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Two approaches to evaluate perception about food

Diferentes abordagens para avaliação da percepção sobre alimentos

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ABSTRACT

Objective

The aims of this research were to investigate the perception about foods in Brazil through two studies: 1) to investigate the perception about the NOVA classification of foods; and 2) to investigate the perception regarding the caloric value of fast foods and restaurant meals.

Methods

The two studies were carried out online using Google Forms. In study 1 (n=156), participants received twenty-five food concepts and were asked to associate each one with one of the five categories: unprocessed, minimally processed, culinary ingredients, processed and ultra-processed. In study 2 (n=184), images of eight meals (four of fast foods and four of restaurant meals) were provided and participants were asked to group them, as they deemed necessary, depending on the caloric value that each meal provided. After that, the individuals were asked to rank the previously formed groups from the most caloric to the least caloric.

Results

Participants perceived which foods are unprocessed and ultra-processed, as proposed by NOVA classification, although there was some confusion and misunderstanding about some foods, such as powdered milk, and the culinary ingredients group. Moreover, participants did not perceive the real caloric values of fast-food meals nor restaurant meals. Meals were ranked differently from their real caloric value and participants thought, in general, that fast foods are more caloric than restaurant meals.

Conclusion

The studies showed that Brazilians have difficulties in perceiving information about foods, i.e., to reach the population regarding food is neither simple nor trivial, highlighting the need to educate the population about it.

Keywords: Fast foods. NOVA classification. Ranking test. Sorting task. Ultra-processed food.

RESUMO

Objetivo

O objetivo deste estudo incluía investigar a percepção dos brasileiros sobre os alimentos, por meio d de: 1) Investigação da percepção da classificação NOVA de alimentos; e 2) Investigação da percepção quanto ao valor calórico de fast foods e refeições de restaurantes.

Métodos

Os dois estudos foram realizados via Google Forms. No estudo 1 (n=156), os participantes receberam vinte e cinco conceitos de alimentos e foram solicitados a associar cada um a uma das cinco categorias: in natura, minimamente processado, ingrediente culinário, processado e ultraprocessado. No estudo 2 (n=184), foram disponibilizadas oito imagens de refeições (quatro de fast foods e quatro de refeições de restaurante) e foi solicitado aos participantes que as agrupassem, conforme julgassem necessário, em função do valor calórico de cada refeição. Em seguida, foi solicitado aos indivíduos que classificassem os grupos formados do mais calórico ao menos calórico.

Resultados

Os participantes percebem quais alimentos são in natura e ultraprocessados conforme proposto pela NOVA, embora tivessem ocorrido algumas confusões e mal-entendidos sobre alguns alimentos, como leite em pó e ingredientes culinários. Além disso, os participantes não conhecem os reias valores calóricos das refeições de fast foods, nem das refeições de restaurantes. As refeições foram classificadas de forma diferente de seu real valor calórico e os participantes entenderam, em geral, que fast foods são mais calóricos do que as refeições de restaurantes.

Conclusão

Os estudos concluíram que o povo brasileiro apresenta certa dificuldade em (re)conhecer informações mais específicas sobre os alimentos. Portanto, entende-se que, instruir a população de forma mais efetiva não é simples, porém, é de extrema importância que os brasileiros se informem mais sobre esse assunto.

Palavras-chave: *Alimentos ultraprocessados. Classificação NOVA. Fast Food. Teste de classificação. Teste de ordenação.*

INTRODUCTION

Non-communicable diseases are a worldwide public health problem that leads to 74% of all deaths globally, unhealthy dietary practices being one of the factors that increase the risk of dying from a noncommunicable disease [1]. Thus, nutritional education has an essential role in promoting and improving eating habits and the quality of life of individuals. In the area of nutritional education, food-based dietary guidelines are documents with the purpose of promoting overall health and reducing the risk of development of noncommunicable diseases and, in many cases, are complemented with food guides [2]. Food guides are educational tools, with practical messages, which facilitate the selection and consumption of healthy foods by populations, based on scientific knowledge about nutritional requirements and food composition.

Among the food guides used in Brazil, the first Dietary Guidelines for the Brazilian population was published in 2008 [3], which focused especially on nutrients. Later, a second version Dietary Guidelines for the Brazilian population was published in 2014 [4], presenting a set of information and recommendations on food that aimed to promote the health of people, families and communities, and of the Brazilian population as a whole. Within proposals in the latter, foods were classified into four categories depending on, among others, the industrial processing used in their production [4]: i) unprocessed or minimally processed; ii) oils, fats, salt and sugar; iii) processed and iv) ultra-processed foods. This classification, first named NOVA in 2019 [5], has received worldwide attention and generated several discussions by Nutrition and Public Health professionals, as well as by Food Science and Technology professionals [6], especially concerning the term 'ultra-processed food'.

Because of this, research has been undertaken to investigate how people understand the term 'ultra-processed food' or whether they understand the classification of foods as proposed by the NOVA. Some studies show that the Brazilian population seems to understand NOVA and can classify foods according to it [7–8], while other studies show that there is still a need to better understand the NOVA classification [9–11]. These contradictory results show that the populations still lack information about it.

One relevant message from the second Dietary Guidelines for the Brazilian population is that feeding is more than the intake of nutrients, because it involves nutrients, foods, food combinations and the social and cultural dimensions of the act of eating, and all these aspects influence health and well-being of individuals [4]. In this way, the perception that individuals have about food and nutrition often drives their dietary behavior. A multi-country study [12] compared the caloric values of full-service meals from different countries and fast food restaurants, and the authors observed that, on average over all the countries, the caloric value of full-service meals (1,317 kcal) was greater than those of fast food (809 kcal) due to the large size of portions. Although the authors are not interested in encouraging fast food consumption with this study, they show that while attention is often only given to fast food, important factors such as portion sizes are being overlooked and that may have an impact on bad eating habits and, consequently, obesity. Clearly, the perception that individuals have about meals is relevant to their dietary behavior. Thus, considering that those authors only measured the energy content of the meals but did not evaluate the perception of individuals about the differences in their caloric value, means that there is an interesting gap to investigate.

In the light of this, we aimed to investigate the perception about foods by Brazilians through two studies: 1) Investigation of the perception about the NOVA classification of foods; 2) Investigation of the perception regarding the caloric value of fast food and restaurant meals.

METHODS

The two studies were carried out online via Google Forms and participants answered Study 1 followed by Study 2. Before starting the data collection, the sampling of individuals was defined according to Aguirre et al. [9]. Those authors recruited 0.0003% of the total population of different countries (Argentina and Ecuador). Considering the last official census of Brazilian population at that time [13], i.e., 190,755,799 people, 573 individuals would be recruited. Nevertheless, data was collected during the COVID-19 pandemic, limited by its online manner and no more than 211 individuals answered the formularies. Moreover, some individuals incorrectly filled in the questionnaire for Study 1 or Study 2, or even both, that meant the sample sizes of individuals were different in the two studies (156 in the Study 1 and 184 in the Study 2).

First, the participants were invited to take part in this research, which was approved by the Research Ethics Committee at the Institute of Biosciences, Humanities and Exact Sciences of São Paulo State University 'Júlio de Mesquita Filho' (Decision nº 3.237.317). It was strongly emphasized to the individuals that they could not have studied or worked in the areas of Nutrition, Gastronomy, Food Engineering, Agronomy, Animal Science or Agronomic Engineering due to their previous knowledge regarding the subjects covered in this research; in these cases, they were instructed not to take part in the study. The participants, after giving their consent, were characterized using a questionnaire regarding demographics and behavior. Then, they answered Study 1 followed by Study 2.

Study 1 aimed to investigate consumer perception about the NOVA classification of foods. Although some studies had already been performed with the same purpose [7–11], either they were performed in other countries (not in Brazil), or different methodologies were used. In this study, twenty-five foods were selected, five corresponding to each category defined in the food guide: i) unprocessed: orange, carrot, egg, lettuce and tomato; ii) minimally processed: rice, powdered milk, frozen meat, whole orange juice and fresh tuna; iii) processed culinary ingredient: brown sugar, lard, refined salt, corn oil and coconut fat; iv) processed: bread, cheese, canned tuna, pickled carrot and tomato paste; v) ultra-processed: cereal bar, instant noodles, packaged snack, ham and powdered

orange juice. Although NOVA and food guide states 'unprocessed or minimally processed' as one category, separating it into two allowed for a deeper study. Thus, those foods were separated that could be seen as 'unprocessed' by consumers (orange, carrot, egg, lettuce and tomato) from the others such as rice, powdered milk, frozen meat, whole orange juice and fresh tuna. Moreover, the term 'oils, fats, salt and sugar' proposed in the Dietary Guidelines for the Brazilian population [4] was changed to 'culinary ingredient' in 2019 [5] and this is the reason why this latter term is used in this paper.

The criteria for food selection were: i) examples provided by the food guide itself [4]; ii) foods from the different classic groups of foods (cereals and derivates, vegetables and fruits, milk and dairy products, meats and eggs, oil and fats, sugar and sweets); iii) foods from the same raw-material, such as 'tomato and tomato paste', 'carrot and pickled carrot', 'orange, whole orange juice and powdered orange juice' and 'fresh tuna and canned tuna', to verify consumers' comprehension of food processing; iv) foods already mistakenly indicated as ultra-processed in previous studies [9–10], such as powdered milk and frozen meat. Moreover, all foods are consumed by the Brazilian population [14], which ranged from 0.6% (canned tuna among other canned fishes) to 84.0% (rice) of the population.

Foods were presented to individuals in the form of concepts (words). For the construction of the questionnaire in Google Forms, the food concepts were put in columns and the food guide categories in rows, and the participants were asked to associate each food (concept) with one of the five categories unprocessed, minimally processed, culinary ingredients, processed and ultra-processed. Google Forms randomized the order of the categories for each participant.

Data was treated in two ways: association between foods and association between food and category. Regarding association between foods, the twenty-five foods were put in columns and in rows and a similarity matrix was constructed considering as '0 = foods not associated in the same category' and '1 = foods associated in the category'. This matrix was transformed into a proximity matrix of Euclidean distance and multidimensional scaling was applied. Regarding the association between foods and categories, the frequency of association of each food with each category was calculated and analyzed using the chi-square test at a significance level of 0.05.

In Study 2, the sorting task technique was applied to verify participant perceptions about the caloric values of different types of meals (fast foods *versus* restaurant meals). For this, eight images of meals (four for each category) were selected from websites of food producing companies, as they inform the caloric values of their meals. The criteria used for the choice were fast foods ***versus*** restaurant meals and a range of caloric values for each category of meal (Table 3). The eight images were simultaneously presented to the participants, who were asked to group them, as they deemed necessary, depending on the caloric value that each meal provided. After that, the ranking test was applied. The individuals were asked to rank the previously formed groups from the most caloric to the least caloric. For data treatment, the similarity matrix was transformed into a proximity matrix of Euclidean distance and multidimensional scaling was applied. After, the ranking of meals was analyzed using the Friedman test (ranking analysis of variance) at a significance level of 0.05. The XLSTAT program for Microsoft Excel (Addinsoft, New York, USA) was used for all the statistical analyses.

RESULTS

Table 1 presents the characterization of participants in Study 1 and Study 2. They are from 18 to 53 years old (Study 1) and from 18 to 83 years old (Study 2), the majority female, single, with some or completed level of higher education. The majority read packaged food labels and the list of ingredients, either often or occasionally. At least 50% of them read the name/type of product, brand, expiry date and nutritional information, motivated especially by curiosity and concern with health. Product weight x price is also looked at. Concerning their previous knowledge, only 18% and 16% of participants of Study 1 and Study 2, respectively, have ever heard about the Dietary Guidelines for the Brazilian population, while 62% and 63% respectively have ever heard the term ultra-processed food.

Table 1 – Characterization of participants in Study 1 (n=156) and Study 2 (n=184). São José do Rio Preto, Brazil, 2020-2021.

1 of 2

Variables	Study 1	Study 2
Age (years)		
Minimum	18	18
Maximum	53	83
Sex (%)		
Female	62	63
Male	38	37
Marital status (%)		
Single	83	73
Married	8	15
Common-law marriage	6	8
Divorced	3	3
Widow(er)	0	1
Education level (%)		
Elementary school (some and completed)	1	1
High school (some and completed)	11	16
Technique education	1	3
Higher education (some and completed)	72	65
Postgraduation (some and completed)	15	15
Participants that read packaged food labels (%)	68	68
Frequency (%)		
Always	16	14
Often	51	40
Occasionally	30	40
Rarely	3	6
Participants that read food ingredient list (%)	67	69
Frequency (%)		
Always	20	14
Often	34	25
Occasionally	37	52
Rarely	9	9
What participants read in the packaged food labels (%)		
Name/type of product	76	72
Brand	56	57
Design	21	18

Table 1 – Characterization of participants in Study 1 (n=156) and Study 2 (n=184). São José do Rio Preto, Brazil, 2020-2021.

Variables	Study 1	Study 2
Product weight	46	46
Expiry date	83	87
Nutritional information	73	66
Functionality	27	29
Interests in reading the packaged food label and ingredient list (%)		
Importance of the brand	14	20
Curiosity	53	58
Product weight x price	42	48
Concern with health	68	72
Concern with aesthetics	25	17
For having some type of dietary restriction	29	24
Participants that have ever heard about the Dietary Guidelines for the Brazilian population (%)	18	16
Participants that have ever heard the term ultra-processed food (%)	62	63

Regarding the food concepts presented to the participants (Study 1), the multidimensional scaling shows that both dimensions differentiated foods (Figure 1A). The most effective discrimination occurred for orange, carrot, egg, lettuce, tomato and fresh tuna, because they were clearly separated from the others and are more distant from 0 in Dimension 1, which also means that participants identified them as similar. Five of these foods, except fresh tuna, are classified as unprocessed by the NOVA classification and were indeed associated together. Nevertheless, the association of the other foods was not so clear because there are foods from different categories of the NOVA classification separated both by Dimensions 1 and 2, such as brown sugar (culinary ingredient) similarly associated to pickled carrot, bread and cheese (processed), or powered milk (minimally processed) associated with ham (processed) and powered orange juice, instant noodles and packaged snacks (ultra-processed).

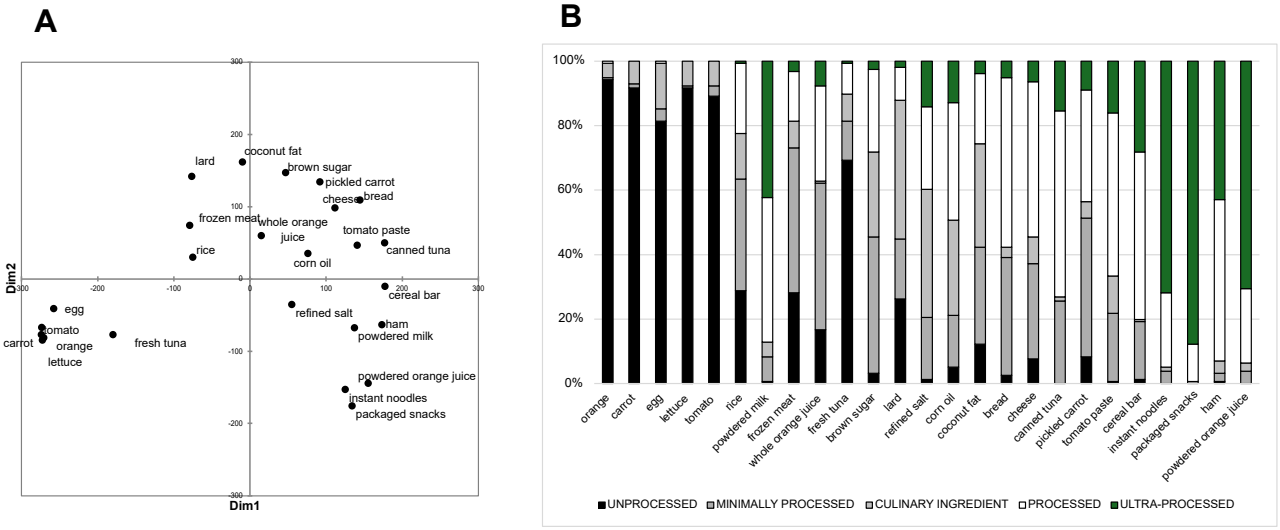

Figure 1 – Bidimensional map for the projection of foods (A) and association frequency of each food with categories proposed by NOVA classification (B). São José do Rio Preto, Brazil, 2020-2021.

The frequency of association of each food with each category is shown in Figure 1B. Again, foods classified as unprocessed by NOVA (orange, carrot, egg, lettuce and tomato) were frequently associated as unprocessed. Fresh tuna was also frequently associated as unprocessed, result that

corroborates those observed in Figure 1A, in which fresh tuna appears with the first five foods. At the same time, instant noodles, packaged snacks and powdered orange juice were frequently associated as ultra-processed as well as classified by NOVA; however, the same does not occur with cereal bar and ham, which were frequently associated as processed. Moreover, the association of all other foods was largely distributed between all the categories, indicating that participants had difficulty in associating such foods with the categories classified by NOVA, the association between powdered milk and processed food being the exception.

Results from Figure 1B are corroborated in Table 2, which gives the association frequencies in more detail. It presents the results of the chi-square test, used to compare whether the frequency of each category is higher or lower than the expected theoretical value. In this case, the expected theoretical value is the uniform distribution of the food among all the categories. Moreover, when the category frequency is significant (indicated by the asterisks), this means that the magnitude of the difference between the observed and the expected values is significant. Concerning the categories classified by NOVA, orange, carrot, egg, lettuce and tomato were frequently associated (> symbol in Table 2; the same is applicable to the next results) with the unprocessed category. Among the minimally processed foods, only rice, frozen meat and whole orange juice were frequently associated with this category, while fresh tuna was frequently associated with the unprocessed category and the powdered milk with processed and ultra-processed categories.

Table 2 – Chi-square results, indicating whether the observed frequency is higher or lower than the expected theoretical value. São José do Rio Preto, Brazil, 2020-2021.

Food concept	Unprocessed	Minimally processed	Culinary ingredient	Processed	Ultra-processed
Orange	>***	<***	<*	<***	<***
Carrot	>***	<***	<	<***	<***
Egg	>***	<***	>	<***	<***
Lettuce	>***	<***	<	<***	<***
Tomato	>***	<***	<	<***	<***
Rice	>	>***	>	<	<***
Powdered milk	<***	<**	<*	>***	>***
Frozen meat	>	>***	<	<**	<***
Whole orange juice	<*	>***	<***	>	<**
Fresh tuna	>***	<	<	<***	<***
Brown sugar	<***	>***	>***	<	<***
Lard	<	<	>***	<***	<***
Refined salt	<***	>	>***	<	<
Corn oil	<***	<	>***	>*	<
Coconut fat	<***	>**	>***	<	<***
Bread	<***	>***	<**	>***	<***
Cheese	<***	>**	<	>***	<***
Canned tuna	<***	>	<***	>***	<
Pickled carrot	<***	>***	<*	>*	<**
Tomato paste	<***	>	>	>***	<
Cereal bar	<***	<	<***	>***	>**
Instant noodles	<***	<***	<***	<	>***
Packaged snack	<***	<***	<***	<***	>***
Ham	<***	<***	<*	>***	>***
Powdered orange juice	<***	<***	<**	<	>***

Note: *$p \leq 0.05$; **$p \leq 0.01$; ***$p \leq 0.001$. Significant differences are within the row. Symbols indicate whether the observed frequency is higher (>) or lower (<) than the expected theoretical value according to the chi-squared test.

Brown sugar, lard, refined salt, corn oil and coconut fat were frequently associated with the culinary ingredient category although brown sugar and coconut fat were also associated with minimally processed and corn oil with processed. Bread, cheese, canned tuna, pickled carrot and tomato paste were frequently associated with the processed category, although bread, cheese and pickled carrot were also associated with culinary ingredient category. And cereal bar, instant noodles, packaged snack, ham and powdered orange juice were frequently associated with the ultra-processed category. All these results show that, in general, participants perceive which foods are unprocessed and ultra-processed as proposed by NOVA; however, there are still some misunderstandings for other foods (minimally processed, culinary ingredients and processed).

For Study 2, the multidimensional scaling separated meals in four groups (Figure 2): one composed of stroganoff and parmigiana; another one composed only of chicken fillet; another one composed of double steak, pizza and sfiha + fries; and a last one composed of beirut and salad. Nevertheless, no dimension separated meals as a function of being fast food or restaurant meals.

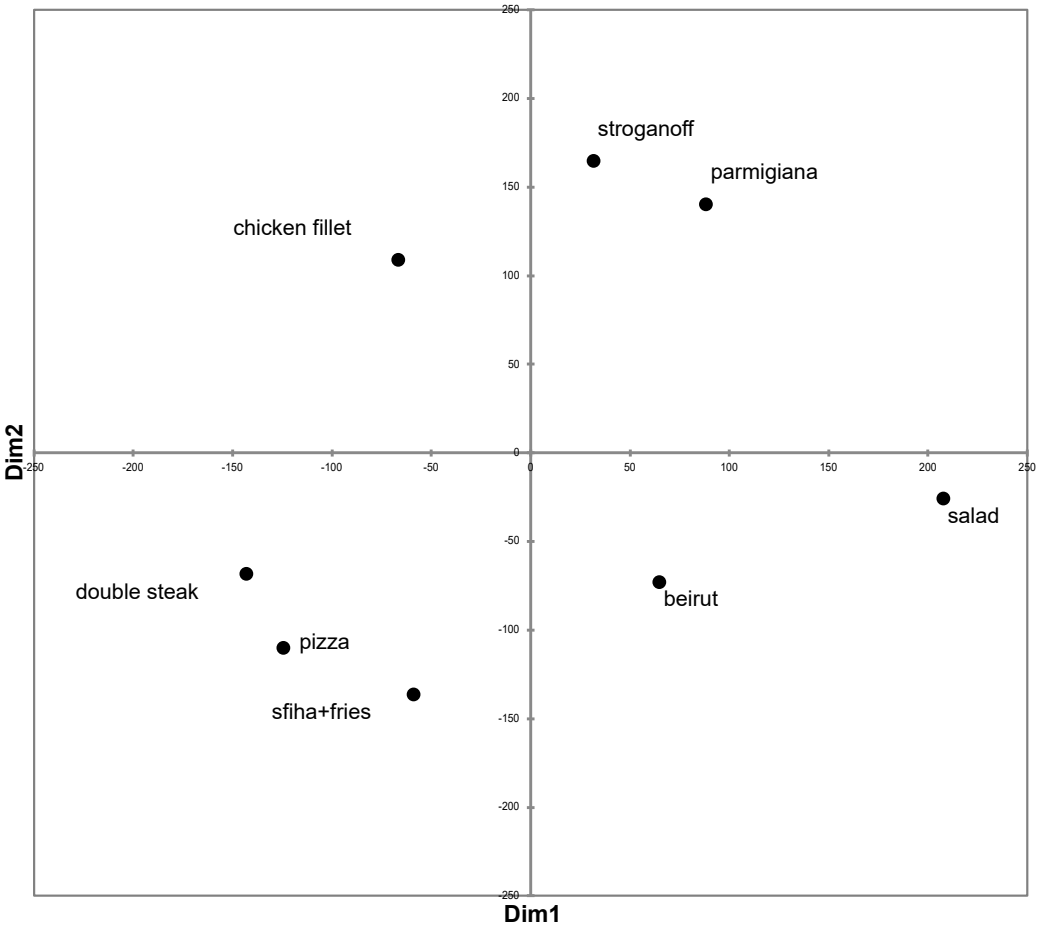

Figure 2 – Bidimensional map for the projection of meals. São José do Rio Preto, Brazil, 2020-2021.

When asked to rank the previously formed groups from the most caloric to the least caloric, participants ranked the Caesar salad as the least caloric, followed by the traditional meat parmigiana, chicken stroganoff and beirut, then by the executive chicken fillet (Table 3). Sfiha of meat + french fries was ranked to be as caloric as pepperoni pizza slice, while the latter was ranked to be as caloric as double steak. Double steak was ranked as one of the most caloric meals. Nevertheless, the caloric values informed by food producing companies do not follow the same order as ranked by participants.

Table 3 – Rank sum scores (n=184) of the meals in function of their caloric value according to participant perception and their caloric value declared by the companies. São José do Rio Preto, Brazil, 2020-2021.

Meal	Sum of orders*	Caloric value (kcal)
Caesar salad	268.0[a]	383[1]
Traditional meat parmigiana	673.0[b]	1,104[1]
Chicken stroganoff	720.5[b]	894[1]
Beirut	745.0[b]	919[2]
Executive chicken fillet	858.5[c]	591[3]
Sfiha of meat + french fries	1,038.5[de]	594[2]
Pepperoni pizza slice	1,119.5[ef]	274[4]
Double steak	1,201.0[f]	1,462[5]

Note: *Meals were ranked from the most caloric (position 8) to the least caloric (position 1). Different letters indicate significant difference ($p \leq 0.05$).
[1][15], [2][16], [3][17], [4][18], [5][19].

DISCUSSION

Regarding the characterization of the participants, differences in the percentage about if they had ever heard about the Dietary Guidelines for the Brazilian population (18% and 16% of participants of Study 1 and Study 2, respectively) and the term ultra-processed food (62% and 63% of participants of Study 1 and Study 2, respectively) must be highlighted. Our perception is that the term ultra-processed food has become a buzz word not only in the scientific literature but also in the media. Because of this, the keywords "ultra-processed food" and "Dietary Guidelines for the Brazilian population" were searched on 02/09/24, in both the English and Portuguese languages and, 2,323 and 103 results in Web of Science, 2,257 and 119 results in Scopus and 78,636,500 and 7,880,000 in Google were found, respectively. These results may help explain differences in the results regarding ever having heard about the Dietary Guidelines for the Brazilian population and ultra-processed food.

In Study 1, the results show that participants generally perceive which foods are unprocessed and ultra-processed as proposed by NOVA; however, there is some confusion about the other foods.

One of the uncertainties found concerns powdered milk. This food is classified as minimally processed by NOVA; however, it was often classified as processed or ultra-processed (Table 2). This same result was found in two other studies. A study carried out in Uruguay [10] showed that, in general, consumers understand 'processed food' in the same way as defined by the guide. Nevertheless, some minimally processed, processed foods and culinary ingredients were also understood as 'processed food'. In another study carried out in Argentina and Ecuador [9], results were similar. Moreover, participants considered powdered milk and powdered orange juice to be similar, although NOVA classifies them as minimally processed and ultra-processed, respectively. NOVA differentiates these foods in function of the list of ingredients. While powdered milk has milk as the major ingredient and vitamins depending on the brand, powdered orange juice has many ingredients, especially additives, differences that guided the NOVA classification. Nevertheless, it seems that participants only used the information about 'powdered' to associate both foods as similar. Even though 67% of participants read food ingredient lists (Table 1), this is not enough to understand the differences used by NOVA.

There is another misunderstanding regarding some culinary ingredients. Brown sugar and coconut fat were associated with culinary ingredients and minimally processed, while corn oil was associated with culinary ingredients and processed. This probably occurred because, while unprocessed, minimally processed, processed and ultra-processed terms refer to processing, i.e., to the technology, the term culinary ingredient is related to its use in the food, i.e., its use as a culinary ingredient.

Although cereal bar, instant noodles, packaged snack, ham and powdered orange juice were indeed associated with the ultra-processed category (Table 2), it should not be overlooked that this term does not exist within food technology and engineering itself, which has generated much discussion and controversy as previously described. It seems that the right associations may be due to the internet, since the term ultra-processed food is searched for much more than the Dietary Guidelines for the Brazilian population and considering the lower percentage of participants that have already heard about the Dietary Guidelines for the Brazilian population compared to the term ultra-processed (Table 1).

Another interesting result is about fresh tuna. As described before, although NOVA and the food guide state 'unprocessed or minimally processed' as one category, here it was separated into two for a deeper study. Thus, we categorized fresh tuna as minimally processed, because it needs more processing steps to be consumed than orange, carrot, egg, lettuce and tomato. Participants grouped fresh tuna with these last foods, but the same did not happen to frozen meat (Figure 1A). Thus, either participants differentiated these foods concerning their origin (fish x bovine) or their processing (fresh x frozen). Anyway, such results show again a misunderstanding of the NOVA classification.

A similar study had already been performed to evaluate the understanding about the NOVA classification before and after a mini course [11]. The authors found a low percentage of correct answers before the mini course, concluding and suggesting the need for wider dissemination of the theme and more similar courses for students, professionals and the general population. Nevertheless, more than this, it is imperative that Nutrition/Public Health and Food Science/Technology professionals start a dialogue in favour of the Brazilian population, instead of assuming different egocentric and immutable positions.

Results of Study 2 are not surprising because it is indeed difficult to understand the caloric value of food and meals. The ranking of meals in order of caloric value by the participants did not follow their real caloric values (Table 3). For instance, Caesar salad, traditional meat parmigiana and beirut were ranked as some of the least caloric. Even though their photos are not shown in this paper, these three meals have a salad as a part of the meal. Maybe, the stereotype of a salad brings the impression of a low-energy food, explaining this result, especially for the traditional meat parmigiana that has the largest number of components, such as rice, fries, salad and breaded meat fillet with cheese and tomato sauce. By contrast, three of four fast food meals (sfiha of meat + french fries, pepperoni pizza slice and double steak) were ranked as the most caloric even though the first two are some of the least caloric, i.e., participants understood that fast foods are more caloric than restaurant meals. The findings show that such pre-concepts are settled in people, since it is believed that fast foods are junk food and more caloric than restaurant meals. This is not necessarily true because it also depends on the quantity of food. This is the same as observed by Roberts et al. [12] in a multi-country study that, on average, the caloric value of traditional meals was higher than that of fast foods since they would have exaggerated portions of food. Thus, considering that the weight gain is due, among other factors, to the excess of calories in the long-term, it is imperative to inform and educate the Brazilian population about food and eating, as well as about the excess of ingestion of calories independent of the type of meal.

Comparing Study 1 and Study 2, reaching the population regarding food is neither simple nor trivial. The same occurs in other countries, as discussed in this paper. Food involves several concepts and, maybe, classifying a food depending on its processing, as NOVA does, is not very effective in educating the population because it can involve knowledge that the population does

not have. By contrast, showing pictures of meals in the way the Dietary Guidelines for the Brazilian population does [4] is very interesting. Nevertheless, the Dietary Guidelines are less well-known than the term ultra-processed (Table 1) and, thus, its diffusion in the population should be encouraged, especially because it provides information about sizes of meals and proportions of foods.

CONCLUSION

Participants perceived which foods are unprocessed and ultra-processed as classified by NOVA, although there is some confusion and misunderstanding about some foods and the other categories. Moreover, participants do not perceive the real caloric values of fast-food meals or restaurant meals. Both studies here show that Brazilians have difficulties in perceiving information about foods, i.e., to reach the population regarding food is neither simple nor trivial, highlighting the need to educate the population about it.

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