UNIVERSIDADE ESTADUAL DE CAMPINAS
SISTEMA DE BIBLIOTECAS DA UNICAMP
REPOSITÓRIO DA PRODUÇÃO CIENTIFICA E INTELECTUAL DA UNICAMP

Versão do arquivo anexado / Version of attached file:

Versão do Editor / Published Version

Mais informações no site da editora / Further information on publisher's website:

https://onlinelibrary.wiley.com/doi/10.1111/joss.12829

DOI: https://doi.org/10.1111/joss.12829

Direitos autorais / Publisher's copyright statement:

DIRETORIA DE TRATAMENTO DA INFORMAÇÃO

Cidade Universitária Zeferino Vaz Barão Geraldo
CEP 13083-970 – Campinas SP
Fone: (19) 3521-6493
http://www.repositorio.unicamp.br

ORIGINAL ARTICLE

Journal of
Sensory Studies

WILEY

Sprouts consumption: A correlational study between Brazilian consumers' perception, motivation to eat new products levels and food choice factors

Roberta Fontanive Miyahira[1] | Thamires Giangiarulo[1] | Jean de Oliveira Lopes[2] |
Wanessa Pires da Silva[3] | Erick Almeida Esmerino[3] [ID] |
Adriane Elisabete Costa Antunes[2]

[1]Institute of Nutrition, State University of Rio de Janeiro (UERJ), Rio de Janeiro, RJ, Brazil

[2]School of Applied Sciences, State University of Campinas (UNICAMP), Limeira, SP, Brazil

[3]Department of Food Technology (MTA), Faculty of Veterinary Medicine, Fluminense Federal University (UFF), Niterói, RJ, Brazil

Correspondence
Roberta Fontanive Miyahira, Institute of Nutrition, State University of Rio de Janeiro (UERJ), São Francisco Xavier St., n. 524, 12th Floor, Room 12006 D—Maracanã, Rio de Janeiro/RJ—20550-013, Brazil.
Email: robertamiyahira@gmail.com

Funding information
Conselho Nacional de Desenvolvimento Científico e Tecnológico; Coordenação de Aperfeiçoamento de Pessoal de Nível Superior; Fundação Carlos Chagas Filho de Amparo à Pesquisa do Estado do Rio de Janeiro

Abstract

Encouraging the consumption of natural foods with a high content of nutrients such as sprouts is a strategy that meets the nutritional guidelines of most countries. Considering that data on sprouts consumption in Brazil are scarce, the present study aimed to evaluate the perception of Brazilian participants about sprouts, correlating these data with the multidimensionality of food choice and motivations for novelties. The perception of 315 participants was evaluated, considering the Food Choice Questionnaire (FCQ), Motivation to Eat New Foods scale, and the projective technique of Word Association (WA). Based on FCQ data, participants were subdivided into two distinct clusters with specific profiles. All factors' scores related to food choice showed significantly higher scores in Group 2. Sensory appeal was their most relevant factor. Both groups were highly motivated to approach new foods. In the WA task, the most mentioned categories were associated with product, health, and environmental aspects.

Practical applications: The evaluation of consumers' perceptions about sprouts demonstrated that the inclusion of sprouts as part of the diet is feasible and aligns with the demands and motivations of Brazilian participants. As a practical application, it is suggested that strategies be developed to promote the consumption of sprouts based on sensory and nutritional aspects, as well as their relationship with health and the environment.

1 | INTRODUCTION

Cereals, legumes, fruits, and vegetables are responsible for a balanced diet worldwide for presenting a significant amount of macro and micronutrients (Kapravelou et al., 2020; Lim, Park, & Yoon, 2020; Medhe, Jain, & Anal, 2019; Montemurro, Pontonio, Gobbetti, & Rizzello, 2019). Moreover, encouraging the intake of these foods is also in line with current dietary guidelines (e.g., Brazil, Germany, Qatar, and Sweden) that advocate more plant-based diets, not only

for their relation to health but also for environmental concerns (Magkos et al., 2020).

The desire for a healthier lifestyle has motivated many individuals to change their eating habits. It has caused an increase in the consumption of plant-based foods, which generally have a high content of bioactive molecules. It is particularly true of vegetables harvested in the early stages of plant growth, commonly known as germinated grains or sprouts (Benincasa, Falcinelli, Lutts, Stagnari, & Galieni, 2019; Miyahira et al., 2022; Salgado, Zago, Antunes, &

Miyahira, 2022). Sprouts are a phytonutrient-rich plant food with flavonoids, other polyphenols, glucosinolates, isothiocyanates, proteins, minerals, and vitamins (Moreno, Pérez-Balibrea, & García-Viguera, 2006).

The germination process seems to be a practical method to increase the nutritional value of grains naturally since germination reactivates their metabolism, resulting in catabolism and degradation of macronutrients and anti-nutritional compounds, biosynthesis of secondary metabolites with potential health benefits, as well as the improvement of sensory properties (Miyahira, Lopes, & Antunes, 2021).

On the other hand, the microbiological quality of germinated grains should not be neglected, given that germination conditions are also ideal for bacterial growth. A recent review by Miyahira and Antunes (2021) discussed the bacteriological safety of sprouts. According to them, more than 60 outbreaks related to sprouting consumption were reported worldwide between 1988 and 2020. These outbreaks totaled 14,739 cases of ill people, with at least 214 hospitalizations and 58 deaths.

However, despite the advantages mentioned above, it is worth mentioning that data on the consumption of sprouts among the Brazilian population are still scarce. Understanding the factors that drive food choice, in addition to a complex activity due to the interactions between intrinsic and extrinsic factors to the product, is crucial for the promotion and success of a product in the market and the effective modification of eating patterns, especially when it comes to the introduction of new foods from culture to the other, as in the case of sprouts (Nezlek, Forestell, & Cypryanska, 2021). Studies in this direction may be of great value to the academic and industrial community because it exposes desires and intentions that indirectly influence decision-making and, consequently, the purchase and consumption of a particular food (Sales et al., 2020).

In this context, several tools have been developed to assess consumer perception toward new products or products not commonly consumed by a population (Baudry et al., 2017; de Albuquerque et al., 2019; Kim, Oh, & Cho, 2022). For example, Steptoe, Pollard, and Wardle (1995) developed the Food Choice Questionnaire (FCQ) to assess the importance of some factors that lead to food choice. This classic questionnaire consists of 36 items and evaluates the relevance attributed by respondents to nine different dimensions (health, mood/well-being, convenience, sensory appeal, natural content, price, weight control, familiarity, and ethical concern) during the food choice process.

Nezlek et al. (2021) recently developed and validated the Motivation to Eat New Foods (MENF) scale. The authors reported that the choice to eat new foods is related to a combination of motives. Not eating new foods, for example, may occur because of fear or lack of interest, and distinguishing between these two sets of motives is necessary for understanding why some people do not want to eat new foods (Nezlek et al., 2021). In a recent study, its applicability is emphasized, as well as its convergent validity with alternative continuous rating scales for novel foods (De Kock et al., 2022). Furthermore, according to the authors understanding these reasons may be

necessary for increasing the consumption of nutritious foods that are the basis for a healthy life.

Finally, consumers or target audience's perception of a product is crucial for developing educational and communication strategies to motivate people to adopt a healthier diet (Ares, De Saldamando, Giménez, & Deliza, 2014). Projective techniques represent a category of important methodologies for consumer studies. Their use is based on the practicality and quality of the information generated by spontaneous verbalization with less bias than traditional approaches (Gambaro, 2018; Penna et al., 2021). Word Association task (WA) stands out as an effective, fast, and consumer-friendly method to obtain information about their perception among the most popular projective techniques. It consists of offering a verbal or visual stimulus, where respondents are asked to share the first thoughts and images that come to mind when they think about the product highlighting essential representations associated with the presented stimulus (de Albuquerque et al., 2019; Pinto et al., 2018).

Therefore, considering all those mentioned earlier and also given the unknown data on the consumption of sprouts in Brazil, it is believed that obtaining insights into the entire dynamics of choosing and consuming a little-known/consumed product can help in the development of strategies that encourage the consumption of this product and popularize the inclusion of this food of high nutritional value in the diet.

Thus, the objective of this study was to investigate the factors, motivations, and perceptions about sprouts in Brazil using and associating data obtained through the FCQ, Motivation to Eat New Foods scale, and WA, respectively.

2 | MATERIALS AND METHODS

2.1 | Participants

A nonprobabilistic sampling (convenience sampling) was used in the present study (Sass et al., 2021). Since this was an exploratory study and a product with low familiarity, the participants did not need to be regular consumers of sprouts, being selected only for their interest and willingness to participate in the study. Therefore, the only criterion for inclusion in the study was individuals over 18 years old with Brazilian nationality.

Participants ($n = 315$) were recruited through social media and e-mail lists in September and October 2021 and were informed that data would be used for scientific purposes only. The research was approved by the Ethics Committee of Pedro Ernesto University Hospital/UERJ under coded number 50519321.3.0000.5259, and data were collected using an online survey developed by *Compusense Cloud* software (CompuSense Inc., Ontario, Canada). Consent to participate in the study was inferred from voluntarily completing the questionnaire.

To capture the perception spontaneously and without the influence of the questionnaire items and scales, the respondents performed the activities starting with the WA, FCQ, Motivation to Eat

New Foods scale MENF, and Socio-demographic Characterization, respectively. The sessions took around 10 min to complete.

2.2 | Socio-demographic characterization

Participants answered questions about gender, age, socio-economic status, marital status, educational level, region of Brazil where they live, eating habits, and profession. In addition, they were asked to answer a series of questions about sprouts, such as: "Have you ever heard of sprouted grains for food?," "Would you consume sprouts?," "Sprouts are foods high in vitamins, minerals, and antioxidant compounds. Knowing this, would you buy a product made with sprouts?," "Thinking about sprouts in food, in which forms would you consume them?"

2.3 | Word Association task

For WA performance, a verbal stimulus containing the word "sprouts" was presented to each respondent, and they were invited to freely describe the first words, terms, phrases, images, associations, or feelings that came to mind when facing it (de Albuquerque et al., 2019; Pinto et al., 2018). Ample blank space was provided to fit as much information as was required. It was told that there were no correct or wrong answers and participants were free to describe whatever came to their minds.

2.4 | Food Choice Questionnaire

Then participants answered the 36 items in the FCQ, developed by Steptoe et al. (1995). Using a 7-point Likert scale (1—*strongly disagree* to 7—*strongly agree*), they indicated their level of agreement with the statements that had the following sentence as their core: "For me, it is important that the food I eat on a typical day …," representing health and nonhealth related food characteristics, grouped into nine factors/dimensions: "health," "mood," "convenience," "sensory appeal," "natural content," "price," "weight control," "familiarity" and "ethical concern" (Table 2). The FCQ sentences were based on a validated questionnaire in the Portuguese language, according to Heitor et al. (2019) and Penna et al. (2021).

2.5 | MENF scale

The MENF scale was developed by Nezlek et al. (2021) and consisted of a 10-item measure with two subscales assessing approach and avoidance motives to eat new foods. Participants responded to each item, indicating their degree of agreement with the sentences, using a seven-point scale with the following labels: 1 = *strongly disagree* to 7 = *strongly agree*.

Since, to our knowledge, this is the first use of the MENF scale in Portuguese, the Portuguese version of the scale was created by a team of researchers fluent in English and Portuguese, and then the items were back-translated. The items are presented in Table 3.

2.6 | Statistical analysis

Similarly to the one performed by Penna et al. (2021), a Hierarchical Cluster Analysis (HCA) was used to determine groups with similarities or differences in food choice criteria. We chose to perform it on the data obtained in the FCQ, as it broadly covers multidimensional aspects that influence people's dietary choices and would possibly bring important information about the heterogeneity of the study population, as described by Steptoe et al. (1995). For this, we used Euclidean distance and Ward's method as the agglomeration method, the Center/Reduce options to avoid having cluster creation influenced by scaling effects, and Automatic—Entropy Truncation method. In sequence, data from the other sections were evaluated according to the groups formed.

FCQ's data were submitted to Confirmatory Factor Analysis (CFA), and the Kaiser–Meyer–Olkin (KMO) test and Bartlett's test of sphericity were assessed for sampling adequacy. KMO values between 0.8 and 1 indicate adequate sampling, and a significance level for Bartlett's test below 0.05 suggests a substantial correlation in the data. Then, the internal reliability/consistency of each FCQ factor was assessed using Cronbach's alpha. The resulting α coefficient of reliability ranges from 0 to 1 in this overall assessment of a measure's reliability.

For the MENF scale, as the performance of the items had already been confirmed through Exploratory Factor Analysis (Nezlek et al., 2021), we also decided to use the exact parameters of CFA. Therefore, the resulting score for each item was calculated by the respective mean and standard deviation (Steptoe et al., 1995) and compared by *t*-test for independent samples between the determined groups.

For WA, all associations elicited by the participants were assessed, and the results were analyzed following previous studies (Esmerino et al., 2017; Pinto et al., 2018). After textual analysis, the terms were categorized, and similar terms were grouped in the same category. All results were categorized and grouped into 10 final categories. Global chi-square analysis was used to test the contingency table's independence between rows (categories) and columns (groups). In contrast, the chi-square per cell was utilized to identify the variation source of the global chi-square (Symoneaux et al., 2012). Table 4 shows the categories, examples of terms, and their respective frequencies.

As performed in WA, socio-demographic data were submitted to the Global chi-square and chi-square tests per cell to assess significant associations of the characteristics of each formed group. The remaining results, separated by groups, were evaluated by frequency.

All statistical analyzes were performed using the XLSTAT March 1, 2021 software (Addinsoft, Paris, France).
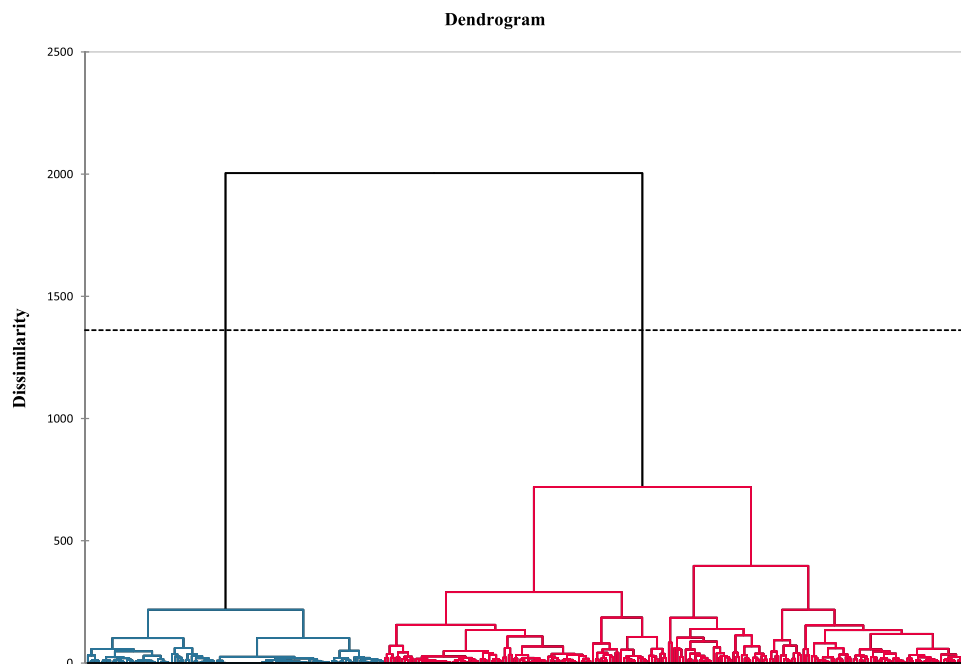
FIGURE 1 Dendrogram of the two groups determined by the Hierarchical Cluster Analysis on The Food Choice Questionnaire data.

3 | RESULTS

According to the results presented in the HCA, performed on FCQ data, and as seen in the dendrogram (Figure 1), two distinct groups were determined. The first group was formed by 209 individuals, while the second was formed by 106. Then, to characterize this population, choice factors, motivations, and perceptions, data were analyzed and interpreted by each group.

3.1 | Socio-demographic characterization

The majority of respondents in both groups were female (>75%), aged 18–25 years old, single, with postgraduate education level, with family income from 3 to 6 salaries, residents in the southeast region of Brazil, and with omnivorous eating habits (Table 1). The global chi-square analysis did not identify any statistical difference ($p > .05$) between the groups in any of the variables evaluated.

Regarding the questions about knowledge of sprouts, most of the participants in Group 1 (79.4%) and Group 2 (86.8%) reported that they had heard of them. In addition, both groups reported that they would probably buy products containing them due to the high nutritional value of sprouts. Finally, the majority of Group 1 and Group 2 responded that they were likely to consume sprouts in salads (87.6%; 90.6%), sautéed (55.0%; 66.0%), or sandwiches (50.7%; 55.7%), respectively (Table 1).

3.2 | Word Association task

A total of 487 and 345 words associations were elicited by Groups 1 and 2, respectively. They were grouped into 10 categories, namely:

"Sprouts," "Healthiness," "Environmental," "Affective memory," "Food," "Nutritional quality," "Sensory," "Eating style," "Technology" and "Biological risk," sorted in descending order according to the frequency of mention. Table 4 shows the categories and examples of the mentioned terms according to the perception of the groups.

There was a significant difference in the frequency of mention of the categories considered between each group (χ^2 35.240, $p \leq .0001$), showing that participants' perception of groups was significantly different in some categories. According to chi-square per cell, "Sports" and "Environmental" were the two categories that drove the variation between groups (<.0001; 0.032, respectively).

As can be seen in Table 3, the most cited categories indicate a positive perception of sprouts. It is noteworthy that Group 2 mentioned significantly more examples related to sprouts, possibly due to greater knowledge of the subject, while Group 1 mentioned more general terms associated with nature and the environment. It is noted that the categories "Food," "Nutritional Quality" and "Sensory" were determined in an intermediate way by the groups, which may still indicate a low perception of this product as part of a diet. It can be reinforced by minor mentions/associations about "Technology" and "Biological Risk," which cover production and product safety aspects.

3.3 | Food Choice Questionnaire

KMO value (0.868) and Bartlett's test of sphericity (≤0.0001) showed sampling adequacy for each variable and its suitability for factor analysis. The estimated items loadings, coefficients for factors from CFA and the univariate summary statistics for each item are presented in Table 2.

TABLE 1 Socio-demographic characterization and questions about participants' knowledge and consumption of germinated grains ($n = 315$) by groups.

Variable	Group 1 ($n = 209$)	Group 2 ($n = 106$)	p value[a]
Gender (%)			
Female	77.5	79.2	.886
Male	22.0	18.9	.599
Do not want to declare	0.5	1.9	.263
Age (%)			
18–25 years old	35.4	28.3	.339
26–35 years old	17.2	16.0	.884
36–45 years old	24.4	25.5	.903
46–60 years old	16.7	17.9	.884
>60 years old	6.2	12.3	.094
Marital status (%)			
Single	51.7	45.3	.482
Stable union	10.5	12.3	.719
Married	30.1	34.0	.587
Divorced	7.2	7.5	1.000
Widowed	0.5	0.9	1.000
Education level (%)			
Incomplete high school	2.0	2,8	.694
Incomplete high school	14.4	17.9	.447
Incomplete graduation	22.5	21.7	1.000
Complete graduation	19.1	17.0	.779
Postgraduation	42.1	40.6	.924
Remuneration (the minimum wage in Brazil) (%)			
Until 1	4.8	6.6	.607
1–3 wages	30.1	27.4	.736
3–6 wages	22.5	23.6	.899
6–9 wages	10.5	16.0	.230
9–12 wages	13.4	8.5	.293
More than 12	18.7	17.9	1.000
Brazil region (%)			
North	1.0	1.9	.607
Northeast	2.9	5.7	.235
Midwest	3.8	5.7	.571
Southeast	80.4	70.8	.350
South	12.0	16.0	.410
Eating habits (%)			
Omnivore	87.1	88.7	.892
Ovolactovegetarian	8.1	10.4	.549
Vegetarian	0.5	0.0	1.000
Vegan	3.3	0.9	.280
Crudivore	1.0	0.0	.553
Have you ever heard about germinated grains (sprouts) for food? (%)			
Yes	79.4	86.8	.943
No	20.6	13.2	.091

(Continues)

TABLE 1 (Continued)

Variable	Group 1 (n = 209)	Group 2 (n = 106)	p value[a]
Would you consume germinated grains? (%)			
Yes	89.0	91.5	.730
No	11.0	8.5	.458
Germinated grains are foods high in vitamins, minerals, and antioxidant compounds. Knowing this, would you buy a product made with sprouted grains?			
Probably would	4.2 ± 0.86	4.48 ± 0.72	.464
How would you consume germinated grains? (%)			
Salads	87.6	90.6	.729
Sandwiches	50.7	55.7	.931
Sautees	55.0	66.0	.460
Soups	34.4	43.4	.422
Juices and vitamins	29.2	34.0	.742
Others	5.7	7.5	.645

[a]All the variables were not considered significant in the global chi-square ($p < .05$).

As can be seen, all the factors had an alpha coefficient value greater than 0.7, indicating good/acceptable internal consistency of the items in the scale and guaranteeing validity and accuracy to the interpretation of results. In addition, all 36 items evaluated showed significantly ($p < .0001$) higher scores in Group 2 than in Group 1, pointing out that both groups considered all factors for food choice, however, Group 2 did so with greater intensity.

Proportionally respecting the importance measured by each group, the most relevant factors were "Sensory Appeal," "Natural Content" and "Price" while the least important were "Familiarity" and "Ethical Concern." In this context, the promotion of the inclusion of sprouts in the diet can be beneficial since it is a natural product of low familiarity but with great sensory, nutritional and economic potential still to be explored.

3.4 | MENF scale

Similarly, the KMO value (0.864) and Bartlett's test of sphericity (≤0.0001) showed the appropriateness of using factor analysis on the data set. As can be seen in Table 3, the approach and avoidance factors were reliable, at least at 0.85.

It is possible to observe that the avoidance scores determined for both groups were relatively low ($p > .05$). On the other hand, the values were higher when analyzing the approach motives toward novelty. There was a significant difference between groups in 4 of the 5 items on the scale: "I enjoy trying foods that I have never eaten before," "I enjoy learning about new foods," and "I am interested in trying familiar foods that have been prepared with new ingredients," and "I am curious about the flavors of new foods and ingredients."

The results are favorable when considering a new product launch since both groups showed enjoyment, interest, and curiosity in food novelties, especially Group 2, with higher scores, which proved to be more open-minded consumers.

4 | DISCUSSION

Society's interest in consuming healthy foods and the demand for its products has increased significantly (Baker, Lu, Parrella, & Leggette, 2022). Therefore, the functional food market is one of the fastest-growing segments of the global food industry (Vorage, Wiseman, Graca, & Harris, 2020). In addition, functional foods have gained research attention in food health and technological innovations (Baker et al., 2022). In this context, sprouts are considered "functional foods" since they have high nutritional compounds responsible for health-promoting or disease-preventing properties (Reed, Ferreira, Bell, Brown, & Zheng, 2018).

However, some demographic variables have been found to influence functional food consumption (Vorage et al., 2020). In our results, two distinct groups were determined with similar socio-demographic characteristics. Most of the study population was in the 18–25 age range, with more than half being younger than 35 in both groups. Emerging adults, defined as approximately 18–29 years of age (Arnett, Žukauskienė, & Sugimura, 2014), have been identified in the literature as an attractive target group for functional foods, as this is a time when individuals are establishing lifestyle habits, including dietary practices (Nelson, Story, Larson, Neumark-Sztainer, & Lytle, 2008). It makes this population of particular interest as a target group for functional foods (Vorage et al., 2020). Our results showed that if the participants knew that sprouts have high nutritional value, they would be interested in buying products containing sprouts. In addition, sprouts can be introduced into food products widely consumed worldwide, such as bakery products, as a replacement for ingredients with lower nutritional value. Further studies on the development of sprout-based products need to be conducted to assess the acceptance of these products by the population.

In the FCQ responses, both groups scored higher in the sensory appeal dimension. Recent research has also achieved the same result showing that intrinsic characteristics of food, especially taste, are the

TABLE 2 The total structure of the FCQ responding to the items "It is important to me that the food I eat on a typical day."

Dimensions	Items	Loadings	Cronbach's α	Group 1 Means ± SD	Group 2. Means ± SD	p value[a]
Factor 1	*Health*		0.862	5.68 ± 0.41	6.70 ± 0.30	<.0001
	Contains a lot of vitamins and minerals	0.733		5.78 ± 1.14	6.77 ± 0.52	
	Keeps me healthy	0.921		6.11 ± 0.95	6.90 ± 0.31	
	Is nutritious	0.903		6.03 ± 0.98	6.90 ± 0.31	
	Is high in protein	0.574		4.96 ± 1.38	6.09 ± 1.17	
	Is good for my skin/teeth/hair/nails, etc.	0.656		5.53 ± 1.29	6.80 ± 0.52	
	Is high in fiber and roughage	0.705		5.64 ± 1.13	6.75 ± 0.55	
Factor 2	*Mood*		0.919	5.19 ± 0.50	6.59 ± 0.32	
	Helps me cope with stress	0.850		5.26 ± 1.48	6.71 ± 0.84	
	Helps me to cope with life	0.894		5.23 ± 1.55	6.68 ± 0.86	
	Helps me relax	0.932		5.08 ± 1.56	6.73 ± 0.58	
	Keeps me awake/alert	0.670		4.49 ± 1.61	5.94 ± 1.38	
	Cheers me up	0.858		5.11 ± 1.47	6.65 ± 0.81	
	Makes me feel good	0.654		5.97 ± 1.16	6.84 ± 0.39	
Factor 3	*Convenience*		0.881	5.81 ± 0.17	6.69 ± 0.11	
	Is easy to prepare	0.830		5.78 ± 1.19	6.62 ± 0.91	
	Can be cooked very simply	0.899		5.78 ± 1.23	6.66 ± 0.75	
	Takes no time to prepare	0.841		5.66 ± 1.29	6.56 ± 0.88	
	Can be bought in shops close to where I live or work	0.670		5.82 ± 1.15	6.81 ± 0.60	
	Is easily available in shops and supermarkets	0.627		6.02 ± 0.94	6.81 ± 0.57	
Factor 4	*Sensory appeal*		0.890	5.94 ± 0.28	6.84 ± 0.03	
	Smells nice	0.847		5.90 ± 1.07	6.88 ± 0.41	
	Looks nice	0.814		5.72 ± 1.21	6.81 ± 0.52	
	Has a pleasant texture	0.867		5.87 ± 1.10	6.84 ± 0.39	
	Tastes good	0.379		6.30 ± 0.90	6.85 ± 0.45	
Factor 5	*Natural content*		0.886	5.43 ± 0.04	6.76 ± 0.09	
	Contains no additives	0.858		5.29 ± 1.49	6.77 ± 0.62	
	Contains natural ingredients	0.852		5.75 ± 1.17	6.85 ± 0.41	
	Contains no artificial ingredients	0.837		5.24 ± 1.56	6.67 ± 0.95	
Factor 6	*Price*		0.743	5.85 ± 0.31	6.71 ± 0.13	
	Is not expensive	0.965		5.83 ± 1.14	6.75 ± 0.60	
	Is cheap	0.713		5.44 ± 1.28	6.57 ± 0.85	
	Is good value for money	0.467		6.28 ± 0.82	6.82 ± 0.51	
Factor 7	*Weight control*		0.896	4.70 ± 0.25	6.45 ± 0.02	
	Is low in calories	0.840		4.56 ± 1.69	6.44 ± 0.92	
	Helps me control my weight	0.951		4.63 ± 1.75	6.47 ± 1.03	
	Is low in fat	0.796		4.91 ± 1.69	6.43 ± 1.04	
Factor 8	*Familiarity*		0.834	3.99 ± 0.61	5.19 ± 0.39	
	Is what I usually eat	0.701		4.31 ± 1.64	5.41 ± 1.69	
	Is familiar	0.911		4.22 ± 1.57	5.42 ± 1.78	
	Is like the food I ate when I was a child	0.690		3.44 ± 1.75	4.74 ± 1.95	
Factor 9	*Ethical concern*		0.738	4.75 ± 1.16	6.12 ± 0.70	
	Comes from countries I approve of politically	0.693		4.09 ± 1.80	5.54 ± 1.78	
	Has the country of origin clearly marked	1.000		4.46 ± 1.83	5.92 ± 1.65	
	Is packaged in an environmentally friendly way	0.448		5.73 ± 1.31	6.90 ± 0.39	
Total				5.34 ± 0.69	6.51 ± 0.52	

[a]All the items were considered significant in independent *t*-test (*p* < .05).

TABLE 3 Mean and standard deviation obtained in the Motivation to Eat New Foods (MENF) scale by each group.

Item	Loadings	Cronbach's α	Group 1 Means ± SD	Group 2 Means ± SD	p value[a]
Motivation to approach new foods					
I enjoy trying foods that I have never eaten before	0.769	0.869	5.80 ± 1.49	6.30 ± 1.01	**0.002**
I enjoy learning about new foods	0.726		6.33 ± 1.05	6.71 ± 0.69	**0.001**
I am interested in trying familiar foods that have been prepared with new ingredients	0.899		6.12 ± 1.24	6.67 ± 0.66	**<0.0001**
I am curious about the flavors of new foods and ingredients	0.866		6.01 ± 1.32	6.58 ± 0.72	**<0.0001**
I get sort of excited when I know I am going to eat some new types of food	0.523		4.88 ± 1.81	5.24 ± 2.04	0.111
Motivation to avoid new foods					
I do not trust new foods	0.598	0.853	2.32 ± 1.46	2.16 ± 1.62	0.376
I am afraid to eat things I have never had before	0.687		2.72 ± 1.66	2.51 ± 1.83	0.310
I think that if I eat something I have not eaten before that it will taste strange	0.789		2.88 ± 1.77	2.58 ± 1.79	0.159
I think that if I eat something I have not eaten before that I will not like it	0.833		2.38 ± 1.59	2.09 ± 1.59	0.136
Foods I have never eaten before seem sort of disgusting	0.763		2.19 ± 1.46	1.89 ± 1.59	0.090

[a]Values displayed in bold are considered significant in independent t-test ($p < .05$).

TABLE 4 Categories identified in word association and examples of individual associations and number of citations from each group.[a]

Categories	Examples	Group 1 ($n = 209$)	Group 2 ($n = 106$)	p value
Sprouts	Alfalfa, bean	94[(−)]	104[(+)]	**<.0001**
Healthiness	Healthy, nutrition, energy, health	94	53	.781
Environmental	Nature, garden, agriculture, field, plant	94[(+)]	38[(−)]	**.032**
Affective memory	Beans in cotton, birth, curiosity, lightness	74	40	.679
Food	Food, roots, salad	56	24	.184
Nutritional quality	Nutritious, nutrient, antioxidant, protein, vitamins	54	43	.149
Sensory	Tasty, crunchy, bitter, texture	46	17	.105
Eating style	Vegetarian, vegan, live food, alternative	36	13	.129
Technology	Transgenic, fertilizer, agrotoxic, industry	28	12	.404
Biological risk	Contamination, bacteria, fungus, *salmonella*	5	1	.420
Total		487	345	

[a]The presence of the superscript (+) or (−) demonstrates that it represents higher or lower frequencies than expected. p-value <.05.

main determinant of food choices in many contexts (Verain et al., 2022; Verain, Sijtsema, Taufik, Raaijmakers, & Reinders, 2020). Assessing food choice factors in a sample in Brazil, Marsola, Cunha, Carvalho-Ferreira, and da Cunha (2020) observed that the dimension with the highest score was also sensory appeal. According to them, this can be complex for launching natural/plant-based products since excessive appreciation for sensory appeal can lead to the choice of highly palatable foods (Marsola et al., 2020), such as ultra-processed foods, which are high in calories, fat, and sugars (Monteiro et al., 2019).

The second highest score in Group 1 was the price factor, while in Group 2, it was the natural content factor, demonstrating different reasons for food choices between the groups. The choice of healthy foods was the fourth most important factor in both groups. This result may show that it can be easier to introduce sprouts into the diet of both groups since sprouts are foods with high nutritional value, and their consumption may be associated with health benefits (Benincasa et al., 2019; Hübner & Arendt, 2013; Lemmens et al., 2019). It can be seen that both groups have the same trend of motivations for choosing food, although individuals in Group 2 consider more strongly ($p < .05$) all dimensions when selecting their food. Furthermore, heterogeneous consumer attitudes toward food choice are commonly found, as beliefs, attitudes, and motivations affect the study population differently (Penna et al., 2021).

Regarding Word Association's results, the four most mentioned categories in the word association were sprouts, healthiness, environment, and affective memory. All four categories presented positive aspects. Projective tasks are useful and practical tools that help to reveal the most relevant interconnections for consumers' conceptualization of the target product and that may affect the decision to purchase the product (Roininen, Arvola, & Lahteenmaki, 2006; Sass et al., 2021). On the other hand, the least cited category was "Biological risk," demonstrating that few people connected sprout consumption with a negative aspect, such as foodborne disease. It is worth noting that although the biological risk has been hardly mentioned, the consumption of sprouts is related to many outbreaks of foodborne disease (Miyahira & Antunes, 2021). It may demonstrate the little knowledge about sprouts in the studied population. Future strategies to stimulate the consumption of sprouts must include safe ways to consume them. Health professionals, especially nutritionists, can recommend the consumption of these foods and instruct the correct way of production in household settings.

Still, understanding people's motives for choosing or rejecting new foods may be necessary for maximizing the number of people who eat nutritious foods that will provide a foundation for a healthy life (Nezlek et al., 2021). Our results showed that although both groups showed stronger motivation to approach than to avoid new foods, Group 2 was significantly more open minded to new foods. Therefore, it can be considered a positive aspect of encouraging the Brazilian population to consume food with high nutritional value, such as sprouts.

Previous studies have already shown the consistent correlation between the factors of the FCQ and food neophobia, that is, reasons for approaching or avoiding a food (; Jaeger, Roigard, Hunter, & Worch, 2021). In the present study, it was observed that the greater the importance of the FCQ factors, the greater the motivations for approaching new foods, according to the data presented by Group 2.

Finally, the two groups formed in the present study provided valuable information for understanding the food choices of each profile and thus, strategies encouraging the consumption of sprouts can be directly targeted to specific groups.

5 | LIMITATIONS

Regarding the limitations of the study, although the findings are of great value for an exploratory study on the perception of a given population, the results should not be generalized to the entire Brazilian population due to convenience sampling. Therefore, more comprehensive and representative surveys are recommended to prove the validity and reliability of the study.

6 | CONCLUSIONS

Encouraging the consumption of sprouts can be an excellent strategy to include foods of high nutritional value in the diet and be in line with dietary recommendations to consume more plant-based foods. Our study showed that the groups studied seemed to support their food choices on sensory appeal. On word association, the groups related sprouts to health, environment, and affective memory. Furthermore, the participants showed interest in consuming new foods, such as sprouts. There was also an intention to consume sprouts in salads, sauteed food, and sandwiches and to buy food products made with sprouts. Thus, we believe that strategies to introduce the consumption of sprouts in the Brazilian population must address its relationship with the benefits to health, and the environment and that present sensory appeal, through the development of recipes or food products with low technological sophistication and high acceptance.

Finally, knowledge about the perception of sprouts consumption can be the first step to introducing this food to the population and encouraging the consumption of foods or products with functional characteristics. We suggest that future studies be conducted aiming to evaluate the sensory acceptability of sprouts and products made with sprouts, to facilitate the introduction of this food.

AUTHOR CONTRIBUTIONS

Roberta Fontanive Miyahira: conceptualization, methodology, formal analysis, writing—original draft, investigation, writing—review & editing. **Thamires Giangiarulo:** methodology, formal analysis, writing. **Jean de Oliveira Lopes:** methodology, formal analysis, writing. **Wanessa Pires da Silva**: ormal analysis, writing, visualization, review & editing. **Erick Almeida Esmerino:** conceptualization, methodology, formal analysis, investigation, writing—review and editing. **Adriane Elisabete Costa Antunes:** conceptualization, writing—review and editing, supervision.

CONFLICT OF INTEREST STATEMENT

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.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ETHICS STATEMENT

This study does not involve any human or animal testing.

ORCID

Erick Almeida Esmerino https://orcid.org/0000-0002-7055-8486

REFERENCES

Ares, G., De Saldamando, L., Giménez, A., & Deliza, R. (2014). Food and wellbeing. Towards a consumer-based approach. *Appetite*, 74, 61–69. https://doi.org/10.1016/j.appet.2013.11.017

Arnett, J. J., Žukauskienė, R., & Sugimura, K. (2014). The new life stage of emerging adulthood at ages 18–29 years: Implications for mental health. *Lancet Psychiatry*, 1(7), 569–576. https://doi.org/10.1016/S2215-0366(14)00080-7

Baker, M. T., Lu, P., Parrella, J. A., & Leggette, H. R. (2022). Consumer acceptance toward functional foods: A scoping review. *International Journal of Environmental Research and Public Health*, 19(3), 1217. https://doi.org/10.3390/ijerph19031217

Baudry, J., Péneau, S., Allès, B., Touvier, M., Hercberg, S., Galan, P., … Kesse-Guyot, E. (2017). Food choice motives when purchasing in organic and conventional consumer clusters: Focus on sustainable concerns (The NutriNet-Santé Cohort Study). *Nutrients*, 9(2), 88. https://doi.org/10.3390/nu9020088

Benincasa, P., Falcinelli, B., Lutts, S., Stagnari, F., & Galieni, A. (2019). Sprouted grains: A comprehensive review. *Nutrients*, 11(2), 421. https://doi.org/10.3390/nu11020421

de Albuquerque, J. G., de Souza Aquino, J., de Farias, T. G. S., Escalona-Buendía, H. B., Bosquez-Molina, E., & Azoubel, P. M. (2019). Consumer perception and use of nopal (*Opuntia ficus*-indica): A cross-cultural study between Mexico and Brazil. *Food Research International*, 124, 101–108. https://doi.org/10.1016/j.foodres.2018.08.036

De Kock, H. L., Nkhabutlane, P., Kobue-Lekalake, R. I., Kriek, J., Steyn, A., Clarissa, V. H., … Tuorila, H. (2022). An alternative food neophobia scale (FNS-A) to quantify responses to new foods. *Food Quality and Preference*, 101, 104626. https://doi.org/10.1016/j.foodqual.2022.104626

Esmerino, E. A., Ferraz, J. P., Filho, E. R., Pinto, L. P., Freitas, M. Q., Cruz, A. G., & Bolini, H. M. (2017). Consumers' perceptions toward 3 different fermented dairy products: Insights from focus groups, word association, and projective mapping. *Journal of Dairy Science*, 100, 8849–8860. https://doi.org/10.3168/jds.2016-12533

Gambaro, A. (2018). Projective techniques to study consumer perception of food. *Current Opinion in Food Science*, 21, 46–50. https://doi.org/10.1016/j.cofs.2018.05.004

Heitor, S. F. D., Reichenheim, M. E., Ferreira J. E. S., & Castro S. S. (2019). Validade da estrutura fatorial da escala de versão brasileira do Food Choice Questionnaire. *Ciência & Saúde Coletiva*, 24, 3551–3561. http://doi.org/10.1590/1413-81232018249.26482017

Hübner, F., & Arendt, E. K. (2013). Germination of cereal grains as a way to improve the nutritional value: A review. *Critical Reviews in Food Science and Nutrition*, 53(8), 853–861. https://doi.org/10.1080/10408398.2011.562060

Jaeger, S. R., Roigard, C. M., Hunter, D. C., & Worch, T. (2021). Importance of food choice motives vary with degree of food neophobia. *Appetite*, 159, 105056. https://doi.org/10.1016/j.appet.2020.105056

Kapravelou, G., Martínez, R., Perazzoli, G., Sánchez González, C., Llopis, J., Cantarero, S., … Porres, J. M. (2020). Germination improves the polyphenolic profile and functional value of mung bean. *Antioxidants (Basel)*, 9(8), 746. https://doi.org/10.3390/antiox9080746

Kim, G., Oh, J., & Cho, M. (2022). Differences between vegetarians and omnivores in food choice motivation and dietarian identity. *Food*, 11(4), 539. https://doi.org/10.3390/foods11040539

Lemmens, E., Moroni, A. V., Pagand, J., Heirbaut, P., Ritala, A., Karlen, Y., … Delcour, J. A. (2019). Impact of cereal seed sprouting on its nutritional and technological properties: A critical review. *Comprehensive Reviews in Food Science and Food Safety*, 18(1), 305–328. https://doi.org/10.1111/1541-4337.12414

Lim, J. G., Park, H. M., & Yoon, K. S. (2020). Analysis of saponin composition and comparison of the antioxidant activity of various parts of the quinoa plant. *Food Science Nutrition*, 8(1), 694–702. https://doi.org/10.1002/fsn3.1358

Magkos, F., Tetens, I., Bügel, S. G., Felby, C., Schacht, S. R., Hill, J. O., … Astrup, A. (2020). A perspective on the transition to plant-based diets: A diet change may attenuate climate change, but can it also attenuate obesity and chronic disease risk? *Advances in Nutrition*, 11(1), 1–9. https://doi.org/10.1093/advances/nmz090

Marsola, C. M., Cunha, L. M., Carvalho-Ferreira, J. P., & da Cunha, D. T. (2020). Factors underlying food choice motives in a Brazilian sample: The association with socioeconomic factors and risk perceptions about chronic diseases. *Food*, 9(8), 1114. https://doi.org/10.3390/foods9081114

Medhe, S., Jain, S., & Anal, A. K. (2019). Effects of sprouting and cooking processes on physicochemical and functional properties of moth bean. *Journal of Food Science and Technology*, 56(4), 2115–2125. https://doi.org/10.1007/s13197-019-03692-y

Miyahira, R. F., & Antunes, A. E. C. (2021). Bacteriological safety of sprouts: A brief review. *International Journal of Food Microbiology*, 352, 109266. https://doi.org/10.1016/j.ijfoodmicro.2021.109266

Miyahira, R. F., de Lima Pena, F., Fabiano, G. A., de Oliveira Lopes, J., Ponte, L. G. S., da Cunha, D. T., … Antunes, A. E. C. (2022). Changes in phenolic compound and antioxidant activity of germinated broccoli, wheat, and lentils during simulated gastrointestinal digestion. *Plant Foods for Human Nutrition*, 77, 233–240. https://doi.org/10.1007/s11130-022-00970-7

Miyahira, R. F., Lopes, J. O., & Antunes, A. E. C. (2021). The use of sprouts to improve the nutritional value of food products: A brief review. *Plant Foods for Human Nutrition*, 76, 143–152. https://doi.org/10.1007/s11130-021-00888-6

Monteiro, C. A., Cannon, G., Levy, R. B., Moubarac, J. C., Louzada, M. L., Rauber, F., … Jaime, P. C. (2019). Ultra-processed foods: What they are and how to identify them. *Public Health Nutrition*, 22(5), 936–941. https://doi.org/10.1017/S1368980018003762

Montemurro, M., Pontonio, E., Gobbetti, M., & Rizzello, C. G. (2019). Investigation of the nutritional, functional and technological effects of the sourdough fermentation of sprouted flours. *International Journal of Food Microbiology*, 302, 47–58. https://doi.org/10.1016/j.ijfoodmicro.2018.08.005

Moreno, D. A., Pérez-Balibrea, S., & García-Viguera, C. (2006). Phytochemical quality and bioactivity of edible sprouts. *Natural Product Communications*, 1, 1037–1048.

Nelson, M. C., Story, M., Larson, N. I., Neumark-Sztainer, D., & Lytle, L. A. (2008). Emerging adulthood and college-aged youth: An overlooked age for weight-related behavior change. *Obesity (Silver Spring)*, 16(10), 2205–2211. https://doi.org/10.1038/oby.2008.365

Nezlek, J., Forestell, C., & Cypryanska, M. (2021). Approach and avoidance motivation and interest in new foods: Introducing a measure of the motivation to eat new foods. *Food Quality and Preference*, 88, 1–12. https://doi.org/10.1016/j.foodqual.2020.104111

Penna, A. C. G., Portel, C. S., Pagani, M. M., Mársico, E. T., Silva, A. C. O., & Esmerino, E. A. (2021). Impact of food choice and consumption profile on the perception of food coloring on kefir labels: Insights of the projective technique of product personality profiling. *Food Research International*, 150, 110802. https://doi.org/10.1016/j.foodres.2021.110802

Pinto, L. P. F., Silva, H. L. A., Kuriya, S. P., Maçaira, P. M., Cyrino Oliveira, F. L., Cruz, A. G., … Freitas, M. Q. (2018). Understanding perceptions and beliefs about different types of fermented milks through the application of projective techniques: A case study using Haire's shopping list and free word association. *Journal of Sensory Studies*, 33(3), 1–8. https://doi.org/10.1111/joss.12326

Reed, E., Ferreira, C. M., Bell, R., Brown, E. W., & Zheng, J. (2018). Plant-microbe and abiotic factors influencing salmonella survival and growth on alfalfa sprouts and Swiss chard microgreens. *Applied and Environmental Microbiology*, 84(9), e02814–e02817. https://doi.org/10.1128/AEM.02814-17

Roininen, K., Arvola, A., & Lahteenmaki, L. (2006). Exploring consumers' perceptions of local food with two different qualitative techniques:

Laddering and word association. *Food Quality and Preference*, 17, 20–30. https://doi.org/10.1016/j.foodqual.2005.04.012

Sales, Y., Corrêa, F., Tavares-Filho, E., Soares, P., Durço, B., Pagani, M., ... Esmerino, E. (2020). Insights of Brazilian consumers' behavior for different coffee presentations: An exploratory study comparing hard laddering and completion task. *Journal of Sensory Studies*, 35, 1–9. https://doi.org/10.1111/joss.12611

Salgado, V. D. S. C. N., Zago, L, Antunes, A. E. C., & Miyahira, R. F. (2022). Chia (*Salvia hispanica* L.) seed germination: A brief review. *Plant Foods for Human Nutrition*, 77, 485–494. https://doi.org/10.1007/s11130-022-01011-z

Sass, C. A. B., Pimentel, T. C., Guimarães, J. T., Silva, R., Pagani, M. M., Silva, M. C., ... Esmerino, E. A. (2021). How buyer-focused projective techniques can help to gain insights into consumer perceptions about different types of eggs. *Food Research International*, 144, 110320. https://doi.org/10.1016/j.foodres.2021.110320

Steptoe, A., Pollard, T. M., & Wardle, J. (1995). Development of a measure of the motives underlying the selection of food: The Food Choice Questionnaire. *Appetite*, 25(3), 267–284. https://doi.org/10.1006/appe.1995.0061

Symoneaux, R., Galmarini, M. V., & Mehinagic, E. (2012). Comment analysis of consumer's likes and dislikes as an alternative tool to preference mapping. A case study on apples. *Food Quality and Preference*, 24(1), 59–66. https://doi.org/10.1016/j.foodqual.2011.08.013

Verain, M. C. D., Sijtsema, S. J., Taufik, D., Raaijmakers, I., & Reinders, M. J. (2020). Motive-based consumer segments and their fruit and vegetable consumption in several contexts. *Food Research International*, 127, 108731. https://doi.org/10.1016/j.foodres.2019.108731

Verain, M. C. D., van den Puttelaar, J., Zandstra, E. H., Lion, R., de Vogel-van den Bosch, J., Hoonhout, H. C. M., & Onwezen, M. C. (2022). Variability of food choice motives: Two Dutch studies showing variation across meal moment, location and social context. *Food Quality and Preference*, 98, 104505. https://doi.org/10.1016/j.foodqual.2021.104505

Vorage, L., Wiseman, N., Graca, J., & Harris, N. (2020). The Association of Demographic Characteristics and food choice motives with the consumption of functional foods in emerging adults. *Nutrients*, 12(9), 2582. https://doi.org/10.3390/nu12092582