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Original burger (traditional) or burger with mushroom addition? A social representation approach to novel foods

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ABSTRACT

Currently, consumers' interest in healthy products has attracted the attention of academia and the meat industry, which has focused mainly on incorporating ingredients with healthier properties. In this context, the aim of this study was to investigate the social representation of original burgers and burgers with mushroom addition considering different sexes and body mass indexes (BMIs) of individuals. Thus, 209 Brazilians answered a word association task followed by a word classification based on their importance and valence for original burgers and burgers with the addition of mushrooms. To obtain the structure of social representation, the words were positioned into four distinct zones based on their frequency of elicitation and importance. Also, the polarity index was used to give a connotation to the words. Three groups of consumers were identified. The first group (consumers with class-1 obesity of both sexes) associated the original burger with positive categories (cheese, juicy, seasoned, food, tasty, joy, salad and delicious). The second one (female consumers with pre-obesity and class-1 obesity) associated the burger with the addition of mushrooms with the elements price, different, vegetarian, flavor, gourmet and healthy. Finally, the third group (men and women for both stimuli and with a wide range of BMI) characterized burgers with sensory attributes, feelings and moments of consumption. In conclusion, the social representation of the original burger and the burger with the addition of mushrooms differed among consumers, suggesting that the main associations can be the main motivations for the consumption of a certain product.

1. Introduction

Food choices and habits are generally quite stable over time (Wood & Neal, 2009). An alteration in the consumption patterns of a product may be due to a series of factors that influence consumer behavior, such as environment, habits and attitudes. Approximately a billion people worldwide are already vegetarians or vegans (Stoll-Kleemann & Schmidt, 2017), between 14 and 60% of the global population define themselves as flexitarians (González, Marquès, Nadal, & Domingo, 2020), and specifically in Brazil, the adoption of the vegetarian diet went from 8% in 2012 to 16% in 2018 (Polli et al., 2021). Some of the motivations for this reduction or elimination of meat and meat products in the diet have been related to their high levels of fat, salt, cholesterol, and synthetic additives (de Paglarini, 2018), whose consumption has been associated with an increased risk of several chronic non-communicable diseases, as type-2 diabetes and coronary heart disease (Abete, Romaguera, Vieira, Lopez De Munain, & Norat, 2014; Kim et al., 2017; Zhong et al., 2020), the impact of their production on the environment (Tilman & Clark, 2014) and the consumers' concern about the welfare of farm animals. Evidence of a possible change in consumer attitudes towards meat products is the result of imagery, beliefs and mentalities, social memory or even representations (Lo Monaco,

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Piermattéo, Rateau, & Tavani, 2016).

Based on a wide range of studies developed in the field of sensory and consumer science, it has been established that consumer preferences, behavior and perception are dependent on intrinsic (i.e., sensory properties) (Rios-Mera et al., 2019; Saldaña et al., 2018) and extrinsic factors related to the product (price, claims, practicality, etc.) (Saldaña, Martins, Behrens, Valentin, Selani, & Contreras-Castillo, 2020); as well as the socioeconomic, ethical, religious, psychological characteristics of consumers and contextual aspects of evaluation (Font-i-Furnols & Guerrero, 2014). Those aspects are the result of consumer's experience with the product, including the level of familiarity, as well as history and culture (Nacef, 2018).

According to Rozin (1996), indirect social factors include beliefs, culinary traditions, and occasions, established as part of the culture acquisition and that influence human food preferences. Fischler (1988) wisely stated that foods not only carry basic nutrients, but also meaning. In other words, consumers buy the food not only for its nutritional properties, but also for what it represents, and these representations will have (directly and/or indirectly) an impact on their choices. Due to their social nature, representations may differ from one culture to another (Lo Monaco & Bonetto, 2019), regardless of whether cultural groups are defined by more contemporary criteria, such as the systems of thought or worldviews of the individuals who compose them (Imai, Kanero, & Masuda, 2016) or by a more classic division, such as ethnicity or geographic location (Bisconsin-Júnior et al., 2020; Rodrigues & Parr, 2019).

Sex and body mass index (BMI) are factors with a strong impact on the choice of food by consumers. On the one hand, it has been widely recognized that sex has a significant impact on the sensory and hedonic responses, as well as on food selection. Mora, Urdaneta, and Chaya (2018) reported that women fell a more intense flavor in wine than men. In another study, it was shown that women prefer chocolates and ice creams, while men prefer savory foods such as cheese, pizza, burger and fries/chips (Drewnowski, Kurth, Holden-Wiltse, & Saari, 1992; Wansink, Cheney, & Chan, 2003). More recently, Love and Sulikowski (2018) reported that, according to implicit responses, men were more willing to consume meat than women.

On the other hand, there is evidence of the influence of BMI on the eating behavior of individuals. A study on the social representations and emotional response regarding fatness among youth was presented by Idoiaga Mondragon and Belasko Txertudi (2018) and indicated that feeling bad for feeling fat is much more associated with social pressure than with self-health or self-comfort. This fat-phobia representation is especially associated with girls or women, in which feeling fat has been considered "a woman's shame" (Silberstein, Striegel-Moore, & Rodin, 1987), with direct negative consequences on women and their weight, producing emotional distress. Finally, Maruyama and Nakamura (2018) observed that in high-income countries, women have a lower BMI than men, which is the opposite of what is observed in low-income countries.

1.1. The theory of social representation

According to Lo Monaco and Bonetto (2019), social representation (SR) can be defined as *"a structured set of ideas, opinions, knowledge and beliefs shared by a social group about specific social objects"*, usually studied through the Social Representation Theory. This theory focuses on lay thinking and the construction of a common view of a social object through interpersonal interactions between the members of a specific social group.

Different techniques were used to study the SR and among them, the association task stood out (Donoghue, 2000), more specifically, the "free word association" task (FWA). This technique was first envisioned by Francis Galton (1879), who suggested that this type of association allows the revelation of memories (see also Lo Monaco et al., 2016). In the FWA, verbal or visual stimuli are presented and participants are asked to associate some words with these stimuli encouraging them to reveal their representations (Rodrigues, Ballester, Saenz-Navajas, & Valentin, 2015; Son et al., 2014), and thus allowing the indirect access to their ideas, values, beliefs, feelings and attitudes (Will, Eadie, & Macaskill, 1996). It is assumed that the associations that first come to mind are the most relevant for product choice (Roininen, Arvola, & Lähteenmäki, 2006). Once the associations are produced, the data processing stage is extremely important, and the approach must be chosen carefully.

Several methods have been used to investigate the structure and the content of social representations; however, the structural approach – central core theory – proposed by Abric (1976) has demonstrated great success in application. In this theory, social representations are organized around a central core and a peripheral system (the latter being formed by elements that are gravitating around the central core). They have different roles in the structure of the representation: The central core has a structuring function, is stable, gives meaning to representation and its organization is affected by collective memory. The peripheral elements, which are more flexible, are sensitive to the effects of context and integrate the individual variations resulting from the individuals' previous experiences (Abric, 2003; Nacef, 2018). This study follows this structural approach proposed by Abric (1976) and investigates the relationship between social representation and food, represented here by the burger, and if these representations can be considered as predictors of consumption habits within a social group. In addition, the framework of social representations has also been used to study the way social groups cope with the unknown, i.e., new foods or innovation-related issues (Lo Monaco & Bonetto, 2019).

1.2. Burger as an object of social representation

It is known that among processed meat products, burgers are highly appreciated, mainly by their sensory characteristics and convenience (Heck et al., 2019). The high level of consumption is mainly due to the combination of fast preparation and its pleasant sensory characteristics (Mizi et al., 2019). However, due to the current growing consumer demand for healthier products, the meat industry has been encouraged to offer products with reduced sodium and fat content in order to minimize their negative effects on human health (De Almeida, Villanueva, & da Pinto, 2016; Saldaña & da Lemos, 2015).

The incorporation of mushrooms in meat products has attracted the attention of the industry for their nutritional value, antioxidant activity and health-beneficial properties (Reis, Martins, Vasconcelos, Morales, & Ferreira, 2017), as well as for their characteristics of texture and flavor. In the presence of mushrooms, the flavor of meat products is enhanced due to the presence of glutamic and aspartic acids, 5′-nucleotides, among others, which give the pleasant umami taste (Zhang, Venkitasamy, Pan, & Wang, 2013). In this context, Patinho et al. (2021) demonstrated the potential use of A. *bisporus* mushroom as a partial substitute for animal fat in beef burgers without impairing sensory quality. The incorporation of mushrooms into beef burgers has recently been studied and favorable results have been reported (Guinard et al., 2016; Myrdal Miller et al., 2014; Sirimuangmoon, Lee, Guinard, & Miller, 2016; Spencer, Cienfuegos, & Guinard, 2018; Summers et al., 2017) which meet the sensory needs of consumers.

In several industrialized countries, meat and meat products not only play an economic and nutritional role, but are also considered a prestigious food (cultural) (Booth, 1994). A recent review of "Meat products and consumption culture in the East" showed that the consumption of meat products is culture-dependent (Nam, Jo, & Lee, 2010). In this sense, the form of consumption of the meat product "burger" has been changing in the last decades and more recently, mushrooms have been incorporated into its formulation to improve the nutritional profile. Therefore, the study of consumers' social representation seems to be necessary to understand this "transition" between the consumption of a traditional and a modified food. In the food science field, the social representation of food has been studied, such as edible flowers (Rodrigues et al., 2017) and edible insects (Bisconsin-Júnior et al., 2020);

pulses (Melendrez-Ruiz, Arvisenet, Laugel, Chambaron, & Monnery-Patris, 2020); the concept of "good rice" (Son et al., 2014) and lamb meat (de Andrade, de Aguiar Sobral, Ares, & Deliza, 2016). In this study, we explored the social representation of the "original" burger manufactured entirely with meat (object 1) contrasted with the representation of the burger with the addition of "mushrooms" (object 2).

1.3. Objectives and hypothesis

The aim of this study was to evaluate the social representation of the "original" burger and a burger with the addition of "mushrooms". To do so, we focus on two factors: consumers of both sexes and consumers with different Body Mass Indexes (BMI).

In line with our purpose, our first hypothesis is that the social representations of burgers are not the same among Brazilian consumers. These differences can show the main criteria used by consumers and explain why burgers with the addition of mushrooms are increasingly gaining ground in the food sector. Our second hypothesis is that there is an effect between sex and body mass index (BMI) on the frequency counts of the evoked words and in the social representation of "original" burgers and burgers with the addition of "mushrooms". As previously mentioned, sex can regulate the visual cues of food images based on the preliminary experiences of individuals (Spence, 2019).

2. Materials and methods

The FWA task was performed in June 2019, following the recommendations of Rodrigues and Otterbring (2019). Data collection was performed entirely in the Compusense Cloud software (Compusense Inc., Guelph, Ont., Canada). All participants filled out the free and informed consent forms approved by the ethics committee (Protocol number 98168118.4.0000).

2.1. Participants

A total of 209 regular consumers of beef burgers were recruited among students, employees and visitors of the *Escola Superior de Agricultura "Luiz de Queiroz", Universidade de São Paulo (ESALQ/USP)* through different advertising systems (Social media, flyers, word of mouth, etc.). The sociodemographic information of respondents is shown in Table 1. It is worth mentioning that the high number of participants in this study is justified by the interest of aggregating the data based on BMI and sex, maintaining a high number of consumers per group.

A non-probability quota sampling method was used for consumer recruitment, considering as criteria: (a) regular consumption of beef burger; (b) consumption of burgers manufactured from non-meat proteins; and (c) Willingness to participate in the entire study. In addition, the weight (Wincy digital scale, dimensions 28 cm × 28 cm × 2 cm, maximum capacity 180 kg) and the height (Mirac magnetic manual measuring tape, 5 m × 25 mm) of the participants were obtained to calculate the BMI according to the WHO, where: BMI = kg/m^2; Underweight: BMI below 18.5; Normal weight: BMI between 18.5 and 24.9; Pre-obesity: BMI between 25.0 and 29.9; Class-1 obesity: BMI between 30.0 and 34.9 (WHO, 2017). This index is defined as a person's weight in kilograms divided by the square of the person's height in meters (kg/m^2).

To obtain a relevant answer in criterion b, consumers were characterized. From the 209 participants, 49% answered that they had never consumed, 32% declared that they consumed a few times, 12% a few times a year, 4% at least once a month, 1% at least once a week and 2% consumed only once in their lives.

2.2. Choice of stimuli

Only two words corresponding to "original" and burgers with the addition of "mushrooms" were used. The same burger image (available in the catalog of a Brazilian restaurant at the moment of data collection) was selected to accompany the two words (original and mushrooms) in order to contextualize the products, thus, increasing the ecological validity of the task (see Galiñanes Plaza, Delarue, & Saulais, 2019). This combination of the burger image and the words "original" and "mushrooms" constituted the two stimuli that were later used in the free word association task.

Table 1
Sociodemographic profile of participants recruited for this study (n = 209).

Item	Consumers (%)	
Sex		
Male	42	
Female	58	
Age		
18–30 years	89	
31–40 years	5.74	
41–50 years	1.43	
51–61 years	3.83	
BMI total		
Under weight	3.88	
Normal weight	60.19	
Pre-obesity	27.67	
Class-1 obesity	8.25	
BMI × Sex	**Male**	**Female**
Under weight	0.97	2.91
Normal weight	22.82	37.38
Pre-obesity	11.65	16.02
Class-1 obesity	6.80	1.46
Education level		
Incomplete elementary school	3	
Complete elementary school	9	
Incomplete higher education	56	
Complete higher education	5	
Incomplete postgraduate	16	
Complete postgraduate	11	

(BMI = kg/m^2; Under weight BMI below 18.5; Normal weight BMI 18.5–24.9; Pre-obesity BMI 25.0–29.9; Class-1 obesity BMI 30.0–34.9) (World Health Organization (2017) (2017), 2017).

2.3. Familiarization

Before starting the formal test, participants were individually familiarized with the procedure and with the data collection software. The familiarization lasted ~10 min, during which consumers were asked to mention the first five words, thoughts or feelings that came spontaneously to their mind when the researcher said "heaven" (warm-up word), and then to indicate its importance and valence.

2.4. Free word association task

Participants were asked to write the first five words, thoughts or feelings that come to their mind when they see the stimuli. Later, they assessed the importance of each word, using a seven-point scale, ranging from "1 = Not important at all" to "7 = Extremely important" and the valence, using a seven-point scale, ranging from (-3) completely negative to (+3) completely positive. All participants evaluated both stimuli. The total duration of the task, including the familiarization phase, ranged from 20 to 30 min.

2.5. Data analysis

2.5.1. Lemmatization and categorization

Before performing the data analysis, the evoked words were checked to delete the typos and/or spelling errors. Then, a lemmatization (Bécue-Bertaut, Álvarez-Esteban, & Pagès, 2008) was performed by five

experienced researchers, replacing each word with its corresponding lemma (also referred to as canonical forms). The researchers evaluated the *corpus* and categorized the words into semantic groups using their meaning. The most frequent dimensions were used to name each category, which was maintained if the frequency was above 5% to avoid over-estimation (Symoneaux, Galmarini, & Mehinagic, 2012). The categories were translated to English and grouped into several dimensions. Then, the words were analyzed by different techniques (based on the nature of the input data) to test each hypothesis (Table 2).

2.5.2. Frequency of the categories and dimensions

A total of 2090 words were originally mentioned by the participants. After lemmatization and categorization, the frequency of semantic category was calculated by five researchers with experience in consumer science, following the recommendations of Guerrero et al. (2010) to balance the subjective influences of an individual researcher (Guerrero et al., 2009). The same procedure was used to merge categories into dimensions.

2.5.3. Structure of social representations

To find the structure of social representation of stimuli, we used the prototypical analysis inspired by the works of Vergès (1992) and Vergès, Tyszka, and Vergès (1994), later adapted by (Abric, 2003). For this author, social representations can be divided into four zones, crossing the importance of words (y-axis) with their elicitation frequency (x-axis). The first zone, which groups the elements with "high importance and high frequency", is the central core and its main role is to give structure and meaning to the content of the representation. The elements found in this zone are determined by collectively shared historical, sociological and ideological conditions (Abric, 1993). The second zone (high frequency and low importance), groups the elements belonging to the first periphery of the social representation and reflects individual experiences, which can be considered as an interface between the central core and the daily reality of a social group (Lo Monaco & Guimelli, 2008). The third zone groups contrasting elements, which have "low frequency and high importance" and are the least shared elements. This zone generally reveals the existence of minority subgroups with a different representation. Finally, the fourth zone (low frequency and low importance) is called the second periphery and provides the elements least present in the representation.

To obtain the four social representation zones (as described by Lo Monaco et al., 2016), it is necessary to determine cut-off points for frequency and importance. The frequency of the categories was plotted in decreasing order, with the cut-off point being the maximum difference between two successive frequencies. The cut-off point for the importance of words was obtained by averaging all the words evoked, as recommended by Wachelke & Wolter (2011).

2.5.4. Polarity index (PI)

To assess the attitudes associated with the words used in social representations, the polarity index (de Rosa, 2002) was calculated using the valence of each evoked word (positive or negative) according to the Eq. (1):

$$\text{Polarity index (P)} = \frac{\text{Number of positive words} - \text{Number of negative words}}{\text{Number of total evoked words}} \quad (1)$$

The polarity index was calculated per word. For example, the polarity index of price was calculated by the number of times it was positive, minus the frequency of its negative connotations, divided by its total frequency. P can take values ranging from −1.0 to + 1.0. P values from −1 to −0.1 indicate that the word has a negative valence. P values from + 0.1 to + 1.0 indicate that most participants gave a positive valence to that word (de Rosa, 2002).

2.5.5. Correspondence analysis

To find possible associations between sex (F × M), BMI (class-1 obesity, pre-obesity, underweight, normal weight) and stimuli O × C (original × mushrooms), participants were aggregated into 16 categories (2 sexes * 4 BMI * 2 stimuli) generating a contingency table with the categories in the rows and words in the columns (dos Harada-Padermo, 2020). This table was used to perform the correspondence analysis (CA). Only words that were used with up to 5% frequency were considered in this analysis to maintain relevant descriptors (Mahieu, Visalli, Thomas, & Schlich, 2020; Rios-Mera et al., 2019). The CA was constructed using XLSTAT software.

3. Results and discussion

3.1. Frequency of categories

From the two stimuli: "original" and "mushrooms", the corpus presented in Tables 3 and 4 were generated. In the end, 28 categories were obtained for "original" and 30 were obtained for "mushrooms". These semantic categories gave rise to 14 and 19 dimensions, respectively. Based on the frequency of citation of the semantic categories associated with each stimulus, we can affirm that the stimuli are different.

As can be seen in Table 3, the category with the highest frequency of mention for the "original" burger was "hunger". Consumers referred to this burger as a product that meets physiological needs, i.e., the individual's need to eat (hunger) is satisfied by a yummy, juicy, tasty and fatty burger. It was also observed that the fat content of "original" burgers is a concern, as consumers associate their consumption with an increased risk of developing cardiovascular diseases and cancer (Jiménez-Colmenero, 2007).

It is interesting to highlight that the category "different" was the most cited by the participants to describe the burger with the addition of mushroom (Table 4), which may indicate low familiarity with the product. Familiarity is a complex notion related to a personal experience with the product, also called exposure (Nacef, 2018). Despite the associations that reflect unfamiliarity with this type of burger, other associations showed the great interest of the participants in trying it, such as "yummy", "tasty" and "juicy". Consistent with this result, a previous study showed that consumers sensory characterized beef burgers with mushroom addition as juicy and tasty (Patinho et al., 2021).

Finally, consumers also emphasized the category "friends" in the dimension "consumption (occasion)" for both stimuli, with words like *fun* and *togetherness*, suggesting that the burger can be conceptualized as

Table 2
General outline for the analyzes and expected results used to contrast the three hypotheses considered in this paper.

	Frequency of each category	Correspondence analysis	Prototypical analysis
Tested hypothesis	H1: The elements of the social representation of the original burger and the burgers with addition of mushroom are different	H2: There is an effect of sex and BMI on the frequency of elicitation of categories	H3: The structure of the social representation of the original burger and the burger with addition of mushroom is different depending on consumption habits
Data used	Words evoked after categorization	Contingency table of categories aggregated by BMI, sex	Frequency and importance of each category
Outcome	Contingence table of categories	Correspondence analysis of aggregated categories	Two-dimensional plane that transposes the frequency and importance

Table 3
Dimensions, categories and words used by participants to describe the original burger.

Dimensions	Category	Examples of words used by the participants	Frequency of mention
Sensory characteristics	*Texture*	Tenderness, Tender	21
	Flavor	Salty	13
		Seasoned	10
	Appearance	Grilled	10
		Huge, Exaggerated, Big, Flashy, Gorgeous, Beautiful	9
Positive feeling	*Happiness*	Love, Happiness, Happy, Longing, Paradise	37
	Satisfaction	Satisfaction, Satisfatory, Satisfied, Saciety	28
	Joy	Joy	12
Consumption (occasion)	*Friends*	Fun, Laughter, Party, Conversation	12
	Leisure	Stroll, Socializing, Travel, Family, Barbecue, Celebrations, Confraternization, Sunday, Weekend, Saturday, Holidays	10
Consumption (environment)	*Environment*	Paulista Avenue (*Av. Paulista*), Bar, Burger King, Burguês, Snack bar, McDonald's, Restaurant, Mall	18
Consumption (ingredient)	*Meat*	Animal, Bull, Meat, Protein, Hamburger	39
	Cheese	Cheese, Melted Cheese, Cheddar	10
	Bacon	Bacon	9
	Salad	Crispy lettuce, Salad	6
Consumption (dish)	*Fast food*	Delivery, Fast food, Fast, Frech fries, Coke	21
	Sandwich	Sandwich, Filling	14
	Food	Meal, Food, Lunch	10
Physiological	*Hunger*	Hunger, Gluttony	129
	Desire	Mouth-watering, Eat, Want, Temptation, Will, Crave to eat, Desire	23
Delicious	Yummy	Divine, Yummy	91
	Delicious	Delight, Delicious	19
	Appetizing	Appetite, Appetizing	11
Juicy	Juicy	Moist, Broth, Juicy, Juiciness	81
Tasty	Tasty	Tasty	73
Fatty	*Fatty*	Fat, Fatty	58
Pleasant	*Pleasure*	Pleasure, Pleasant	39
Extrinsic attribute	*Price*	Expensive, Cost, Price	27
	Quality	Agribusiness, Industrialized, Quality	9
Gourmet	*Gourmet*	With care, Gourmet, Special	6

a product for specific occasions, rather than for daily meals. This result is similar to that reported by de Andrade et al. (2016) for lamb meat. It also reinforces the importance of the context of consumption in the perception and choice of food products by consumers (King, Meiselman, Hottenstein, Work, & Cronk, 2007; Köster, 2003) and suggests that familiarity with the burger can affect how consumers perceive this product.

3.2. Social representation and polarity index

According to the results, the structure of social representation between stimuli was different.

For the original burger (Fig. 1), the central core contains two sensory attributes (*juicy and tasty*), two hedonic categories (*yummy* and *pleasure*), one ingredient (*meat*) and one emotion (*happiness*). According to the PI (Fig. 4), all of these categories have positive connotations, while the first periphery showed one category with a negative connotation (*fatty*) (see Fig. 1).

Table 4
Dimensions, categories and words used by participants to describe the burger with the addition of mushroom.

Dimensions	Category	Examples of words used by the participants	Frequency of mention
Sensory characteristics	*Texture*	Tenderness, Tender, Good texture	19
	Flavor	Different flavor, Taste, Strong mushroom flavor, Distinct flavor	14
		Seasoned, Seasoning	9
	Aroma	Aromatic, Smelling	10
Positive feeling	*Satisfaction*	Satisfaction, Satisfactory, Satiated	17
	Happiness	Happiness, Happy, Tranquility	15
Consumption (occasion)	*Friends*	Hang out with friends, Young, Experience, Togetherness, Fun	6
Consumption (ingredient)	*Salad*	Lettuce, Rocket, Salad	9
	Cheese	Cheese	7
	Sauce	Mustard	6
Consumption (dish)	*Food*	Food, Kung Pao Chicken, Meal	8
Different	*Different*	Different, Peculiar, Atypical, Unusual, Homemade, Strange, Exotic, Weird	85
Delicious	*Yummy*	Adore, Yummy, Wonderful, Very good, Appetizing	66
	Delicious	Delight, Delicious	19
Health and Nutrition	*Healthy*	Fitness, Healthier, Healthiness, Healthy, Health, Light, Nutritious	65
Tasty	*Tasty*	Tasty	49
Vegetarian	*Vegetarian*	Vegetarian	48
	Vegano	Forest, Non-animal origin, Plant, Vegetables, Green	10
Physicological	*Hunger*	Hunger, Gluttony	46
	Desire	I would eat, Desire, Want, Will, Will to eat, Prove, Try	17
Extrinsic attribute	*Price*	Expensive, Cost, Price	36
Juicy	*Juicy*	Moist, Wet, Juicy, Too Juicy	36
Novelty	*New*	Alternative, Innovation, Fashion, Modern, New, Option, Substitute, Surprised	30
	Curiosity	Curious, Curiosity, Interesting, Interest, Inclusive	21
	Novelty	Novelty, Future, Advertising, Trend	13
Pleasant	*Pleasure*	Pleasant, Light, Lightness, Great, Top, Acceptable, Convenience	17
	Good	Good	9
Natural	*Natural*	Natural, Organic	10
Rejection	*Dislike*	Dislike, Unwanted, No, Not attractive, I don't like, I don't like mushrooms, Denial, Ask for something else, Bad, Disgust, Disinterest, Terrible, Tasteless	10
Fatty	*Fatty*	Buttery, Fat, Fatty, Butter	9
Gourmet	*Gourmet*	Special, Gourmet, Representative, Sophisticated	6

For consumers of the original burger, the elements located in the central core (*pleasure*, *meat* and *happiness*) show a strong association with the "original" burger. According to Graça, Calheiros, and Oliveira (2016), meat is seen as a source of pleasure (hedonism) and meat consumption is considered natural, normal, necessary and pleasant (Wang & Basso, 2019). Thus, as meat is the main ingredient of the original burger, it consequently provides positive feelings (happiness). However,

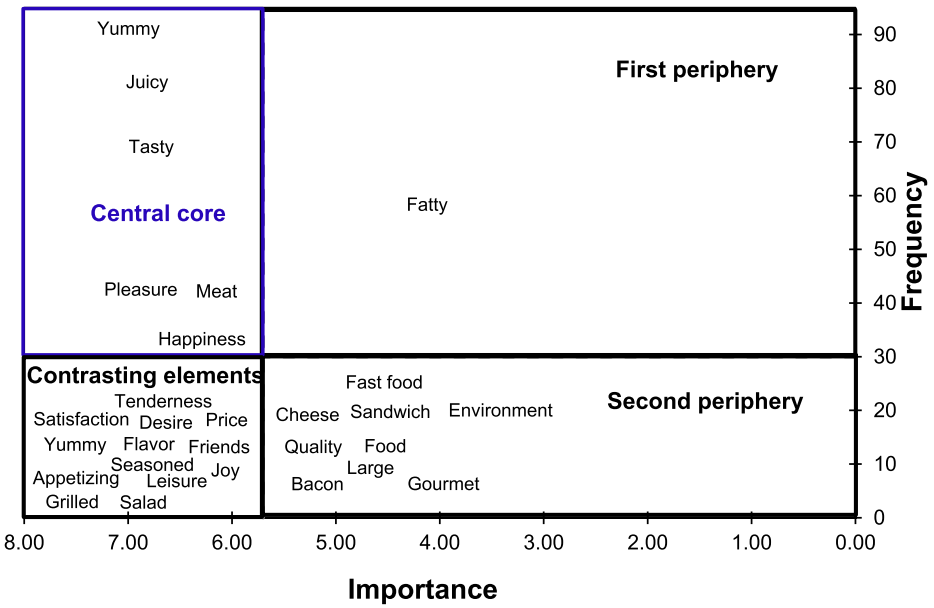

Fig. 1. The four representation zones of the prototypical analysis of social representation of original burger (Abric, 2003).

it is possible that these elements located in the central core were not resistant to changes in the central and peripheral areas, as there are no elements associated that can "protect" them. Our findings corroborate the results obtained by Gómez-Corona, Lelievre-Desmas, Escalona Buendía, Chollet, and Valentin (2016).

In the "contrasting elements" zone, which includes elements susceptible to change, almost all evoked elements are positive, with the exception of *price*, which is negative. This zone is interesting because it can portray the central core for a minority group within the social group, since these categories or elements are of great importance. The second periphery – the result of idiosyncrasy and individual representations – contains elements with different polarity indexes, i.e., with different valences. *Fast food* had a negative connotation and the other elements showed a positive connotation (Fig. 2).

For burgers with the addition of mushrooms, the central core (Fig. 3) was defined by positive elements (Fig. 4), related to sensory properties (*tasty* and *juicy*); to a hedonic property (*yummy);* and to a category that included healthy foods. Similar to what was found for the "original burger", the first periphery had only one negative element (*price*). Thus, we can infer that, for this stimulus, consumers created the first periphery with more elements that protect the central core, such as *different*, *vegetarian* and *new*, indicating stability in the representation of this social group. This effect was specifically studied by Bordarie and Gaymard (2015), who demonstrated that the distance to the object affected the valence of the representational elements: the more the participants felt concerned about the studied social object, the more they related positive elements to the representation of that object. Based on the polarity index, 9 elements had a positive connotation of 1, which indicates a positive attitude of consumers towards the product and justifies the results found in this study.

In the "contrasting elements" zone, elements semantically similar to the central core were observed, such as *delicious,* which is close to *yummy*. The second periphery contains other elements with a positive polarity index, such as *curiosity*, *novelty*, *salad* and *natural*, which support the healthy element present in the central core. However, elements with a negative connotation (*fatty and I don't like*) were also observed in this periphery, which reveal a possible rejection by some consumers, probably because they are not familiar with the consumption of mushrooms.

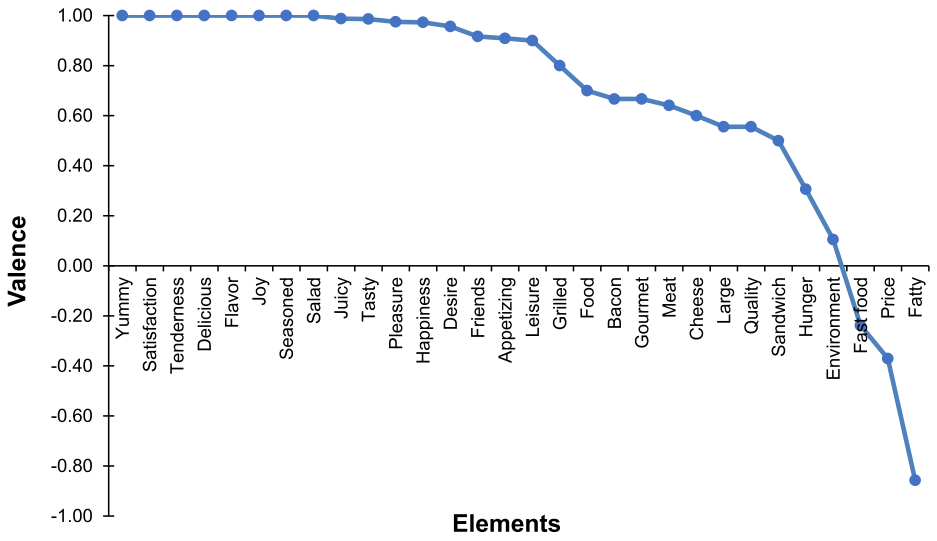

Fig. 2. Polarity index of the elements evoked by the original burger.

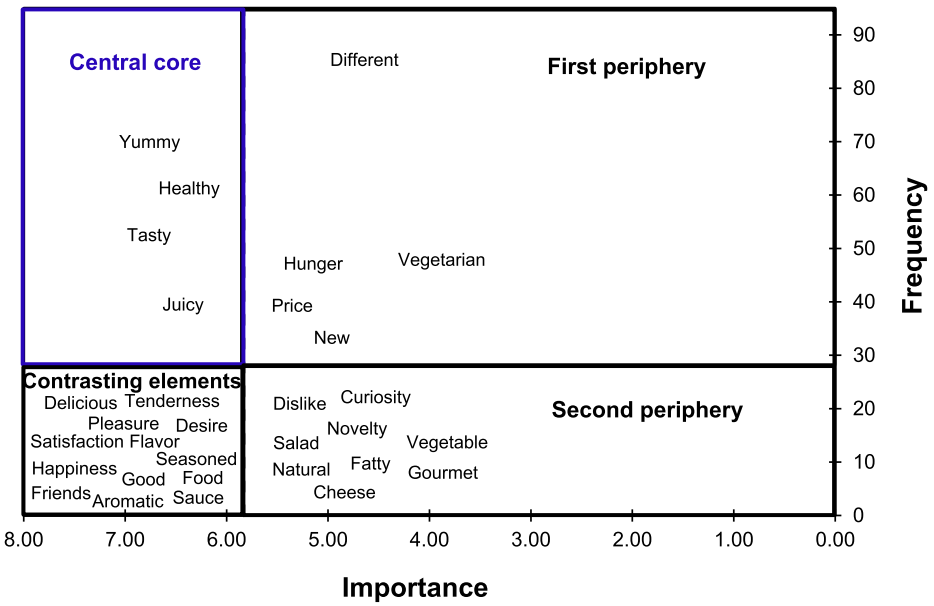

Fig. 3. The four representation zones of the prototypical analysis of social representation of burger with addition of mushrooms (Abric, 2003).

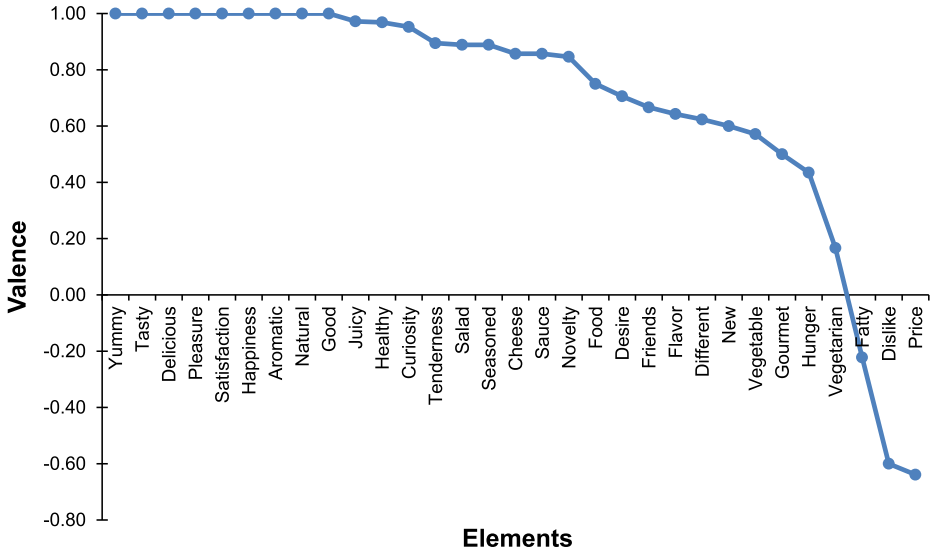

Fig. 4. Polarity index of the semantic categories for the burger with addition of mushrooms.

In spite of this, these elements are found only in the second periphery, which indicates that they are not so relevant and, therefore, may disappear from the representation of this social group in a short period.

To conclude, it was observed that the main difference between stimuli was the healthy element, which appears in the central core of the burger with the addition of mushrooms. It was surprising to have the healthy element associated with the central core of a processed meat product. According to Costa, Claro, Martins, and Levy (2013), Brazilian consumers consider processed foods less healthy, i.e., these products do not carry health claims when evaluated by consumers. This was proven in the representation of the "original" burger, which had the fatty element in the first periphery.

3.3. Correspondence analysis

The first two dimensions of CA (Fig. 5) accounted for 66.47% of the original variance, showing three groups of consumers, which highlight the differences between sex, BMI and stimuli. The first group consisted of consumers with class-1 obesity in both sexes, which associates the original burger with positive categories, such as *cheese, juicy, seasoned, food, tasty, joy, salad* and *delicious*. On the other hand, the second group consisted of female consumers with pre-obesity and class-1 obesity, who associated the burger with the addition of mushrooms with the elements *price, different, vegetarian, flavor, gourmet and healthy*. Finally, the third group, composed of men and women for both stimuli and with a wide range of BMI, characterized burgers with sensory attributes, feelings and moments of consumption.

The results of the correspondence analysis revealed that sex and BMI impacted the frequency of stimulus associations. It is clearly observed that consumers of the original burger (first group) used similar words to define the product since it is already known and consumed by Brazilian consumers. According to Antmann, Ares, Salvador, Varela, and Fiszman (2011), the terms most frequently mentioned by consumers can be considered the most relevant and commonly used to describe the characteristics of the product.

Our purpose of finding differences in the BMI categories was due to

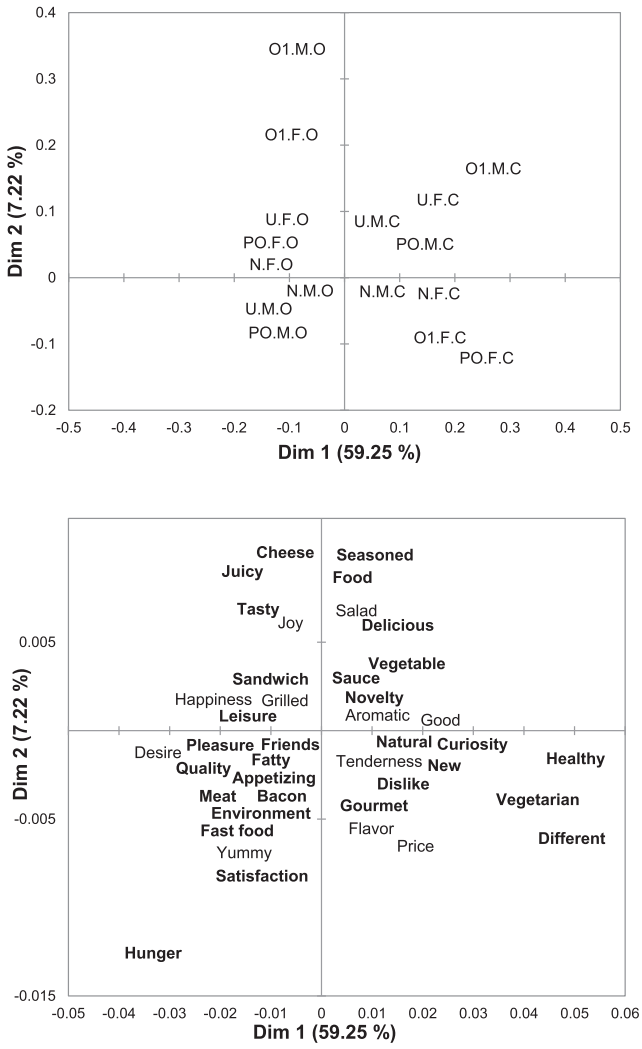

Fig. 5. Correspondence analysis of consumer response categories based on sex, body mass index (BMI) and type of stimulus. 01.M.O (class-1 obesity, male, original); 01.M.C (class-1 obesity, male, mushrooms); 01.F.O (class-1 obesity, female, original); 01.F.C (class-1 obesity, female, mushrooms); PO.M.O (pre-obesity, male, original); PO.M.C (pre-obesity, male, mushrooms); U.M.O (under weight, male, original); U.M.C (under weight, male, mushrooms); N.F.O (normal weight, female, original); N.F.C (normal weight, female, mushrooms); N.M.O (normal weight, male, original); N.M.C (normal weight, male, mushrooms); PO.F.C (pre-obesity, female, mushrooms); PO.F.O (pre-obesity, female, original); U.F.C (under weight, female, mushrooms); U.F.O (under weight, female, original). Elements in bold indicate that the observed value is higher or lower than the expected theoretical value. $p < 0.001$; $p < 0.01$ and $p < 0.05$; effect of the chi square per cell.

the study location, a university environment. Several studies with university students have indicated that they are highly exposed to unhealthy eating habits, which results in an increase in body weight. For example, Ibe et al. (2016) demonstrated that for male students, eating three meals irregularly was associated with BMI and weight gain, while in women, it was associated with BMI and weight loss. In another study, Triaca, dos Santos, and Tejada (2020) demonstrated that men with complete higher education have a higher prevalence of overweight, while for women, the effect goes in the opposite direction. Evidence presented shows that, in Brazil, the increase in income leads to an increase in the consumption of unhealthy foods. However, women with higher education tend to be more sensitive to physical conditioning and are the first to adjust their diet and physical activity to avoid the harmful effects of being overweight.

Although we did not take this factor into account in this study (eating meals regularly or irregularly), it was observed that in the category obesity class 1 (BMI 30.0–34.9) the percentage of male participants (6.80%) is higher when compared to female participants (1.46%), indicating that weight gain is higher in men. The opposite occurs in the underweight category (BMI < 18.5), where female participants represent 2.91% against 0.97% male, showing the prevalence of underweight among women. Yu et al. (2018), reported similar results in female students from the United States and Kesgin (2019) showed that eating attitudes are negatively associated with low self-esteem and that ethnicity can play a crucial role in eating habits. Cultural influences determine how we eat and dress and have a strong influence on individuals, especially women and girls in Western culture, reflecting on the unrealistic idea of thinness and that thinness is synonymous with beauty.

With regard to the second group, sex and BMI classes justify the elicitation of the words referring to the burger with the addition of mushrooms. Consumers considered the burger to be expensive, especially the one with the addition of mushrooms, which had the highest negative value, suggesting that the price may be one of the barriers for its success in the market. In fact, burgers designed to specific niche markets are a little more expensive. Another important point that deserves to be highlighted is that consumers may have associated the price of fresh mushrooms, which is high in Brazil, with the price of burger and thus, the negative connotation for this extrinsic attribute was expected. This result agrees with those reported by de Andrade et al. (2016), with lamb meat.

Furthermore, another factor is that in recent years the prevalence of overweight has significantly increased in Brazil, reaching 53.8% in 2016. Regarding obesity, the increase is even greater, representing 60% (Triaca et al., 2020). Given this worldwide concern, changes in women's lifestyles and concern for health demand a healthy and practical diet; the large number of young women studying or working outside the home, looking for food and food services that offer health benefits and a better quality of life shows a growing market (ABIA, 2019). Currently, the healthy food sector corresponds to 13% of the Brazilian industry. In 2018, about 91.4% of the Brazilian population had some degree of health concern (ABIA, 2019). Therefore, this context may have impacted the representations of consumers, specifically in relation to women.

In the third group, the burger showed a similar representation for all consumers (female and male), regardless of their BMI or whether they are consumers of the original burger or that with mushroom addition. Most of these consumers showed positive and favorable attitudes, indicating that there are no strong barriers in the market that prevent the consumption of burgers with the addition of mushrooms.

3.4. Limitation of the study

Although this study has presented interesting results, some limitations should be recognized. The first limitation is the imbalance between age groups since young people (18–30 years old) represented 89% of the participants. This imbalance will also have an impact on sociodemographic characteristics. Despite this limitation, the results obtained here are still valid since young people are the main consumers of burgers in Brazil.

4. Conclusions

This study has explored the main similarities and differences in the social representation of burgers. According to the results, three groups of consumers were identified and the structure of social representations of "original burgers" and "burgers with mushroom addition" is different. The use of mushrooms reflected a condition of "novelty and healthiness". This fact may be explained by the observation that, as the representation of burger is changing among consumers, their consumption habits are also changing, a trend that is being noticed in the market with the constant growth of the participation of burgers of non-animal origin

in the food sector. Thus, the possibility of introducing burgers with mushroom addition to the table of the Brazilian consumers is feasible because, in general, they showed low rejection. For all the reasons presented in this study, our results can guide industry professionals in defining communication and marketing strategies for the burger market since these strategies should consider the complexity of consumer perception and balance all factors identified in this study.

CRediT authorship contribution statement

Iliani Patinho: Conceptualization, Methodology, Writing - original draft. **Erick Saldaña:** Conceptualization, Writing - original draft. **Miriam Mabel Selani:** Conceptualization, Writing - original draft. **Ana Clara Bortoluzzi Teixeira:** Formal analysis. **Beatriz Schmidt Menegali:** Formal analysis. **Thais Cardoso Merlo:** Formal analysis. **Juan Dario Rios-Mera:** Formal analysis. **Mariana D.B. Dargelio:** Formal analysis. **Heber Rodrigues:** Writing - original draft. **Carmen J. Contreras-Castillo:** Supervision, Writing - original draft.

Declaration of Competing Interest

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

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