factor labelled attachment to "Meat in restaurants" (5 items, Cronbach's Alpha = .863) captured the pleasure and the perceived necessity of providing meat in restaurants. As in the original scale, the second factor was named "Affinity" (3 items, Cronbach's Alpha = .777), and the third factor was labelled "Entitlement" (2 items, Cronbach's Alpha = .578).

Second, a two-step clustering based on the meat attachment was applied. Ward's hierarchical clustering method with Euclidian distance was used to explore different homogeneous segments based on the 3 factors resulting from the PCA. Based on the proportionate increase in heterogeneity and inspection of the dendrogram, two clusters emerged as an optimum number. After that, a non-hierarchical K-means clustering procedure was used to discriminate students. Student's *t*-test and chi-square tests were used to characterize the groups based on beliefs and sociodemographic variables, respectively. The following figure provides a concise overview of the study's workflow Fig. 1.

[1] To minimize automatic responses, such as acquiescence bias, and encourage more thoughtful answers, the Likert scale polarity was reversed, with 'strongly agree' placed on the left and 'strongly disagree' on the right.

[2] The original meat attachment scale proposed by Graça et al. (2015) includes 16 items. To adapt it to the context of future professionals in the restaurant industry, five items were rephrased and five items were discarded as they were deemed too focused on consumer preferences.

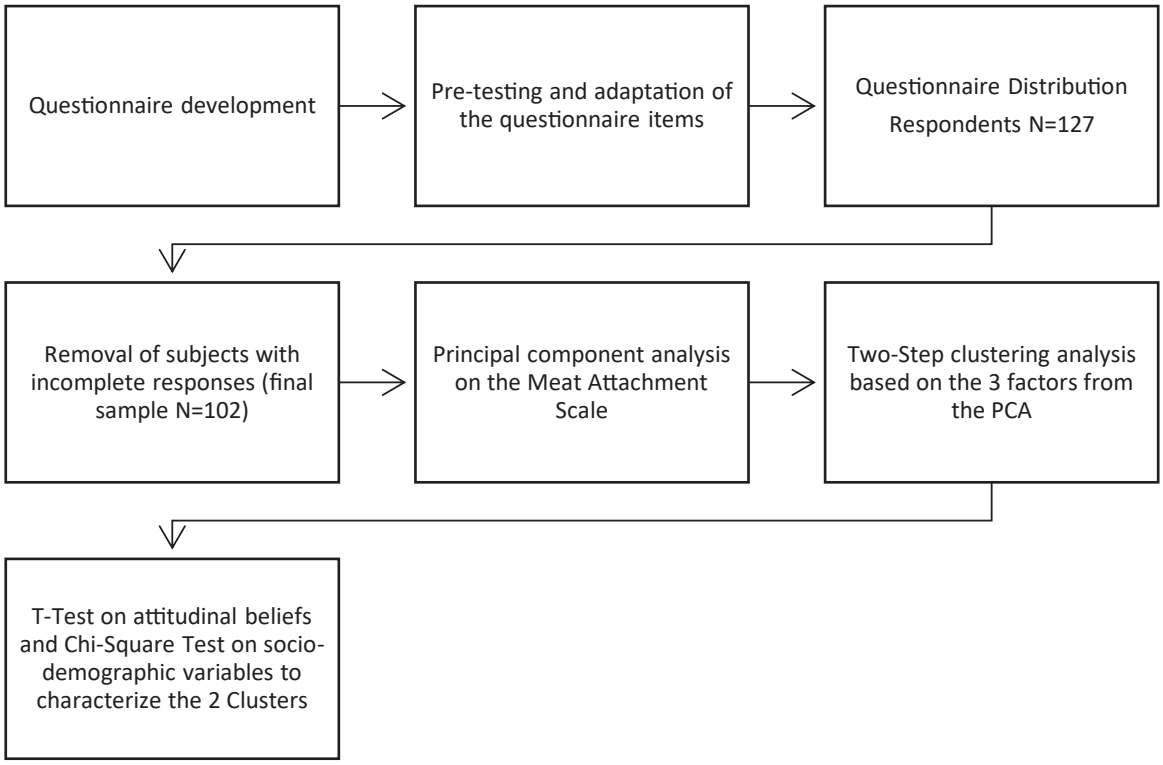

Fig. 1. Study's workflow.

2.4. Ethical consideration

The study complies with the Declaration of Helsinki. Written informed consent of each of the participants was obtained before data collection by explaining the purpose and methods of the study. The participants were made aware that their participation in the study was voluntary and free to discontinue participation at any time.

3. Results

The means scores for the three dimensions of the meat attachment (see Table 1.), slightly below the scale's neutral value, show that catering students tend to be attached to meat in the restaurant (Meat in Restaurant = 2.57) to express affective attributes to meat (Affinity = 2.36 *[3]) and to share the idea that eating meat is a human right (Entitlement = 2.58).

The clustering procedure reveals two groups of individuals based on the intensity of their attachment to meat products. Representing 36 % of the sample, the first cluster is composed of individuals who are significantly less attached to meat than the second cluster.

Consequently, the first cluster was called LOW MAT, and the second was HIGH MAT (MAT for Meat ATtachment).

Table 2. presents the sociodemographic characteristics of the respondents. Compared to the distribution in the total sample, there was a significantly higher proportion of women than men, a higher proportion of omnivores, and a lower proportion of students attending the hospitality management curriculum in the LOW MAT cluster than in the HIGH MAT cluster.

Responses to belief statements about legumes are presented in Table 3. Results revealed that students had an overall favourable attitude toward legumes. Regarding the environment, they believe that legumes are more environmentally (4.22*) and climate-friendly (4.12*) than meat and that they are beneficial to soil fertility (3.58*), with students in the LOW MAT cluster expressing significantly stronger agreement on these 3 environmental attributes than those in the HIGH MAT cluster.

Nutritionally, students consider legumes to be a good source of protein (4.24) with high nutritional value (4.15) that are useful for vegetarians (4.69 *). At the same time, they tend to be less convinced by statements such as '*legumes are difficult to digest*' (3.32), and *"legumes have a protein content equivalent to meat"* (3.17*). The two clusters differed on two beliefs. First, LOW MAT considers more widely legumes as a good source of protein (LOW MAT = 4.59. HIGH MAT = 4.04; $p = 0.002$). Second, compared to LOW MAT (3.64*), HIGH MAT (2.90*) tends to not agree with the statement that legumes have the same protein content as meat ($p = 0.001$). This suggests that individuals with a weaker attachment to meat could be more likely to see legumes as an alternative protein source than individuals with a stronger attachment to meat.

In terms of food service operations and supply, students do not think that legumes are complicated to store and preserve (4.43) and, in a less affirmative way, they consider them as a foodstuff easy to source (3.58*) whose availability is not limited (3.58) and which is not expensive (3.08). They do not think legume-based dishes are less profitable than other dishes (3.90). This statement was significantly more pronounced among LOW MAT (4.21) than HIGH MAT (3.72). Looking at the belief statements on perceived consumer demand, students admit that meat dishes are widely liked by clients (1.54), with a belief more strongly present among HIGH MAT (1.39) than LOW MAT (1.81) ($p = 0.001$), it seems that the popularity of meat is not perceived as antinomic with the appeal of legumes to customers. For example, they also recognize that consumers expect more legume-based dishes (3.40 *) and that the trend in restaurants is to include more legumes in vegetarian offerings (4.00 *). Again, these two beliefs are significantly more pronounced among LOW MAT than HIGH MAT.

Finally, in terms of culinary characteristics, respondents were fairly neutral in terms of gustatory interest (3.94 *), difficulty of cooking

[3] *Asterisks indicate reversed scores*

Table 1
means scores on the classification variables.

Classification variables	Sample N = 102		Cluster 1 N = 37		Cluster 2 N = 65		t	p-value
	Mean	S.D	Mean	S.D	Mean	S.D		
Meat attachment								
Entitlement	2.58	0.98	3.45	0.83	2.09	0.66	9.04	**< 0.0001**
Affinity*	2.36	1.02	3.26	0.77	1.85	0.74	9.11	**< 0.0001**
Meat in Restaurant	2.57	1.05	3.5	0.76	2.05	0.81	8.87	**< 0.0001**

Note. A higher value indicates a weaker attachment to meat. * = Reverse-scored items

Table 2
Sociodemographic characteristics.

Individual characteristics	Sample	LOW MAT	HIGH MAT	χ^2	p-value
	Number (and percentages) of individuals				
Gender				5.005	**0.025**
Female	65	29 (78)	36 (55)		
Male	36	8 (22)	28 (43)		
No Response	1		1 (2)		
Nationality				0.179	0.672
French	82	29 (78)	53 (82)		
Other	20	8 (22)	12 (18)		
Diet				32.201	**<0.0001**
Omnivores	51	5 (13)	46 (71)		
Meat reduced diets (flexitarian, vegetarian, vegan)	46	30 (82)	16 (25)		
No Response	*5*	*2 (5)*	*3 (4)*		
School program				4.620	**0.032**
Culinary Management	63	27 (73)	36 (55)		
Hospitality Management	37	8 (22)	29 (45)		
No Response	*2*	*2 (5)*			

(3.47), preparation time (3.03) and inspiration (3.25). On the other hand, the creativity and appeal of legumes received a slightly negative rating (2.20 *). No significant difference was observed according to the level of attachment to meat.

4. Discussion and conclusion

Our findings shed light on the psychological profile of future professionals in the culinary industry, with theoretical and managerial implications.

From a theoretical perspective, two distinct groups of individuals emerge based on their attachment levels (high vs. low). Students with a high level of attachment to meat (HIGH MAT) exhibit a different profile compared to other students (LOW MAT), with a higher representation of males and omnivores in this group. These results are consistent with those of Graça et al. (2015), who demonstrated that men generally express stronger attachment to meat than women and that individuals with higher meat attachment incorporate more meat into their diets.

Regarding their relationship with legumes, previous research on the social representations of legumes has shown that, compared to non-consumers, food industry professionals spontaneously make more positive associations with legumes, particularly in terms of culinary preparations and nutritional attributes (Melendrez-Ruiz et al., 2020). Consistently, our results demonstrate that students in the culinary field hold a generally favorable attitude towards legumes, both in terms of the attributes of these foods (environmental and nutritional characteristics) and their use in a professional context (practicality and perceived customer demand).

At the same time, we show that this favorable attitude is less present among students with a strong attachment to meat (HIGH MAT) than among students with a weak attachment to meat (LOW MAT). This is embodied in less positive beliefs about environmental attributes their nutritional benefits (in terms of protein intake) and their profitability in food service. Taken together, these elements tend to show that students more attached to meat may see legumes as an interesting ingredient without considering them as a meat substitute. In terms of the relationship between meat attachment and attitudes towards plant-rich diets (of which legumes may be an essential component), these results converge with those of Graça et al. (2015), who showed that individuals with a strong attachment to meat have a low intention to adopt a more plant-based diet.

Culinary skills are decisive in enhancing the value of plant-based offerings in a restaurant (Rivera & Shani, 2013). Our results offer food for thought for training students at hospitality and catering/culinary schools. While the students surveyed perceive the nutritional and environmental benefits of legumes, it is interesting to note that they tend to regard these foods as neither creative nor attractive on a menu. Consequently, the challenge seems to be not so much to develop *theoretical knowledge* about the benefits of legumes but rather to build *practical know-how* around the gastronomic value of these ingredients. Thus, practical teaching courses focusing on alternative proteins to meat should be developed to demonstrate how pulses are interesting and exciting foods from a culinary perspective. In addition, creating creativity challenges around legumes could stimulate student interest in these foods. For LOW MAT students, the teaching should develop the student's skills in creating new dishes in which legumes are the main element of the dish. For HIGH MAT students, for whom meat is more of a non-substitutable element of the dish, teaching should develop student's skills in creating dishes that combine meat and legumes to rebalance the dish's protein, while preserving the symbolic place of meat on the plate.

Our survey was distributed to students enrolled in a private post-secondary training institute. The cost of studies and the selection of students admitted to the school mean they are not representative of students at hospitality and catering/culinary schools in France. Further investigations among high-school students would be necessary to reinforce the external validity of our results. Finally, cooks develop dishes and menus per consumer preferences to maximize consumption and satisfaction. If cooks' skills are decisive in developing tasty and popular dishes, customers must also recognize and appreciate the value of legumes. Future research could seek to understand how consumers choose and appreciate legume dishes.

This study focused on a relatively understudied population: students in culinary arts. Two groups of students were identified based on their level of attachment to meat: positive beliefs toward legumes are more strongly present among students with a weaker attachment to meat than among students with a stronger attachment to meat. Our findings underscore the significance of training future culinary professionals and fostering skills that are tailored to promote a more sustainable food service sector.

CRediT authorship contribution statement

Maxime Sebbane: Writing – review & editing, Writing – original draft, Methodology, Funding acquisition, Formal analysis, Conceptualization. **Arnaud Lamy:** Writing – original draft, Investigation. **Anestis Dougkas:** Writing – review & editing, Validation, Supervision, Project

Table 3
Means scores on beliefs.

Beliefs statements	Sample		LOW MAT		HIGH MAT		t	p-value
	N = 102		N = 37		N = 65			
	Mean	S.D	Mean	S.D	Mean	S.D		
Environment								
Legumes contribute to soil fertility*	3.58	0.90	3.94	0.88	3.37	0.85	3.196	**0.002**
Legumes are more environmentally friendly than meat*	4.22	0.87	4.62	0.59	4.00	0.92	3.670	**0.000**
Replacing meat with legumes helps to reduce the impact on climate change*	4.12	0.93	4.59	0.79	3.86	0.91	4.084	**< 0.0001**
Nutrition								
Legumes are not a good source of protein	4.24	0.85	4.59	0.59	4.04	0.91	3.264	**0.002**
Legumes have the same protein content as meat*	3.17	1.10	3.64	0.97	2.90	1.08	3.432	**0.001**
Legumes have a high nutritional value*	4.15	0.64	4.24	0.79	4.10	0.53	1.027	0.307
Legumes are difficult to digest	3.32	1.11	3.37	1.18	3.28	1.07	0.394	0.694
Legumes are useful for people on a meat-free diet*	4.69	0.55	4.83	0.37	4.62	0.62	1.918	0.058
Food service operations								
Legume dishes are less profitable than other dishes	3.90	1.02	4.21	1.00	3.72	1.00	2.376	**0.019**
Quality legumes are easy to source*	3.58	1.04	3.70	1.05	3.51	1.04	0.874	0.384
Availability of legumes is limited	3.53	0.93	3.54	0.90	3.53	0.95	0.011	0.991
Good quality legumes are expensive	3.07	0.94	3.13	0.97	3.04	0.92	0.458	0.648
Legumes are complicated to store and preserve	4.43	0.76	4.54	0.83	4.36	0.72	1.089	0.279
Perceived Consumer demand								
In restaurants. meat dishes are very popular	1.54	0.63	1.81	0.70	1.39	0.55	3.334	**0.001**
Nowadays, consumers expect more pulse dishes in restaurants*	3.40	0.83	3.75	0.72	3.20	0.83	3.400	**0.001**
The trend in restaurants is to make menus more vegetarian by increasing the proportion of legume dishes*	4.00	0.80	4.21	0.67	3.87	0.85	2.071	**0.041**
Customers are not willing to eat legumes in restaurants	3.21	1.02	3.18	0.96	3.22	1.06	−0.180	0.858
Legume dishes are not very popular with customers	3.25	0.95	3.18	0.93	3.28	0.97	−0.500	0.618
Restaurant owners are offering more and more pulse dishes*	3.61	0.83	3.78	0.78	3.51	0.84	1.585	0.116
Culinary characteristics of legumes								
Offering [lentils, dried beans, chickpeas, split peas, broad beans] adds a creative and appealing touch to the menu*	2.20	0.63	2.14	0.58	2.23	0.66	−0.73	0.47
[lentils, dried beans, chickpeas, split peas, broad beans] have gustative interests*	3.94	0.72	4.05	0.66	3.88	0.75	1.11	0.27
[lentils, dried beans, chickpeas, split peas, broad beans] are difficult to cook	3.47	0.71	3.44	0.74	3.49	0.69	−0.36	0.72
[lentils, dried beans, chickpeas, split peas, broad beans] are a time-consuming food to prepare	3.03	0.81	2.94	0.84	3.08	0.80	−0.86	0.39
Cooking [lentils, dried beans, chickpeas, split peas, broad beans] is uninspiring	3.25	0.85	3.31	0.81	3.21	0.87	1.98	1.98

* = Reverse-scored item. Note. Means and standard deviation based on scores agreement with each statement on a 5-point Likert-type scale ranging from 1 (strongly agree) to 5 (strongly disagree); A higher value indicates a more favorable attitude towards legumes.

administration, Methodology, Funding acquisition, Conceptualization. **Audrey Cosson:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Data curation. **Maxime Michaud:** Writing – review & editing.

Declaration of Competing Interest

This work was supported by the Olga Triballat Institut (France) and the Louis Bonduelle Foundation (France).

The study was conducted in accordance with the Declaration of Helsinki.

Informed consent was obtained from all subjects involved in the study.

We have no conflicts of interest to disclose.

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Appendix A. . Results of the PCA

Item	Factor loadings			Mean	SD
	Factor 1	Factor 2	Factor 3		
Meat in Restaurants					
Item 1. Meat is irreplaceable in the restaurant offer	**0.83**	−0.12	0.16	3.02	1.44
Item 2. If I had to stop offering meat in restaurants. I would feel sad	**0.77**	0.31	0.21	2.48	1.41
Item 3. A good steak in a restaurant is beyond comparison	**0.75**	0.08	0.30	2.77	1.27
Item 4. I can't imagine not offering meat regularly in my restaurant	**0.74**	0.28	0.24	2.84	1.41
Item 5. Eating meat in restaurants is one of life's good pleasures	**0.68**	0.35	0.18	1.75	0.96
Affinity					
Item 6. Meat evokes diseases and epidemics*	0.05	**0.84**	−0.02	2.35	1.17
Item 7. Eating meat reminds us of the death and suffering of animals*	0.28	**0.80**	0.25	2.25	1.23
Item 8. Eating meat is a lack of respect for the living and the environment*	0.19	**0.63**	0.54	2.47	1.26
Entitlement					
Item 9. Our position in the food chain means that we have the right to eat meat	0.22	0.07	**0.82**	2.52	1.12
Item 10. Eating meat is a natural and undeniable practice	0.36	0.16	**0.68**	2.65	1.20
Eigenvalue	4.78	1.40	0.83		

(*continued on next page*)

(*continued*)

Item	Factor loadings			Mean	SD
	Factor 1	Factor 2	Factor 3		
Percentage of Variance explained	44	13	9		
Cronbach's alpha	.863	.777	.578		

Note. KMO measure of sampling adequacy = .828. Bartlett's test of sphericity χ^2 = .000.
* = Reverse-scored items.

Appendix B. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.foohum.2024.100465.

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