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Understanding Consumers' Perception of Different Fish Species Marketed in Brazil using Word Association

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Abstract

Word association (WA) is a qualitative technique widely used to understand how consumers perceive food products. The aim of the present study was to investigate the consumer's perception (n = 300) regarding five different fish species marketed in Brazil and to elucidate whether the perception is affected by the consumption frequency using the WA task. Samples of the panga, tuna, salmon, tilapia, and hake were utilized in this study. Different perceptions were identified for both frequent and occasional fish consumers. Among 17 categories elicited to describe the fish species, almost all categories presented significant differences in the frequency of mention according to the chi-square per cell approach ($p \leq .001$). The conceptualization of each species of fish was strongly affected by the frequency of consumption of this matrix. The findings from the present work provided a insight into Brazilian consumers' perception of fish meat, which can be used to develop strategies to increase the commercialization of these species in the Brazilian market.

Keywords: Fish Meat; Projective Techniques; Consumer Studies; WA

Abbreviations: WA: Word Association; FDA: Food and Drug Administration; EFSA: European Food Safety Authority.

Introduction

The consumer purchasing behavior regarding fish meat has been increasing the interest of researchers due to political and economic reasons in addition to aspects of nutrition, food safety, sustainability, and business of the fish industry [1]. Fish is a valuable source of proteins and nutrients in the diet of many countries, and its contribution to food security is rising significantly [2]. Additionally to a high-quality protein, fish meat is also a source of polyunsaturated fatty acids, such as eicosapentaenoic acid and docosahexaenoic acid acids, which positive contribute to reducing risk factors associated with cardiovascular disease, thrombosis, and cancer [3].

World consumption per capita of fish has increased gradually in recent years, reaching 2.7 and 3.0 kg in 2022 [4]. In Brazil, the consumption per capita of fish at the national level did not grow at the same rate, which can be attributed to the lack of information about the nutritional aspects of seafood meat [3]. In addition, the low frequency of fish consumption may be related to consumption barriers such as difficulty in buying, preparing, and cooking, the perception to be expensive meat, or the unpleasant characteristics of some species, such as the fishbones or smell, in addition to population culture [5].

Brazilian water resources comprise a million hectares of freshwater, and artificial reservoirs, in addition to an 8,500 km of coastline and the 15th largest exclusive marine economic zone in the world. In this context, tilapia stands out as the main freshwater specie produced by Brazilian aquaculture industries. In addition, there is a domestic demand for species that cannot be farmed or trawled in the country, such as salmon, hake, and panga [6].

Mitterer-Daltoé, et al. [5] investigated the consumer's behavior, in a population with low fish consumption and observed that consumers' intentions and attitudes are determinants of fish consumption frequency. In addition, habit also seems to be an important discriminating variable for fish consumption. It is well known that the comprehension of how consumers perceive food products represents a challenge due to the complexity of food choices. However, through qualitative techniques, this goal can be achieved, and it is possible to determine the key drivers of consumer choice for a product category [7]. Among the qualitative methods used to investigate consumers' perceptions, the projective techniques provide verbal or visual stimuli that encourage participants to express their personality, attitudes, opinions, and concepts [8].

Word association (WA) is a fast and effective projective technique to obtain an insight into consumer perceptions. This technique consists in providing a verbal or visual stimulus to the participants, and ask them to share their first thoughts, images, and impressions about the product [9,10]. WA has been widely used to obtain consumers' perceptions of products from animal origin, including beef hamburgers [11], lamb meat [7], fish almondega [12], fermented dairy products [13], coalho cheese [14] and fermented milk [15]. However, there is a lack of information regarding the consumers' perceptions of fish species.

Therefore, the aim of the present study was to investigate the consumer's perception of five different fish species marketed in Brazil and to elucidate whether the perception is affected by the consumption frequency using the word association task.

Material and Methods

Selection of Participants

The study was conducted using a convenient sample of Brazilian consumers indicated in qualitative research, to obtain information regarding their intimate feelings, beliefs, attitudes, and motivations [7,15]. The research was carried out in cities of the southeast region of Brazil, and an interview was conducted with different potential consumers in the fish market, students and employees of the Federal Fluminense University, in addition to people with interest and willingness to participate in the study.

A total of 300 Brazilian consumers were interviewed. The participants received a questionnaire with socio-demographic questions and were divided into two groups (frequent consumers, FC; and occasional consumers; OC) classified according to their frequency of consumption of fish meat. The group of "frequent consumers" comprised the participants who consumed fish daily up to once a week, whereas the "occasional consumers" consisted of the participants who consumed fish once a month, a few times in the year, or only on special occasions. In this context, 150 participants classified as frequent consumers, and 150 as occasional fish consumers were allocated in the present study.

Procedures

The 300 selected participants, who previously answered the questionnaire, were required to complete a word association task about fish meat. The participants were approached individually and randomly at different places and presented to five different stimuli (fish species) in a randomized and balanced way on a white sheet of A4 paper [14,15]. In this paper, they were asked to write the first four words, phrases, or expressions that came to mind when they received the stimulus [7,13].

The words quoted in the 300 tests were grouped into 17 categories, through triangulation. To performed that, three different researchers utilized the semantic analysis and personal interpretation of each word and entered into a consensus to define the categories [7,9,15].

Data Analysis

The data from valid answers were analyzed [7], and the terms with similar meanings were grouped into categories by triangulation. The categories mentioned by at least 5% of consumers were considered for analyses [16] and 17 categories were established. The frequency of words mentioned and the categories within each class was calculated without considering if the words were provided by the same participant or not [7,9,14]. Thus, in some cases, the same participant provided more than one word assigned to the same category.

The presence of statistical differences in the frequency of word mention and the categories among consumer groups (frequent and occasional) was evaluated using chi-square tests. Then, a chi-square per cell test ($p<.001$, $p<.01$ e $p<.05$) was used to identify the source of variation of the Global Chi-square [17].

Results and Discussion

Word Association Task

The characteristics of participants in terms of gender and age of each group of consumption are summarized in Table 1. Regarding gender, 143 (48%) were female, and 157 (52%) were male, with a gender-balanced sample group. Concerning age, the participants aged between 18-29 years exhibited the highest percentage between frequent and occasional consumers of fish. The frequency of fish meat consumption is greater for males than for female participants. In respect of the frequency of consumption and age, FC kept the fish consumption regardless of age, whereas the OC exhibited a decrease in consumption as the age increased.

Categories		Consumption of fish meat	
		Frequent consumer	Occasional consumer
	n	150	150
Gender (%)	Female	66	77
	Male	84	73
Age (years)	18-29	25	41
	30-39	18	17
	40-49	23	16
	50-59	17	14
	≥ 60	17	12

Table 1: Gender and age of word association task participants with different consumption frequency of fish meat (n = 300).

Significant differences in perception of fish consumers were observed between the FC and OC through the global chi-square ($x^2 = 104$, $p < 0.0001$). In addition, variances were observed in the frequency of mention of individual words, as well as in the categories identified in the WA task of the five fish species studied The categories identified in the free word association and examples of the associated terms to consumers' perceptions are exhibited in Table 2.

Categories	Examples of relevant individual words	Percentage of mention (%)
Anatomy	Small, big, with / without spine	2%
Presentation	Fish steak, fillet, whole	5%
Distrust	Prejudice, fear, controversy	1%
Lack of knowledge	Don't know, never bought	8%
Familiarity	ate, bought, knows	6%
Form of consumption	Fried, Baked, Breaded, Grilled	18%
Origin	Vietnam, China, Chile, Canada, Japan	8%
Others	Myth, predator	3%
Price	Cheap, expensive, affordable	6%
Preference	Like, prefer, love, favorite	5%
Production	Captivity, aquaculture, breeding	1%
Quality	Good, bad, noble, excellent	9%
Rejection	Don't like it, don't recommend it, wouldn't eat	5%
Health	Diet, light, healthy	2%
Sensory characteristics	Soft, watery, white, orange	14%
Product Technology	Frozen, pickled, canned, packed	4%
Nutricional Value	Omega 3, protein, fat	3%

Table 2: Individual associations and frequency of mention of the categories regarding to consumers' perceptions of fish marketed in Brazil.

The individual associations regarding fish meat were mainly related to form of consumption and sensory characteristics, indicating the main motivations for fish consumption. The most cited categories were "form of consumption" (18%) and "sensory characteristics" (14%) (Table 2), followed by "origin" (8%) and "quality" (9%) of fish, suggesting that Brazilian consumers currently search for information about the traceability and hygienic-sanitary conditions fish meat.

A total of 15 of 17 categories (Table 3) were significant for both (FC and OC) consumer classes ($p \leq .001$). However, no significant relevance was observed for the categories "others" and "preference" ($p \geq .05$).

	Panga		Tuna		Salmon		Tilapia		Hake	
Categories	**FC**	**OC**	**FC**	**OC**	**FC**	**OC**	**FC**	**OC**	**FC**	**OC**
Anatomy	5	6	3	11	4	3 (-)*	14 (+)***	10	8	11
Presentation	9(-)*	10	9(-)**	5(-)**	4(-)***	9(-)*	33(+)***	19	36(+)***	38(+)***
Distrust	18(+)***	10(+)***	0(-)*	0	1	1	0(-)*	1	1	2
Lack of knowledge	46(+)***	77(+)***	9(-)***	9(-)***	8(-)***	9(-)***	23	42	27	30
Familiarity	27	22	7(-)***	20	17	17	27	25	30(+)*	25
Method of consumption	23(-)***	12(-)***	116(+)***	106(+)***	97(+)**	105(+)***	57	45(-)**	60	45
Origin	44(+)***	31	7(-)***	24	23	22(-)**	42(+)***	59(+)***	22	27
Others	12	8	6	9	10	10	6	15	9	9
Price	17	15	14	21	34(+)***	46(+)***	7(-)**	21	17	21
Preference	15	10	22	21	17	23	21	16	19	13
Production	1	2	0(-)*	2	3	1(-)	13(+)***	17(+)***	0(-)*	0(-)*
Quality	47(+)*	34(+)*	34	25	31	38	31	20(-)*	34	26
Rejection	30(+)*	21	17	16	20	18	15	12	19	16
Health	0(-)**	0(-)**	11	5	11	14(+)**	6	9	7	4
Sensory characteristics	44	52	49	38(-)***	68(+)**	69	30(-)*	71	41	55
Product Technology	9	8	49(+)***	55(+)***	1(-)***	1(-)***	1(-)***	2(-)***	13	9
Nutricional value	6	6	15	9	33(+)***	21(+)***	4(-)*	2(-)*	2(-)**	2(-)*

Effect of the chi-square per cell. (+) or (-) indicate that the observed value is higher or lower than the expected theoretical value. Categories mentioned by last 5% of respondents. *p≤.05. **p≤.01. ***p≤.001.

Table 3: Frequency of mention of the categories identified in the word association for fish species marketed in Brazil from frequent consumers (FC) and occasional consumers (OC).

Regarding fish species, panga was associated with "distrust," "lack of knowledge," and "origin" for FC (Table 3 $p \leq .001$). On the other hand, for the occasional consumers, panga was associated with "distrust" and "lack knowledge" ($p \leq .001$). The category "distrust" was evidenced for both classes of consumers, which could be explained by the frequent reports published by the Brazilian media, suggesting that this species is raised in contaminated places and in unsatisfactory sanitary conditions in Vietnamese producing industries. The category "distrust" has also been cited previously by Banovic, et al. [18] in a study conducted with fish consumers in the European Union using the WA technique, in which the authors documented the association of fish with chemical contaminants, antibiotics, and genetic mutation [18].

These results highlight the importance of studies emphasizing the safety of panga consumption. Food safety agencies such as the Food and Drug Administration (FDA), European Food Safety Authority (EFSA), and Ministério da

Agricultura, Pecuária e Abastecimento (MAPA) has inspected panga fish suppliers in Vietnam, attesting their reliability. The Vietnamese industry has been adapted to the most diverse quality standards, from field production to fish processing and distribution around the world [20,21].

The category "lack of knowledge" was attributed to panga by FC and OC, which could be attributed to the fact of this species was not a Brazilian, but an imported product. Previous investigations Wang & Freitas [22,23] supported the lack of knowledge of panga fish by the consumers. Wang and Hsieh [22] reported on the menu of 37 restaurants and demonstrated that the majority of the available dishes (66.7%) are described generically as "fish," although it was prepared with panga. Freitas and Miguel [23] reported that 105 from 114 conumers did not have knowledge about panga fish.. This fish is often consumed by low-income families in various countries around the world in the form of skinned, boneless fillets, frozen in different sizes, and is mainly exported to Europe and North America [24,25].

Regarding the category "origin," the FC associated panga with words related to their origin as "Vietnam," "imported," and "Asian." Once they are FC, was expected a greater knowledge about the fish origin, which could explain the relevance of this category to them. The country of fish origin is among the most relevant characteristics for consumers and affects their buying attitude [1].

The WA for tuna reported that the frequent and occasional consumers firstly associated this species as a "form of consumption" and "product technology" with significant frequency ($p \leq .001$) (Table 3). The difference observed among consumer classes was in the cited terms for the category "form of consumption." For FC, "natural sandwich" received the highest number of citations, while among the OC, the term "raw" was the most mentioned. The association of FC with "natural sandwiches, could be explained by the consumer's habits and the form of presentation, which is traditionally utilized by participants [26]. The OC have associated tuna with "raw" due to their consumption as Japanese food. This form of consumption has become frequent in Brazil, so typical products of Japanese cuisine, such as sushi and sashimi, have been highlighted in consumption by the Brazilian population [27,28].

Some consumers still consider fish a relatively inconvenient food due to their preparation time and the preference for products that are tasty, fast, and easy to cook [18,23,29]. This barrier of inconvenience is overcome when the fish industry has different forms of fish commercialization, with the development of new products such as frozen, pickled, packaged, canned, and others. In the present study, FC and OC evidenced in the category "product technology" the term "canned". Canned tuna is a product widely sold, which delight the taste of different consumer profiles. Although considered a high-priced product, canned tuna is the preferred fish among both high-income and lower-income consumers, who are already familiar with this form of consumption [30].

The FC associates the salmon with "price" and "nutricional values" ($p \leq .001$) (Table 3) with the terms "expensive" and "fat," respectively. The OC related salmon with "form of consumption," "price," and "nutritional value" ($p \leq .001$). The most cited expressions in each category were, "Japanese food," "expensive," and "omega3", respectively. For both classes of consumers, the main positive factor involved in the consumption of salmon was the nutritional value, and the negative factor was the price, which was highlighted as an obstacle to consumption. According to Nguyen, et al. [30], additionally to the intrinsic attributes of fish (nutritional value and taste), consumers also evaluate extrinsic characteristics such as price, which directly affects consumer purchase decisions [31-33]. The price issue has been discussed previously with salmon [34] and other fish species [1,30,32,33]. There is a strong positive correlation between the price and the nutritional value of each fish [1,30,32,33].

The FC and OC related salmon as "healthy" and "fat" fish, which could be attributed to the salmon being high nutritional value meat due to the percentage of polyunsaturated fatty acids such as omega 3 [30,35]. Salmon is also a very versatile fish that allows the production of a variety of products. C The participants reported that salmon can be consumed boiled, grilled, smoked, ground, sliced, and sliced, or mixed with spices such as canned pate [34] which also explains why the OC have associated it with the category "form of consumption." For this class of consumers, the main form of consumption is raw, as found in Japanese food [23,28].

Regarding tilapia, the categories most reported by the FC ($p \leq .001$) were "anatomy," "presentation," "origin," and "production". The categories "origin" and "production" were also cited among OC ($p \leq .001$) (Table 3). The most cited terms for categories "anatomy" and "presentation" were "spine" and "fillet, respectively. Badr, et al. [36] concluded that the low consumption of freshwater fish was linked to sensory, convenience and quality barriers. Among the sensory barriers, consumers have revealed the presence of numerous bones (spine) as a negative feature of freshwater fish. In addition, previous investigations reported that the consumers attributed the presence of spines and the difficulty of preparing as a barrier to fish consumption [1,36-38]. Moreover, Badr, et al. [36] documented that the attributes related to fish anatomy and appearance may influence their added value and acceptance in the market. However, in the present study, FC the presence of spines was not identified as

a limit to the consumption of tilapia. Our results corroborates with Araújo, et al. [39] which demonstrated that high FC prefer freshwater species, and the tilapia is one of the most consumed.

For FC, the category "presentation" was also reported for tilapia, with the term "fillet" often mentioned. The observed results could be attributed to the fillet being the most common form of presentation in the market. The fillet attends to consumer demand due to its easily preparing [23,36]. FC and OC, associated tilapia with the categories "origin" and "production," widely related to aquaculture. The most cited expressions were, respectively, "freshwater" and "breeding". Although OC did not exhibit the habit of consumption of tilapia, they know its origin and form of production once the aquaculture has increased in Brazil [40]. Consumer preference is also related to fish production methods and origin [30]. Pinto, et al. [15] assessed the preference of fish consumers regarding their origin (marine or freshwater), and concluded that there was no difference in consumers' preference related to the fish origin [15,39].

Hake was featured only in the category "presentation" for both FC and OC ($p \leq .001$; Table 3). The term "fillet" has the highest number of citations for both classes of consumers, which could be attributed to the form of presentation. The hake fillet is widely imported to Brazil, due to their firm, light, and good quality meat, which is appreciated by the taste. The fresh or frozen fillet is preferred by the consumers once it is considered a convenient and easily prepared product, favoring consumer purchasing decisions [18,23,30,41].

According to the present results, the WA was able to obtain information about the participant's perceptions and get a number of categories relevant to fish consumption. In this context, the associations were significantly affected by the frequency of consumption. These results are in agreement with Andrade, et al. [7] who reported that consumption frequency significantly affected the perception of lamb meat.

Conclusion

The word association task allowed the identification of differences and similarities between frequent and occasional consumer insights of fish meat in Brazil. The sensory characteristics and form of consumption seemed to be the main motivations for the consumption of products. Additionally, the association regarding the fish specie was affected by the frequency of consumption. The findings from the present work provided insight into Brazilian consumers' perception of fish meat, which can be used by industry to develop strategies to increase the consumption of the evaluated species.

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