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Knowledge of the NOVA food classification in a sample of Brazilian adults

El estado de conocimiento de adultos brasileños con respecto a la clasificación NOVA de alimentos

ABSTRACT

The NOVA classification categorizes foods according to the extent of industrial processing. NOVA has been used in dietary guidelines of some countries including Brazil and Uruguay. This article aimed to investigate knowledge and perceptions of a sample of Brazilian adults regarding NOVA. A qualitative study was conducted in Dourados city, Mato Grosso do Sul, Brazil. First, participants (N= 24) were asked to classify a series of 24 pictures of foods and beverages using NOVA, which define the four major food groups: unprocessed or minimally processed foods; processed culinary ingredients; processed foods; and ultra-processed foods. Next, participants were asked to explain their classification through semi-structured interviews. Data from the classification activity were analyzed using non-metric multidimensional scaling and interviews using exploratory content analysis and summative content analysis. Participants seemed to understand NOVA in terms of food processing, food production, and additives used. They easily identified unprocessed or minimally processed foods and ultra-processed foods; processed culinary ingredients and processed foods were harder to identify. Professionals, researchers and government organisations in Brazil or abroad could consider the results of this study in order to optimize this tool's potential for research and policy in nutrition and public health.
Keywords: Brazil; Food classification; Food guide; NOVA; Ultra-processed food.

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RESUMEN

La clasificación NOVA ordena los alimentos según su grado de procesamiento industrial. NOVA ha sido utilizado en las guías alimentarias de algunos países incluyendo Brasil. Investigamos el conocimiento y las percepciones de un muestreo de adultos brasileños con respecto a NOVA. Se realizó una investigación cualitativa en la ciudad de Dourados, Mato Grosso do Sul, Brasil. Los participantes (N= 24) clasificaran 24 imágenes de alimentos y bebidas en los cuatro grupos de NOVA: alimentos sin procesar o mínimamente procesados; ingredientes cu-

linarios procesados; alimentos procesados; y alimentos ultraprocesados. Luego, se les pidió que explicaran su clasificación a través de entrevistas semiestructuradas. Los datos de esa actividad se analizaron mediante escala multidimensional no métrica y las entrevistas mediante análisis de contenido exploratorio y análisis de contenido sumativo. Los participantes entienden la NOVA en términos de procesamiento y producción de alimentos, y uso de aditivos. Ellos identificaron fácilmente los alimentos sin procesar o mínimamente procesados y los alimentos ultraprocessados pero no los alimentos de los otros grupos. Investigadores y organizaciones gubernamentales en Brasil y en el extranjero podrían tener en cuenta estos resultados para optimizar el potencial de

esta herramienta para la investigación y las políticas en nutrición y salud pública.
Palabras clave: Alimentos ultraprocessados; Brasil; Clasificación de alimentos; Guías alimentarias; NOVA.

INTRODUCTION

The NOVA classification categorizes foods according to the nature, extent and purpose of industrial processing[1]. Industrial food processing, as understood by this classification, involves physical, chemical and biological processes that occur after foods are separated from nature, and before they are consumed or used in preparation of dishes and meals[1]. NOVA classifies all foods and beverages into four groups: unprocessed or minimally processed foods; processed culinary ingredients; processed foods; and ultra-processed foods[1].

Unprocessed foods are obtained directly from nature (i.e., plants, animals, and also fungi, algae, and water) and do not undergo any alteration before consumption. Minimally processed foods, in turn, are foods that have undergone minimal processes, such as cleaning, drying, grinding or fermentation. Examples are dried fruits with no added sugars or oils; pre-washed vegetables; meat, poultry, fish, and seafood, whole or in the form of steaks, fillets or other cuts; and milk, pasteurized or powdered[1,2]. The group of processed culinary ingredients is composed of ingredients commonly used in culinary preparations, usually obtained directly from unprocessed or minimally processed foods by processes such as pressing and refining. Examples of processed culinary ingredients are vegetable oils, salt and sugars[2]. Processed foods are manufactured by the addition of salt or sugar or any other processed culinary ingredient to unprocessed or minimally processed foods, in order to extend shelf-life and/or modify flavour, as in the case of jellies and pickled vegetables[2]. Finally, ultra-processed foods are formulations made mostly or entirely from refined substances derived from foods, and additives, with little if any whole foods. A few examples are soft drinks, sweet or savoury packaged snacks, reconstituted meat products, and ready-meals[2].

Studies have shown a positive association between consumption of ultra-processed foods and the overall deterioration of the quality of diets, as well as health outcomes[3] including obesity[4,5], metabolic syndrome[6], and dyslipidaemias[7].

Since its creation[8,9], the NOVA classification has undergone some updates and revisions[1,10]. Currently, NOVA is recognized by international organizations such as the Food and Agriculture Organization of the United Nations and the Pan-American Health Organization as a valid tool for nutrition and public health research, policy, and action[11].

In Brazil, the second edition of the national Dietary Guidelines contain recommendations to guide food choices which are based on empirical evidence obtained by applying the NOVA classification to national food consumption data[12]. Dietary guidelines and nutritional education instruments, such as the Dietary Guidelines for the Brazilian Population,

should be easy to understand[13], practical, realistic, and should allow flexibility in food choices[14]. It is important, therefore, to know how comprehensible these instruments are, as well as their recommendations. More precisely, it is important to know how Brazilian adults understand the NOVA food classification in order to translate the classification into better food choices.

In Brazil, despite the increasing use of the NOVA food classification in research and education[15,16,17,18], there are no studies investigating how Brazilian adults understand it. The present study aimed 1) to investigate the level of understanding of the NOVA food classification, among a sample of Brazilian adults, and 2) to identify what adults easily understand, what they have difficulty understanding, and potential doubts regarding this classification.

MATERIALS AND METHODS
Study design and setting

The present cross-sectional, exploratory and qualitative study was conducted at the Federal University of Grande Dourados (Universidade Federal da Grande Dourados [UFDG]), located in the city of Dourados, in the state of Mato Grosso do Sul, Brazil. This work is part of the Ph.D. thesis of the author of this paper. In 2018, Dourados had an estimated population of 220,965 inhabitants[19], and is considered a medium-sized city[20]. Dourados concentrates a large part of the population that migrates to the State of Mato Grosso do Sul, which comes from several Brazilian states, mainly from the South, Southeast, Northeast and from the Central-West region itself[21]. The academic community of UFGD shows reflections of this migratory flow and as a consequence exhibits important socio-cultural diversity. This justifies the choice of the setting of the study.

Selection of participants

Professors (P), administrative technicians (A), and students (S) from UFGD were selected to participate in this study. Segmentation, following the process described by Bauer and Gaskell[22], was applied to create natural –instead of statistical– groups. Such groups are much more suitable for qualitative studies. This selection, however, was not a method of stratification for the analysis.

The inclusion criteria for the study were: 1) being Brazilian, 2) being affiliated with UFGD, and 3) age between 18 and 60 years. The exclusion criteria were: belonging to a traditional community (e.g., indigenous people). This was done because specific ethical issues were not considered at the time of proposal submission to the Research Ethics Committee. The study sample was selected for convenience.

The sample size was determined by the theoretical saturation criterion, that is, the point at which new information is not obtained through the data collection process used[23]. The saturation criteria were reached considering a total of 24 participants (N= 24) (12 women and 12 men), eight for each segment.

Data Collection

Data collection was performed in 2016 in two phases. First, a classification activity was performed, followed by semi-structured interviews. Both were performed individually.

For the classification activity, a set of 24 cards (all 4.5cm wide and 4.0cm high) each featuring a picture of a food or a beverage was used. The food and drink items selected were sourced from examples of the four NOVA food groups. In addition, we ensured that all items were commonly consumed and available in most supermarkets in the study region[4,24]. Afterwards, the cards were evaluated by two referees, both nutritionists and experienced in qualitative studies (Table 1). The card set used in this study is similar to tools created by Dressler[25] and Lynch and Holmes[26]. For this activity, research staff presented all the cards (randomly ordered and without any information concerning their respective food groups in the NOVA classification) to participants who were asked to identify any unfamiliar items. All participants were familiar with all items. Then, the names of the four NOVA groups were presented to the participants, printed on stripes of paper. Lastly, the participants were asked to classify each food item into the NOVA food groups.

The semi-structured interviews were held after the participants had completed the classification activity. They were asked to explain the reasons why they classified each food in each group and to describe the food characteristics, using their own words[27,28]. Participants were recorded and transcribed by the first author of this article. At the end of the interview, additional information on the participants was obtained (age, marital status and place of birth was collected to characterize our study sample).

Data analysis

Data were analysed in two stages. First, in order to investigate the participants' state of knowledge about the NOVA classification, an exploratory content analysis of transcripts was performed. Bernard and Ryan[29] defined content analysis as "a set of methods for systematically coding and analyzing qualitative data […] used to explore explicit and covert meanings in text". Classical content analysis is more deductive and uses codes derived from theory, while exploratory content analysis is more inductive and uses codes derived from data. Next, a codebook was developed, following procedures described by Bernard and Ryan[29] and MacQueenet al[30]. The transcripts were read several times to identify themes regarding food classification. Then, quotes that seemed crucial were highlighted and grouped into themes using the cutting and sorting method described by Bernard and Ryan[29]. These authors described this approach as a process which 'involves identifying quotes or expressions that seem somehow important – these are called exemplars – and then arranging the quotes/expressions into piles of things that go together'. Similarities that each exemplar shared with the others in its group were identified, and this common essence helped in nominating the themes, which appear in italic in the results section. All this was done by the first author of this paper. Then, the list of themes that emerged because of this analysis was discussed and refined jointly with the others authors of this paper until they reached a consensus; and a codebook was developed according to the practices described by Bernard and Ryan[29] and MacQueenet al[30].

The themes were described considering their core and peripheric aspects (what was more and less common in the theme, respectively), with greater attention to their focus or central tendency[29]. Following the criteria described in the codebook, we coded the interviews and present the anonymized answers of the participants as citations (in between quotation marks), indicating their occupation (indicated by the letters P, A, or S) and numbers from 1 to 8 - to ensure the anonymity of participants. With the goal of comparing what participants understood by NOVA with the theory itself, we used the most recent and published literature[3] as a theoretical reference.

Table 1. Food items (n= 24) featured in the set of cards used in the classification activity, organized according to the food groups of the NOVA classification.

Unprocessed or minimally processed foods	Processed culinary ingredients	Processed foods	Ultra-processed foods
Banana	Vegetable oil	Canned corn	Carbonated drink
Cassava	Lard	Peach in syrup	Beef broth cube
Bean	Salt	Cheese	Salted snack
Rice	White sugar	French bread	Stuffed cookie
Meat	Brown sugar	Jam	Ready-to-eat lasagna
Egg	Butter	Pickles	Frozen breaded chicken

In the second stage, in order to identify what participants easily understood, what they had difficulty understanding, and their potential doubts regarding the NOVA classification, we performed a summative content analysis of the transcripts, according to Hsieh and Shannon[31]. The initial steps of this analysis consisted of identifying and quantifying certain words in the text to find data patterns, and contextualising the codes found[31]. To do so, we started by identifying the following words in the transcripts: easy and ease; difficult and difficulty (and its plural, superlative and comparative forms); and doubt (and its plural form). We identified the word's contexts of use and excluded passages in which the words were not used in the contexts of interest.

In addition, we analysed the food classification done by the participants using Multidimensional Scaling (MDS) as an auxiliary technique. MDS generates a perceptual map where each variable corresponds to a point, and the distance between each point represents the degree of dissimilarity between them[32].This analysis allows the researcher to evaluate, by using visual maps, the relationship and interaction among variables, according to the distance between them[33]. In the present study, the variables were the foods listed in table 1. This analysis was performed using the Anthropac® software (Analytic Technologies, Lexington, KY).

Ethical considerations

This study was conducted according to the Declaration of Helsinki and was approved by the Research Ethics Committee of the University of São Paulo (approval number 1.127.723/2015). Written informed consent was obtained from all participants.

RESULTS
Participant characteristics

A total of eight teachers, eight administrative technicians, and eight students participated in the study (twelve women and twelve men), with a mean age of 30 years (SD= 9.4). Six teachers and five administrative technicians were married; all students were single.

Themes obtained through content analyses

In general, participants understood the NOVA classification groups mainly in terms of the extent of food processing, the ways food is produced, and use of additives. There seemed to be greater ease among participants in understanding the NOVA group of unprocessed or minimally processed foods and the group of ultra-processed foods than the group of processed culinary ingredients and processed foods.

In our analysis, we identified three major themes regarding food classification: food processing, food production, and additive use (Table 2). The theme food processing focused mainly on the type of food processing. Surprisingly, the type of processing was often described for the NOVA groups of unprocessed or minimally processed foods and processed foods, but not for the group of ultra-processed foods.

This theme also covered aspects such as the extent of processing that foods undergo before being available for consumption. We observed that the groups of processed and ultra-processed foods were often linked to the extent of food processing, they were identified as foods that undergo "many processes" or that were "highly processed".

The second theme food production focused mainly on the places foods were produced, but also included methods of production. In general, participants identified the "nature" and the "soil" as sites of production of unprocessed and minimally processed foods, and "industry" as the place where processed and ultra-processed foods were manufactured. Concerning methods of production, "harvesting" and "cultivation" were described as production methods of unprocessed or minimally processed foods. Processed foods were identified as being "prepared" by the industry but "not transformed", whereas ultra-processed foods were described as being "transformed" through processes sometimes unknown to the participants.

The third theme additive use focused on the use of "chemical products" or food additives. The words "colour stabilisers", "preservatives", and "glutamate" were used to describe foods from the groups of processed and ultra-processed foods. Ultra-processed foods were also identified as having a "chemical composition", referring to food additives and "artificial ingredients". Interestingly, the term "artificial" was only used to describe ultra-processed foods.

Furthermore, ultra-processed foods were pointed out to contain artificial ingredients that try to mimic natural ingredients, as observed in the statement: "Sodas have a colour to induce us… for example, the orange soda has this colour to induce our brain to think that soda is made from the natural product itself [orange fruit], but it is not true" (P8). Participants also talked about the number of additives used in processed and ultra-processed foods. For example, processed foods were referred as having fewer additives than ultra-processed foods. Foods from the group of unprocessed and minimally processed foods were described as not undergoing any "chemical processing" and not having their "chemical composition" altered.

The term "natural" was mentioned by some participants to describe the group of unprocessed or minimally processed food. This term suggests an absence of food transformation and use of additives, as well as a link between food and nature. To illustrate, see the following quote: "I consider products in nature to be a product as natural as possible" (A5).

In addition to the themes presented, the group of processed culinary ingredients was also identified by the ways these ingredients are used and consumed. This can be observed in the following quotes: "used for cooking", "[used] to prepare other foods", and "should be consumed with other foods and not by itself".

The group of ultra-processed foods was identified by attributes such as "absence of nutritional value", "can cause damage to our health", "addictive", "practical", "convenient", and "[with] long shelf-life". We observed this in the following

statements, respectively: "For salted snacks, for example, it is difficult to identify any 'food' in it" (A4); "Ultra-processed foods would be something that harms you" (S2); "And as much as a person realizes that it is not something healthy, it creates an addictiveness for this type of product" (S4); "Ultra-processed foods are fast food…I did not plan my time, I do not have time, then I will eat a ready-to-heat lasagna and have a glass of carbonated drink" (P6); "Ultra-processed foods are the ones that people eat alone, eat standing up, in the streets in a hurry" (P7); "They last a little bit longer before spoiling" (S6).

Table 3 summarizes what participants easily understood, what they had difficulty understanding, and their doubts about the NOVA classification. Among the three key words analysed (easy, difficult and doubt), we observe that the word "doubt" was the most frequent. We also identified other expressions indicating uncertainty, such as "I don't know", "I'm uncertain", and "I'm not sure". These expressions were also accounted under the "doubt" category.

Table 2. Understanding (terms and expressions) of study participants (N= 24) regarding the NOVA food classification.

Themes (number of quotes)	Groups			
	Unprocessed or minimally processed	Processed culinary ingredients	Processed foods	Ultra-processed foods
Food processing (33) Type	Bagging; separating; mixing; cutting; packaging; cleaned; pasteurized; removed from the pod; washed	-------	Cooking; less-refined processing; preservation; hydrated	-------
Extent	Minimal intervention; will not remove its nature; its natural essence; with not much processing; does not require processing	Very processed; fairly processed	Fairly processed; quite high processing index; there are fewer stages to get to the final product	Fairly processed; largely processed; went through many processes
Food production (20) Places	That comes from the nature; it is from the nature; comes straight from the soil	-------	Several things are not added [additives]; you cannot make it at home	There's no way you can produce it at home; heavy industrial processing; industrialized
Methods of production	They are harvested or prepared; cultivated in a farm; I pick it myself	-------	It is made [produced]; they are not transformed	Are transformed; I have no idea what the processing is like
Additives uses (16)	Minimal processing that did not significantly alter the nutritional value of the food or its chemical composition	-------	It has a lot of additives; with a large number of chemical additives; there are fewer preservatives; with less chemical processes and fewer mixtures	Has more chemical composition; has ingredients that you cannot find naturally in food; has a lot of salt and preservatives; foods are very artificial

The word "easy" (and its plural, superlative and comparative forms) was often used when describing the NOVA group of unprocessed or minimally processed foods, and the group of ultra-processed foods. In contrast, the word "difficult" (and its plural, superlative and comparative form) was mainly present when the participants were talking about the group of processed culinary ingredients (Table 3). Lastly, the word "doubt" (and its plural form and other expressions) was often employed to express the participants' uncertainties regarding food processing, and certain foods from the group of processed culinary ingredients (such as butter and white sugar), and from the group of processed foods (such as cheese and jam) (Table 3).

Figure 1 shows the multidimensional scaling (MDS) analysis which allows for evaluating the relationship and interaction among the foods classified by the study participants, according to the distance between them. The stress value of this analysis was 0.089, and according to Kruskal (1964) cited by Fávero, Chan, Belfiore, Silva[33], it indicates an excellent fit for the MDS adjustment. The higher the stress value, the worse the

Table 3. What study participants (N= 24) easily understood, what they had difficulty understanding and doubts regarding the NOVA food classification.

Words (number of quotes)	Citation example
Easy (3)[a]	"Unprocessed or minimally processed foods was one of the easiest too. I classified into this group rice, banana, egg, cassava, bean, meat and jam." (S4) "Some of the pictures are easier to classify. The first ones, the ultra-processed foods. It is much clearer for you to see these foods as being ultra-processed: the stuffed cookie, ready-to-heat lasagne, carbonated drink, salted snack, beef broth cubes, frozen breaded chicken." (S4) "… and the fresh ones are the easiest, aren't they? Fresh or minimally processed would be banana, cassava, meat, rice and bean, and eggs." (A7)
Difficult (2)[b]	"Look, I am having a little difficulty in putting this together even though I have some idea. But I want to make it clear that I cannot differentiate processed foods from ultra-processed foods, and what is considered a culinary ingredient" (A5) "And processed culinary ingredients…can you give me some explanation? Ah, hold on, let me think about what processed culinary ingredients would be. Ah, let's put it here, this one is more difficult." (A4)
Doubt (42)[c] Foods (27)	"For example, cheese, I mean, the way to produce it is still a bit more handmade, how do I say? It is often produced in farms, I'd say, so it is kind of classified as processed food or minimally processed foods… because it confuses me, the fact that the way cheese is produced is artisanal." (S4) "This one, jam, seems to be that it is homemade or something like that, I am uncertain about whether it would be minimally processed food or processed food." (A7) "This one is a very good question, the brown sugar…I don't know if it's unprocessed food, it might be processed food." (A5)
Groups (12)	"And processed culinary ingredients, I am not sure because I've never paid much attention…, I cannot define the meaning of 'culinary'." (S4) "Processed and ultra-processed, these are great terms to confuse someone." (A5)
Processes (3)	"I am uncertain about these three: peach in syrup, pickles, and jam, because I do not know what their processes are like…" (S4) "Pickles, I do not know what the processing is for pickling." (A5)

[a] Includes the words "easy" (its plural, superlative and comparative forms), and "ease".
[b] Includes the words "difficult" (its plural, superlative and comparative forms), and "difficulty".
[c] Includes the words "doubt" [sometimes translated as 'uncertain'] and its plural forms, and the expression "I do not know".

adjustment, since its minimum value will be zero when there is no difference among the distances of the observations[33]. Figure 1 allows us to observe the distance between the points in the perceptual map. The proximity between certain foods indicates the similarity among them. We can affirm that items that are closer to each other were seen as belonging to the same food group. For instance, on the left side of the perceptual map, we observed that some food items - carbonated drinks, salted snacks, frozen breaded chicken, stuffed cookies, and ready-to-heat lasagna - are fairly close to each other. As well, on the right side, we observe proximity among the foods meat, banana, egg, rice, bean and cassava.

Interpreting the results from the perceptual map with the data from the summative content analysis, we can conclude that the foods placed on the left side were classified as ultra-processed foods, and the ones on the right side as unprocessed or minimally processed foods. These foods were the least linked to the participants' doubts. In contrast, we observed that the items located in the centre of the figure were further away from each other. These foods were more linked with participant's doubts.

DISCUSSION

Overall, the results of this study show that study participants understand the NOVA classification in accordance with its definitions. However, there appears to be some difficulty for participants in defining the groups of processed culinary ingredients and processed foods, indicating some gaps in knowledge concerning these food groups.

All participants seemed knowledgeable about the NOVA group of unprocessed or minimally processed foods. They mentioned specific types of processing typically undertaken by the food industry in order to preserve original characteristics of unprocessed or minimally processed foods when they are removed from nature.

Foods from the group of unprocessed or minimally processed food were often referred as "natural foods" by the participants. Monteiro, Cannon, Moubarac, Levy, Louzada and Jaime[3] describe the NOVA group of unprocessed foods also using the term "natural". According to Lifschitz[34], for small food communities (such as naturalists and vegetarians), "natural" refers to the origin of the products, this is, the nature. In a study carried out in Spain, Zafra et al[35], shows that "natural" is often linked to other attributes, such as rural (vs. urban), traditional (vs. modern), near (vs. far), and local (vs. global). In a study developed in the U.S. by Furst et al[36], participants easily differentiated fresh foods –synonymous of natural foods– from processed foods. In our study, we found similar results. This might indicate that individuals can easily differentiate between natural vs. processed foods. Carvalho and Luz[37] conducted a study in Rio de Janeiro, Brazil, with participant observation, and found that in "natural diets" the following food attributes are valued: handmade, foods as close as possible to their state in nature, and the absence of additives or "makeup". In our study, we found that the term "natural" was related to an absence of food transformation and additives, and to a connection of food with nature.
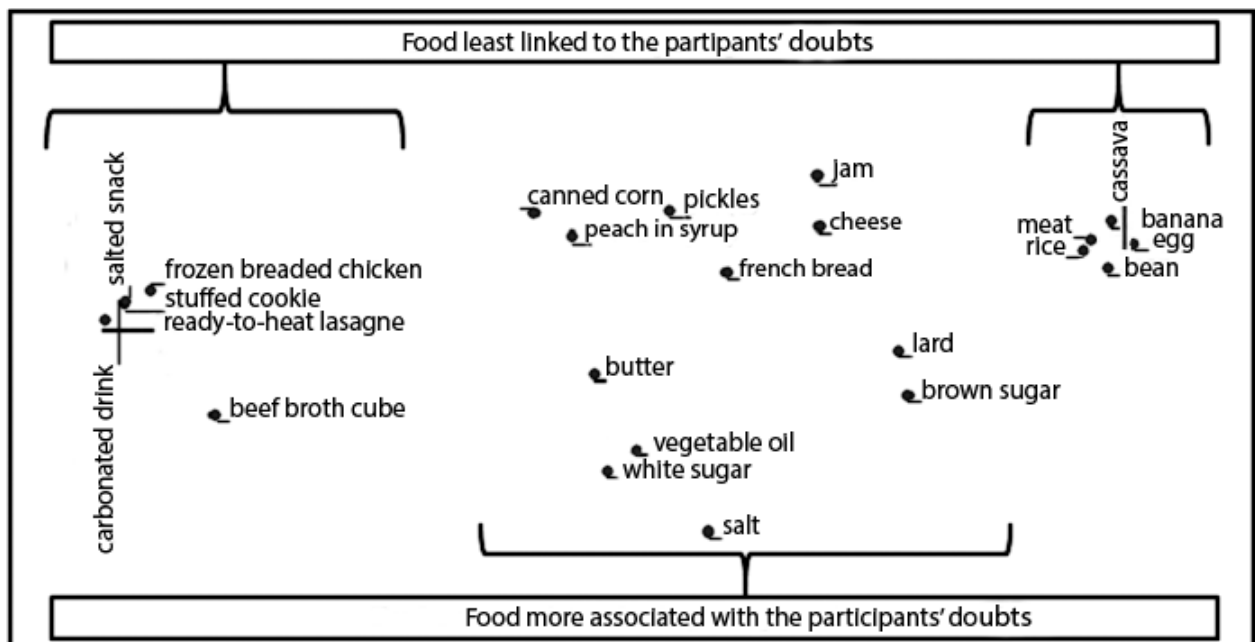
Figure 1: Multidimensional Scaling Analysis of the foods classified by study participants (N= 24), Dourados, Brazil. Note: We indicate in vertical the names of items in which the points are superimposed.

Regarding the term "minimally processed", a study carried out by Cardello et al[38] in the U.S. about individuals' perceptions of processed foods found that this term might have a pejorative meaning to some consumers. The authors hypothesize that this term may imply the idea that the product has not been sufficiently processed, posing microbiological or other safety risks[38]. In our study, in contrast, participants seemed to understand this term in the sense that minimally processed foods undergo minimal intervention, not altering their nutritional value or composition. This interpretation is in accordance with the theory of the NOVA classification[3].

We found some discrepancies between participant knowledge and the NOVA theory concerning the group of processed culinary ingredients. According to NOVA, processed culinary ingredients are substances extracted from unprocessed foods with the goal of obtaining durable ingredients such as vegetable oils, fats, butter, sugar and honey used to prepare, season, and cook enjoyable meals and dishes made up from unprocessed or minimally processed foods3. In our study, some food items were classified as processed culinary ingredients not considering this rationale, but rather thinking only about the purpose of processing, rather than extent and purpose, as the theory indicates. For instance, egg, an unprocessed food, was sometimes considered a liquid ingredient of a culinary preparation (e.g. a cake). Another example is the beef broth cube that was often classified as a processed culinary ingredient, since it is often used to season foods such as rice and beans. This food, however, contains significant amounts of additives, including artificial flavours and flavour enhancers[39], and is considered an ultra-processed food[3].

Other food items from the group of processed culinary ingredients also raised doubts, for instance, brown and white sugar. Some individuals classified brown sugar as a minimally processed food and white sugar as a processed or ultra-processed food. One might have rationalized that brown sugar is less "processed" than white sugar, therefore, they might belong to different food groups with different extent of food processing.

In our study, we identified some gaps in knowledge concerning the group of processed foods as well. Some food items from this group, such as pickles, canned corn, and peach in syrup, were classified as processed foods. Others foods items from this group, like jam and cheese, were classified as unprocessed or minimally processed foods. In many cases, participants assumed these foods were "handmade" or "homemade". We hypothesized that the absence of labelling with brands and logos (even if fictitious) in the food figures contributed to participant doubts. For future studies, this should be taken into consideration.

According to Furst, Connors, Sobal, Bisogni and Falk[35], people construct their knowledge about food based on personal experiences. A person who may have experienced the very production of jams, cheeses, or other processed foods such as breads and vegetable pickles, or may have lived in a context in which they were produced locally, might think these products belong to the group of unprocessed or minimally processed foods. Not because of their processing per se, but because they were not produced by the industry, but at home or at a farm. Still, regardless of whether jam, breads and cheeses are artisanal or not, they are considered processed foods, since they are produced combining unprocessed or minimally processed foods with processed culinary ingredients. Participants did not address these issues when classifying foods from the group of processed foods.

In our study, participants seemed to understand the NOVA group of ultra-processed foods. They described ultra-processed foods in terms of food processing, food production, and additives use, often using the attributes "largely processed", "highly industrialised products", and "chemically processed". Our results are similar to those found in a study carried out in Uruguay investigating consumer conceptualization of ultra-processed foods[37]. The study found that people describe ultra-processed foods using their nutritional attributes, such as "contain a lot of ingredients", "high in fat", "high in sugar", "high in salt", and "contain additives"; their healthfulness ("bad for health"); and their convenience such as "ready-to-eat", and "long shelf-life"[40]. In our study, we observed that the participants also understand ultra-processed foods beyond the three themes that we have identified (food processing, food production and additives use). Ultra-processed foods were also identified as "the foods we consume when we do not have time to cook" and "the foods that people consume by themselves, standing up, in the streets and in a hurry". We can conclude that ultra-processed foods are also identified by the ways they are consumed, and therefore, the social and cultural dimensions of consumption. Social life in and out of the home is weakened by ultra-processed products. Because they are convenient, being formulated as ready-to-consume snacks and drinks or ready-to-heat items, the shared experiences of acquiring, preparing, cooking and enjoying food together become increasingly reduced. Consequently, some knowledge related to the nature, meaning and value of food are being eroded. Everywhere, food customs and culture –that are part of the identity of countries and regions– based on shared meals, are being undermined by ultra-processed products[3]. The nutritional, metabolic, social, cultural, economic, environmental and political implications of ultra-processed foods have been largely discussed by Monteiro et al[3] and inspired the gold rule of the Brazilian Dietary Guide: always prefer unprocessed or minimally processed foods and freshly made dishes and meals to ultra-processed foods[12].

Limitations and perspectives

The present results should be interpreted considering the following limitations. Although the sample size was limited to 24 Brazilian adults living in Dourados, MS, using appropriate methodology, data saturation was reached and the study objectives were achieved.

The selection of some foods and beverages over others may have influenced participant hesitations about the NOVA food classification. For future studies, we suggest that the list of ingredients should also be made available for participants in order to support their classification decision.

Although the authors reached a consensus in the analysis of the transcripts, it was not validated by other methods.

This study can be considered as initial research about the knowledge among Brazilian adults regarding the NOVA food classification. New studies should be carried out emphasizing age ranges and other specific characteristics of the population that appear to be particularly interesting for this theme.

CONCLUSION

In general, participants seem to understand the NOVA classification in terms of food processing, food production, and additives used. They often easily identified and defined both groups of unprocessed or minimally processed foods and ultra-processed foods. However, participants had some difficulty clearly identifying processed culinary ingredients and processed foods. These results have important implications. Health professionals, community agents and educators should give special attention to the NOVA groups of processed culinary ingredients and processed foods when giving nutritional advice or performing nutritional education activities. For example, they should clearly present the specific characteristics and examples of these foods. In addition, researchers and government organisations in Brazil or abroad could take into consideration the results of this study when using the NOVA food classification in order to optimize the potential of this tool for research and policy in nutrition and public health.

In spite of difficulties in identifying the group of processed culinary ingredients and processed foods, participant knowledge of the NOVA food classification met the definition given by the theory itself. This may indicate that, in general, participant definition of NOVA classification groups corresponds to what it wants to convey.

The results of the present study may indicate that the NOVA food classification is an easy and intuitive way to group foods. The recommendations from Brazilian Dietary Guide that aim to guide dietary food choices based on the classification NOVA may be comprehensible and may be successful in transmitting clear dietary guidance in order to promote healthy eating habits for the Brazilian population.

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