SCIENTIA AGROPECUARIA

Scientia Agropecuaria

Web page: http://revistas.unitru.edu.pe/index.php/scientiaagrop

Facultad de Ciencias Agropecuarias

Universidad Nacional de Trujillo

RESEARCH ARTICLE

Non-sensory factors driving the packaging design of ready-to-eat *mazamorra morada* based on consumer perception

Erick Saldaña[1, *]; Cathia Samán[2]; Jhordin Saldaña[2]; Carmen M. S. Ambrosio[3, *]

[1] Escuela Profesional de Ingeniería Agroindustrial, Universidad Nacional de Moquegua, Prolongación calle Ancash s/n, Moquegua 18001. Peru.

[2] Departamento de Ciencias Agroindustriales, Facultad de Ciencias Agropecuarias, Universidad Nacional de Trujillo, Av. Juan Pablo II s/n. Ciudad Universitaria, Trujillo. Peru.

[3] Dirección de Investigación y Desarrollo, Universidad Privada del Norte (UPN), Trujillo. Peru.

* Corresponding author: erick_16_13@hotmail.com (E. Saldaña); carmen.sinche@upn.edu.pe (C. M. S. Ambrosio).

Received: 8 July 2021. Accepted: 9 August 2021. Published: 20 August 2021.

Abstract

Food choice is often influenced by extrinsic factors, which drive consumer perception of a given product or service. It is therefore critical to study them during the design of food packaging. In this context, the aim of this study was to investigate the effect of extrinsic factors on the expected acceptance, purchase intention and holistic perception of consumers of the popular Peruvian dessert *mazamorra morada*. Twelve stimuli were created by using a fractional factorial design considering *packaging material, nutritional information, quality, convenience, and naturalness* as factors, previously obtained by open-ended questions. Ninety-seven consumers answered an online survey indicating their expected acceptance, purchase intention and holistic perception. The results showed that the most salient factors for consumers, in terms of expected acceptance, purchase intention, and holistic perception, were packaging material and convenience. For these factors, the levels that increased expected acceptance and purchase intention were the "package made of food grade paper", conveniently adding a "spoon and napkin".

Keywords: Conjoint Analysis; Napping; Label and packaging design; Peruvian dessert.

DOI: https://dx.doi.org/10.17268/sci.agropecu.2021.046

Cite this article:

Saldaña, E., Samán, C., Saldaña, J., & Ambrosio, C. M. S. (2021). Non-sensory factors driving the packaging design of ready-to-eat *mazamorra morada* based on consumer perception. *Scientia Agropecuaria, 12*(3), 421-428.

1. Introduction

Mazamorra morada is a traditional and widely consumed dessert in Peruvian cuisine. This dessert is commonly prepared at home, at local restaurants, or sold as a street food, and it is consumed fresh all over Peru. *Mazamorra morada* stands out because of its intense dark purple color, which is provided by its main ingredient, the purple corn (*Zea mays L.*), a variety of Peruvian Andean maize, (Salvador-Reyes & Clerici, 2020). Besides of the corn, the other ingredients used for preparing *mazamorra morada* include potato starch (which is used to give consistency to this dessert), chopped fresh fruits (pineapple and peach), dried fruits (raisins and prunes), spices (cinnamon and clove), and sugar (Saldaña et al., 2018). *Mazamorra morada* is highly popular in Peruvian eating habits and is almost exclusively sold as a street food.

Certainly, hearing "the consumer's voice" in the initial stages of a new product development is key to guaranteeing its success in the market (van Kleef et al., 2005). However, this step is frequently ignored or misunderstood in the development of certain products. Currently, consumers are more and more demanding in their choices and preferences, looking for products that satisfy aesthetic attributes beyond sensory characteristics (Saldaña et al., 2020). According to Köster (2009), consumer food choices are strongly influenced by six main factors: (i) intrinsic product characteristics, (ii) biological and physiological factors, (iii) psychological factors, (iv) situational factors, (v) socio-cultural factors, and (vi) extrinsic product characteristics. This study highlights the extrinsic characteristics of the product, as they must be carefully chosen when designing a package vying for success in the market. The extrinsic factors, known also as non-sensory factors, are *"related to the product but do not form part of the physical product itself"* (Ampuero & Vila, 2006), being the first factors to be put in contact with consumers and having a proven influence on their food choices (Ares et al., 2009). To date, only studies on sensory properties (intrinsic properties) associated with *mazamorra morada* have been carried out (Saldaña et al.,

2018) but no study on the non-sensory properties (extrinsic properties) have been conducted. Extrinsic factors mostly comprise label, price, origin, convenience, nutritional information, and health statements, among others (Gil-Pérez et al., 2019; Sáenz-Navajas et al., 2013). Moreover, the most important non-sensory factors for food choice are convenience, price, production technology, personal health, branding, social and political issues, and contextual influences (Jaeger, 2006).

Usually, the nutritional composition of food products is informed to consumers through nutritional labeling on the packaging (Ares et al., 2018). Recently, the front-of-package (FOP) labeling typology has stood out because it simplifies consumers' understanding of the nutritional content of food products by using logos, symbols, and icons (Dean et al., 2014). There are different types of FOP labeling (Aschemann-Witzel et al., 2013), among which the warning type presents significant advantages over the others in terms of reaction time of consumers, thus facilitating the informed purchasing decision (Arrúa et al., 2017a). Another important non-sensory factor is "quality", which has a broad and multidimensional definition with both objective and subjective components in each situation and time frame (Lawless, 1995). The objective component refers to physical characteristics present in the product and the subjective component is associated with how the consumer perceives quality (Grunert, 2007). Interestingly, the concept of quality becomes more important when there are physical modifications on the product resulting in a high-quality product for consumers. According to (Shepherd and Raats, 2010), the quality expectation is formed by quality cues, such as some texts on the label referring to quality or packaging materials that reflect quality. The packaging material has been scientifically proven to have a strong influence on consumers' perception about the product, which is expressed by their intention to purchase it (Rebollar et al., 2017). Similarly, another non-sensory factor, the convenience that a product offers to the consumer, in terms of practicality, can significantly affect the expected acceptance (EA) and the purchase intention (PI) of a product (Saldaña et al., 2020). Therefore, products with low convenience are not well-valued by consumers who do not want to spend time/effort in using or consuming that good or service (Buckley et al., 2007). Conversely, if a product is perceived as practical, the PI and re-purchase will be high (Hyldelund et al., 2020). Finally, the naturalness of foods is a broad construct that includes the following aspects: "natural content" (Steptoe et al., 1995), "without additives" (Roininen et al., 1999), and "natural foods" (Roininen et al., 1999). Despite the different nuances of naturalness, it is known to be a positive attribute for consumers. However, its importance varies depending on the culture, country and history and a given product or service (Román et al., 2017). In the case of *mazamorra morada*, which is either a street food or a homemade dessert, it is mainly consumed warm once prepared, so that the perception of "natural" is implicit. The development of a ready-to-eat *mazamorra morada*, certainly, would negate the distinctiveness of a "homemade" dessert, making the product less natural for certain consumers. This, undoubtedly, would negatively impact the intention to purchase and eat it. For this reason, incorporating naturalness as an extrinsic factor (through a picture of purple corn) to this study is very important.

The expectations generated by the different non-sensory factors need a reliable design and analysis that allows us to measure the impact of these factors and their levels of interest. One of the most used and established techniques to measure the impact of non-sensory factors on sensory and consumer science is the Conjoint Analysis (CA) (Claret et al., 2012). This technique allows researchers to estimate the structure of consumers' responses by using a set of profiles of a target product, which is obtained by predetermined combinations using a specific experimental design (Green & Srinivasan, 1990). Understanding the structure of consumers' responses will help to understand the factors that modify the EA, PI, and holistic perception (HP). The HP is based on the evaluation of global similarities and differences among products (Varela et al., 2017) rather than common analytical descriptions and hard-to-verbalize characteristics (Valentin et al., 2018). Once the relative importance and the utility of levels of each factor have been estimated, it will be possible to create packages and labels that capture the interest of consumers and promote an informed purchase decision of a product (Ares and Deliza, 2010). Several studies have investigated consumer behavior towards products with several modifications to their label (Rojas-Rivas et al., 2020), brand (Varela et al., 2010), shape (Gislason et al., 2020), color (Baptista et al., 2021), figures (Ares et al., 2016), nutritional information (Gębski et al., 2019), health claims (Gislason et al., 2020), ecological aspects (Lim et al., 2018), price (Calegari et al., 2018), and processing technology (Martins et al., 2020).

To our best knowledge, there are no previous studies addressing the impact of extrinsic factors on consumer behavior towards ready-to-eat *mazamorra morada*. In this context, the aim of this study was to estimate the salient extrinsic factors (packaging material, nutritional information, quality, convenience, and naturalness) in terms of EA, PI, and HP for *mazamorra morada*, based on consumers' perception.

2. Materials and methods

2.1 Stimuli

Stimuli were designed by the combination of factors and levels previously selected, based on a pre-test with regular consumers of *mazamorra morada*. For that, ninety-one target consumers (frequency of *mazamorra morada* consumption = once a month or more, Mean age = 24 ± 4) answered, through Google forms, the following open-ended question: *"Please, write down all components (words, descriptors or associations) that come to mind when you think of the packaging and label of mazamorra morada"* (Piqueras-Fiszman et al., 2013). After the categorization of components, 16 semantic categories were obtained (Figure 1), with the most frequent being: nutritional information, packaging material, expiration date, label, brand, nutritional composition, and convenience.

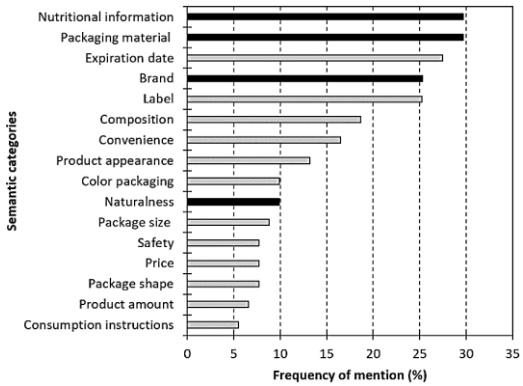

Figure 1. Frequency of mention of semantic categories corresponding to the elements of packaging and label for *mazamorra morada*. Bars in black were selected as factors for CA.

Of these most important factors, the expiration date and label were kept as constant factors in all the stimuli, because they appear in all ready-to-eat products in the Peruvian market. Thus, the five factors to study were: packaging material, nutritional information, quality to express the brand (until the execution of the study, there was no brand that produces ready-to-eat *mazamorra morada*, avoiding the selection of different brand levels), convenience and naturalness. These factors were used to create 12 stimuli by means a fractional factorial design considering two levels per factor as shown in **Table 1**. Concerning "packaging material", they ranged from food grade paper (FGP) to glass, since these were the levels most frequently cited by consumers in the open-ended question. Regarding "nutritional information", the levels ranged from the classic "Guideline Daily Amount (GDA)" system to the food warning system, currently used in Chile (**Ministerio de Salud de Santiago de Chile, 2015**), Uruguay (**Ministerio de Salud Pública de Montevideo, 2018**), and Peru (**Ministerio de Salud del Perú, 2018**). The warning system consists of placing a "High in 'X'" or "Excess 'X'", where X would refer to the nutrients of concern when they are high/excessive. This system was recommended by The Pan-American Health Organization (PAHO), since it presents visible, clear and concise information to consumers (**Pan American Health Organization, 2016**). Finally, the low level for quality was the absence of any cue while the high level was designated 'premium'. Regarding convenience and naturalness, the low and high level considered the addition of napkins and a spoon, and no image and the addition of an image, respectively. Incorporating the study of naturalness is important since consumers have a strong preference for natural foods, being a "decisive buying incentive" because natural products are perceived as healthier (**Román et al., 2017**).

Table 1
Factors and levels used in conjoint designs of this study

Factor	Low level	High level
Packaging material	FGP	Glass
Nutritional labeling	GDA	Warning
Quality cue	None	Premium
Convenience	None	Spoon and napkin
Naturalness	None	Image

GDA: Guideline Daily Amount. FGP: Food Grade Paper.

To estimate the relative importance and utility of the five two-level factors without increasing exponentially the number of stimuli, an orthogonal fractional factorial design was used (**Table 2**), assuming negligible interactions of factor effects (**Claret et al., 2012**). All combinations were used to design the graphical stimuli using Adobe Photoshop software (**Figure 2**).

2.2 Consumers

The questionnaire was sent via email to students, professors and officials from the Agroindustrial Engineering School of the Universidad Nacional de Trujillo (UNT), inviting them to participate in the study of "*mazamorra morada*" through a link with the questionnaire implemented in *Compusense Cloud* software (Compusense Inc., Guelph, Ontario, Canada). Before answering the questionnaire, the participants were allowed to accept or decline their participation in the study through an informed consent form. This study is in accordance with the declaration of Helsinki and was approved by the UNT ethical committee.

The within-subjects online questionnaire was answered by 300 Peruvian consumers. However, only 97 responses were valid (questionnaires not completed or exceeding 10 minutes' time that reflect neglect). Out of the 97 respondents considered in this study, 49 were male and 48 were female, ranging from 18 to 57 years old (mean age = 26). Regarding consumption frequency, 56% claimed to consume *mazamorra morada* once per month, 27% stated to consume it once per week, 14% twice per week, and 3% at other frequencies.

Table 2
Twelve combinations of factors and levels used to design the hypothetical stimuli showed in the **Table 1**

Stimuli	Packaging material	Nutrition labeling	Quality cue	Convenience	Naturalness
1	FGP	GDA	None	None	None
2	FGP	GDA	Premium	None	None
3	Glass	Warning	Premium	None	None
4	Glass	GDA	None	Spoon and napkin	None
5	Glass	Warning	None	Spoon and napkin	None
6	FGP	Warning	Premium	Spoon and napkin	None
7	FGP	Warning	None	None	Image
8	Glass	Warning	None	None	Image
9	Glass	GDA	Premium	None	Image
10	FGP	GDA	None	Spoon and napkin	Image
11	Glass	GDA	Premium	Spoon and napkin	Image
12	FGP	Warning	Premium	Spoon and napkin	Image

GDA: Guideline Daily Amount.

Figure 2. Graphical stimuli presented to consumers based on Table 2.

2.3 Procedure

Firstly, consumers indicated their sociodemographic profile and consumption frequency of *mazamorra morada*. Then, visual stimuli were coded with 3 random numbers and presented to consumers in a sequential monadic format, following the Latin square design. Subsequently, consumers were asked to indicate their EA for each stimulus by means of a linear hedonic scale of 10 cm ranging from "dislike extremely" on the left to "like extremely" on the right. Then, consumers were asked to indicate their PI by using a categorical scale of 5 points (from "I would definitively not buy it" to "I would definitively buy it").

Finally, the *Napping* test was applied (Figure 3) to know the HP that stimuli generate in consumers' mind (Lê et al., 2015). To do so, all stimuli were shown to consumers on the right side of the screen and respondents were asked to allocate the stimuli in the box showed on the left side of Figure 3, according to their similarities and differences (Saldaña et al., 2019). This was done considering that two stimuli which are close together are similar, whereas if they are far apart, they are different (Varela & Ares, 2012). Consumers were encouraged to use the whole surface of the box and, when necessary, the consumer could zoom in on stimuli by clicking the symbol ⊕ twice for a better visualization. Finally, consumers were asked to indicate a few words to describe each stimulus allowing us to understand the reason of the similarities and differences between stimuli.

2.4 Data analysis

EA and PI of the stimuli were evaluated through an analysis of variance (ANOVA), considering stimulus, consumers, and presentation order as factors. A Tukey's test was used for pairwise comparison of stimuli. Both analyses were carried out at 5% significance level.

For CA, the relative importance of each factor and the utility associated to each level were estimated. An individual additive model was used to determine the utility of each level. This model assumes that the assessments of expected liking/purchase intention are formed by the sum of the contributions of the factor levels as recommended by (Lima Filho et al., 2015). The structure of this model for m_j factors and n levels is shown in equation (1):

$$Y = \sum_{i=1}^{n} \sum_{j=1}^{m_j} V_{ij} X_{ij} + \varepsilon_{ij} \quad (1)$$

Where, Y was EA or PI for a stimulus, V_{ij} is the utility corresponding to j^{th} level for i^{th} factor (i = 1, 2, 3...n and j = 1, 2, 3.m), X_{ij} is the variable that indicated the presence of j^{th} level for i^{th} factor in the stimulus, and $\mathcal{E}_{ij}$ is the random error of the model. Once the utility of each level was determined (Vij), the relative importance of each factor was determined according to the equation (2). Where, I_n is the importance of i^{th} factor. The sum of the importance of all factors accounts for 100% (Raz et al., 2008).

$$RI_m = \frac{I_n}{\sum_1^2 I_n} \cdot 100 \quad (2)$$

In addition, a Multiple Factor Analysis (MFA) was performed on the Napping data (Pagès & Husson, 2013). Initially, the coordinates of each stimulus were obtained from the perceptual map of each consumer, using the lower left side of each perceptual map as the origin of the coordinates. Consumers' coordinates were considered as active variables and stimuli descriptions as supplementary variables. Confidence ellipses were built by parametric *bootstrapping* at 95% significance to evaluate the stability of samples in the perceptual map by using the script provided by (Dehlholm et al., 2012).

All analyses were performed using R software (R Core Development Team, 2019). The ANOVA was performed using the *lmerTest* package (Kuznetsova et al., 2017). The relative importance and utilities were performed using the *Conjoint* package (Bak et al., 2018) and the MFA of *Napping* was performed using *FactoMineR* package (Lê et al., 2008).

3. Results and discussion

3.1 Expected acceptance and purchase intention

The results of open-ended questions indicate the most relevant factors and levels for CA based on the frequency of elicitation of semantic categories (see Table 1 and Table 2). This selection was validated by the discrimination of stimuli by individuals for EA and PI (see Figure 4 and Figure 5, which show the significant difference between stimuli for EA and PI). On the one hand, the stimulus 10 presented the highest EA, being significantly higher than the stimuli 1, 3, 4, 7 and 8. On the other hand, Stimuli 3 and 8 presented the lowest EA.

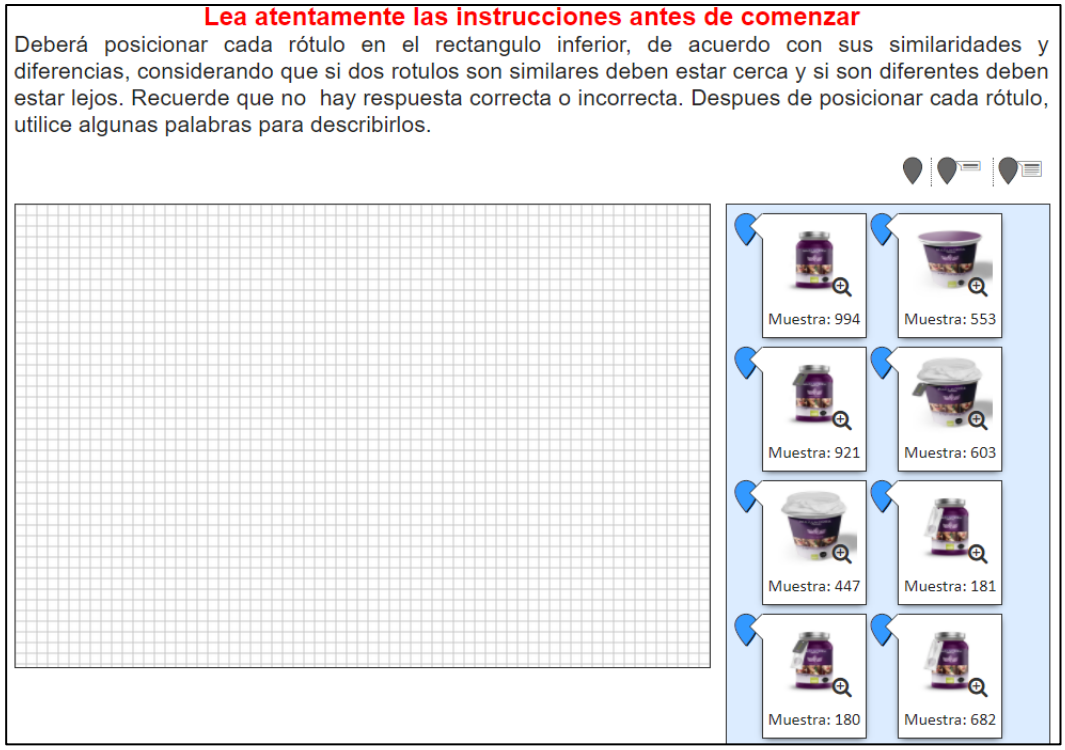

Figure 3. Screenshot of Napping test performed by consumers (in Spanish). Instructions in English given to consumers are: You must position each label in the lower rectangle, according to their similarities and differences, considering that if two labels are similar, they must be close and if they are different, they must be far away. Remember that there are no right or wrong answers. After positioning each label, use a few words to describe it.

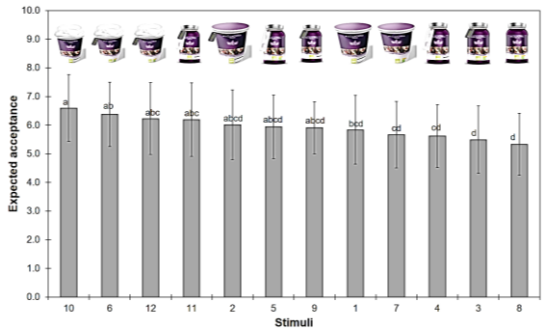

Figure 4. Average expected acceptance of stimuli. Different letters indicate significant difference between stimuli according to Tukey test ($p < 0.05$). Vertical bars are the standard deviation.

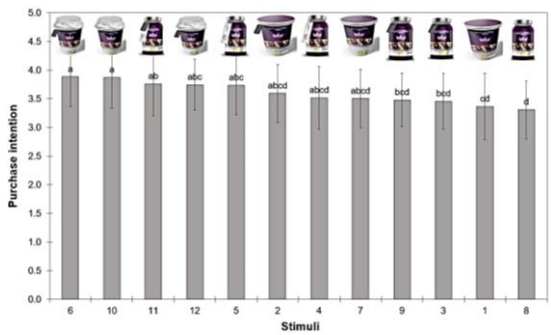

Figure 5. Average purchase intention of stimuli. Different letters indicate significant difference between stimuli according to Tukey test ($p < 0.05$). Vertical bars are the standard deviation.

Regarding PI results, the pattern found was similar to that of EA. Stimuli 6 and 10 presented the highest PI, which was significantly alike for both, and they were only higher than stimuli 1, 3, 8 and 9. Stimulus 8 presented the lowest PI. Therefore, both EA and PI were affected in a similar way by the different levels of factors.

EA and PI are important variables to be measured when designing a product because they provide quantitative responses for consumers' perception of a product and give a projection of the possible success of a product in the market (Costell et al., 2010). Based on the images of the stimuli placed in the upper part of Figures 4 and 5, they allow us to affirm that convenience, packaging material, and quality cues significantly impacted EA and PI. The presence of a "napkin and spoon", as well as a package made with "FGP" increased EA and PI at the same level. Convenience has proven to be a determining factor in food selection, increasing the intention of purchase. This increase is explained by the short time invested to consume or use a product (Bove et al., 2003). However, any improvement in convenience will impact food choices in different ways. For example, Saldaña et al. (2020) reported that convenience did not significantly impact the EA and PI of smoked bacon, probably because this type of product was not ready-to-eat after purchasing and involved an additional preparation process. For the case of *mazamorra morada*, we hypothesized that convenience had a greater impact since it was studied in a ready-to-eat product. However, convenience can also be explained by the current consumption of this dessert in

Peru, which is frequently consumed as street food (Valentin & Gomez-Corona, 2018). In other words, both street food and ready-to-eat products can be perceived as convenient by the consumer. The convenience of using napkins and a spoon could be enhanced by using a light and resistant material, such as FGP.

3.2 Conjoint analysis

To fully understand the impact of factors and levels of stimuli on EA and PI, the relative importance and utility of each factor and their respective levels were determined. It was observed that the relative importance of EA and PI was similar (Figure 6A), meaning that consumers rated both parameters similarly. The EA and PI of consumers showed to have the same behavior pattern. Although PI and EA do not represent the same construct (as PI is more related to spending money to buy a product), the similarity in consumer's behavior towards these parameters may be associated with the fact that the consumer pretends to spend money to buy a product that manufacturers think the consumer will like (Saldaña et al., 2020). For Peruvian people, packaging material was the most important factor, followed by convenience, naturalness, quality, and nutritional labeling (Figure 6A). The two most salient factors were "packaging material" and "convenience", which presented a relative importance higher than 20%. It is known that the packaging material can generate expectations on consumers, increasing their intention to buy a product (Rebollar et al., 2017). This tendency was confirmed for *mazamorra morada* and, looking to the utility values (Figure 6B), it is possible to indicate that FGP material was the level responsible for the increase of EA and PI, while the glass level was responsible for the decrease of EA and PI. This behavior can be explained by the previous experience of consumers regarding the superior practicality of FGP package when comparing to the glass one. For convenience factor (the second most salient factor), the incorporation of a spoon and napkin significantly increased utility values, showing their importance for consumers when eating *mazamorra morada*. This can be explained by previous experiences of consumers when eating *mazamorra morada*, as this dessert has a consistent texture, which makes it difficult to eat without the help of a spoon and a napkin. In addition, mazamorra morada is ideally eaten warm. Thus, the use of a spoon and napkin is almost essential in terms of practicality and for avoiding burn accidents.

The remaining factors (naturalness, quality, and nutritional labeling) presented a moderate relative importance close to 15%. According to the levels of factors, the use of an image of purple corn increased the utility of naturalness and the incorporation of the word "premium" positively influenced the utility of quality. Finally, the nutritional labeling style shows that the warning system decreased PI, showing once again the effectiveness of this system to warn consumers about nutritional danger; for example, *mazamorra morada* is "high in sugar". This finding is in line with other studies on a wide variety of foods, for which the warning system was used in their nutritional label (Antúnez et al., 2020; Arrúa et al., 2017b; Deliza et al., 2020; Khandpur et al., 2018). It is important to highlight that this study is the first of its kind considering the perception of Peruvian population regarding the warning system used in food, which should be explored in depth with further studies to design public policies based on empirical evidence on the use of this system.

Therefore, these results bring out the levels with a positive utility of factors that consumers considered relevant for a ready-to-eat *mazamorra morada*. These were a FGP package (packaging material factor) with a spoon and napkin (convenience factor), as they presented the highest EA and PI, and these were represented by the stimuli 6 and 10, validating the results analyzed by ANOVA (using stimuli as factors).

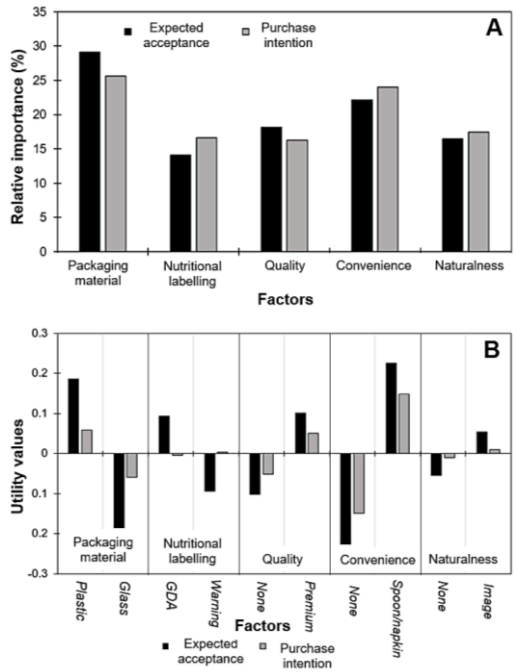

Figure 6. Relative importance of factors (A) and utilities of levels (B) from a CA approach. The negative or positive sign of the utility indicates the negative or positive contribution in the importance of a factor.

3.3 Napping

To explore another aspect of consumers' perception, the *Napping* test was used to access the holistic perception of consumers, which is much more intuitive and, therefore, less analytical than EA and PI (Varela et al., 2017). Holistic perception is worth studying since it shows less analytical nuances, typical of the rapid decisions made by most consumers in a supermarket (Saldaña et al., 2019). Based on confidence ellipses, the stimuli were clustered in three main groups (Figure 7). The first cluster was comprised of the stimuli 1, 2 and 7, which were perceived as natural and healthy, and presented an intermediate EA and PI. This means that, despite consumers stating that they worry about their health, there are other factors more important that may determine their purchase decision. This may be associated with the fact that most of the respondents were young adults, who are generally less concerned about their health (Ares et al., 2010). The second cluster was comprised of stimuli 6, 10 and 12, which were perceived as convenient and high quality, also presenting the highest EA and PI.

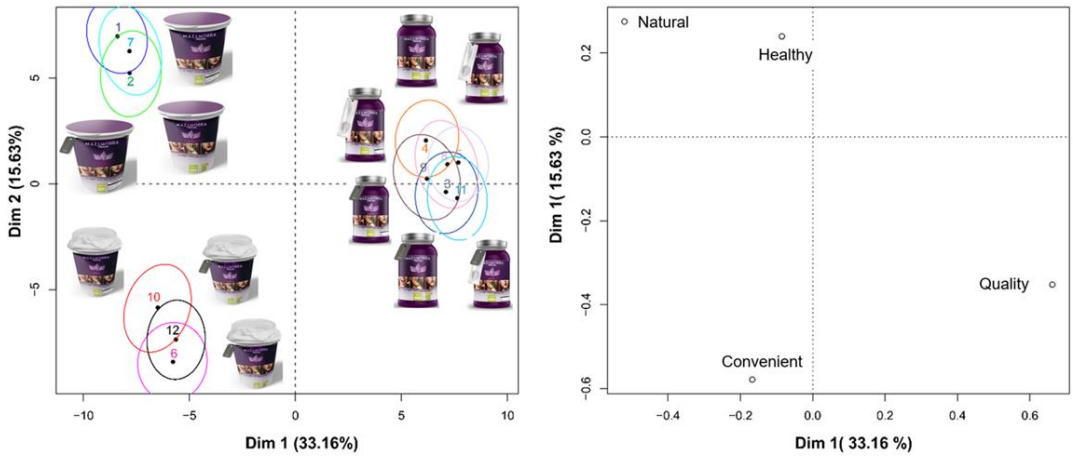

Figure 7. Holistic representation of stimuli based on Napping results. The left side is the consensus positioning of the stimuli while the right side is the positioning of the words used to describe the stimuli by the participants.

These stimuli were designed by using FGP as packaging material, and a "napkin and spoon" as convenience level. In view of this, for the future processing of *mazamorra morada*, one of these stimuli should be considered as a possible prototype to be launched to the market. The third cluster was composed of the remaining stimuli, which were in the positive part of the first dimension of MFA and presented the lowest EA and PI. This last cluster represents designs of glass containers.

4. Conclusions

Non-sensory factors impacted significantly on EA, PI, and HP. Convenience and packaging material were the most salient factors, presenting the highest relative importance. Based on the utility of levels of these two factors, the use of a FGP as packaging material, and the inclusion of a spoon and napkin increased EA and PI of the *mazamorra morada* package. These findings were confirmed by stimulus 6 (Packaging material = FGP, Nutrition labeling = Warning, Quality cue = Premium, Convenience = Spoon and napkin, Naturalness = None) and stimulus 10 (Packaging material = FGP, Nutrition labeling = GDA, Quality cue = None, Convenience = Spoon and napkin, Naturalness = Image), which presented these levels and are the most well-rated by consumers. In addition, according to the Napping results, the stimuli were clustered in three main groups by consumers, using, as the main criteria, convenience and packaging material. Thus, the results once again confirm the importance of these two non-sensory factors in the packaging design of *mazamorra morada*. The findings of this study highlight the importance of non-sensory factors that influence consumers' purchase intention and acceptance of products, which can help stakeholders to design a package and a label that catches the attention of consumers.

ORCID

E. Saldaña https://orcid.org/0000-0002-4018-2852
C. M. S. Ambrosio https://orcid.org/0000-0002-6308-2803

References

Ampuero, O., & Vila, N. (2006). Consumer perceptions of product packaging. J. Consum. Mark. 23, 102–114.

Antúnez, L., Alcaire, F., Giménez, A., & Ares, G. (2020). Can sodium warnings modify preferences? A case study with white bread. *Food Res. Int., 134*, 109239.

Ares, G., Arrúa, A., Antúnez, L., Vidal, L., Machín, L., et al. (2016). Influence of label design on children's perception of two snack foods: Comparison of rating and choice-based conjoint analysis. *Food Qual. Prefer., 53*, 1-8.

Ares, G., & Deliza, R. (2010). Studying the influence of package shape and colour on consumer expectations of milk desserts using word association and conjoint analysis. *Food Qual. Prefer., 21*(8), 930-937.

Ares, G., Giménez, A., & Deliza, R. (2010). Influence of three non-sensory factors on consumer choice of functional yogurts over regular ones. *Food Qual. Prefer. 21*, 361–367.

Ares, G., Giménez, A., & Gámbaro, A. (2009). Consumer perceived healthiness and willingness to try functional milk desserts. Influence of ingredient, ingredient name and health claim. *Food Qual. Prefer., 20*(1), 50-56.

Ares, G., Varela, F., Machin, L., Antúnez, L., Giménez, A., Curutchet, M. R., & Aschemann-Witzel, J. (2018). Comparative performance of three interpretative front-of-pack nutrition labelling schemes: Insights for policy making. *Food Qual. Prefer. 68*, 215–225.

Arrúa, A., MacHín, L., Curutchet, M. R., Martínez, J., Antúnez, L., et al. (2017a). Warnings as a directive front-of-pack nutrition labelling scheme: Comparison with the Guideline Daily Amount and traffic-light systems. *Public Health Nutr., 20*, 2308–2317.

Arrúa, A., MacHín, L., Curutchet, M. R., Martínez, J., Antúnez, L., et al. (2017b). Warnings as a directive front-of-pack nutrition labelling scheme: Comparison with the Guideline Daily Amount and traffic-light systems. *Public Health Nutr., 20*, 2308–2317.

Aschemann-Witzel, J., Grunert, K. G., van Trijp, H., Bialkova, S., Raats, M. M., et al. (2013). Effects of nutrition label format and product assortment on the healthfulness of food choice. *Appetite, 71*, 63–74.

Bak, A., Bartlomowicz, T., & Tomasz Bartlomowicz, M. (2018). Package "conjoint" Title An Implementation of Conjoint Analysis Method.

Baptista, I., Valentin, D., Saldaña, E., & Behrens, J. (2021). Effects of packaging color on expected flavor, texture and liking of chocolate in Brazil and France. *Int. J. Gastron. Food Sci., 24*, 100340.

Bove, C. F., Sobal, J., & Rauschenbach, B. S. (2003). Food choices among newly married couples: Convergence, conflict, individualism, and projects. *Appetite, 40*, 25–41.

Buckley, M., Cowan, C., & McCarthy, M. (2007). Consumer attitudes towards convenience foods, in: Understanding Consumers of Food Products. Elsevier Ltd, pp. 200–220.

Calegari, L.P., Barbosa, J., Marodin, G.A., & Fettermann, D.C. (2018). A conjoint analysis to consumer choice in Brazil: Defining device attributes for recognizing customized foods characteristics. *Food Res. Int., 109*, 1–13.

Claret, A., Guerrero, L., Aguirre, E., Rincón, L., Hernández, M.D., et al. (2012). Consumer preferences for sea fish using conjoint analysis: Exploratory study of the importance of country of origin, obtaining method, storage conditions and purchasing price. *Food Qual. Prefer., 26*(2), 259-266.

Costell, E., Tárrega, A., & Bayarri, S. (2010). Food acceptance: The role of consumer perception and attitudes. *Chemosensory Perception, 3*, 42–50.

Dean, M., Spence, M., Hodgkins, C., & Raats, M.M. (2014). Front-of-pack (FOP) labelling of foods and beverages, in: Advances in Food and Beverage Labelling: Information and Regulations. Elsevier Inc., pp. 113–131.

Dehlholm, C., Brockhoff, P.B., & Bredie, W. L. P. (2012). Confidence ellipses: A variation based on parametric bootstrapping applicable on Multiple Factor Analysis results for rapid graphical evaluation. *Food Qual. Prefer., 26*, 278–280.

Deliza, R., de Alcantara, M., Pereira, R., & Ares, G. (2020). How do different warning signs compare with the guideline daily amount and traffic-light system? *Food Qual. Prefer., 80*, 103821.

Gębski, J., Jezewska-Zychowicz, M., Szlachciuk, J., & Kosicka-Gębska, M. (2019). Impact of nutritional claims on consumer preferences for bread with varied fiber and salt content. *Food Qual. Prefer., 76*, 91–99.

Gil-Pérez, I., Rebollar, R., Lidón, I., Martín, J., van Trijp, H. C. M., & Piqueras-Fiszman, B. (2019). Hot or not? Conveying sensory information on food packaging through the spiciness-shape correspondence. *Food Qual. Prefer., 71*, 197–208.

Gislason, S., Bruhn, S., Christensen, A. M., Christensen, M. T., Hansen, M. G., Kha, T. T., & Giacalone, D. (2020). The influence of bottle design on perceived quality of beer: A conjoint analytic study. *Beverages, 6*, 1–11.

Green, P. E., & Srinivasan, V. (1990). Conjoint Analysis in Marketing: New Developments with Implications for Research and Practice. *Journal of Marketing, 54*(4), 3-19.

Grunert, K. G., 2007. How consumers perceive food quality, in: Understanding Consumers of Food Products. Elsevier Ltd, pp. 181–199.

Hyldelund, N.B., Worck, S., & Olsen, A. (2020). Convenience may increase vegetable intake among young consumers. *Food Qual. Prefer., 83*, 103925.

Jaeger, S. R. (2006). Non-sensory factors in sensory science research. *Food Qual. Prefer., 17*, 132-144.

Khandpur, N., de Morais Sato, P., Mais, L. A., Bortoletto Martins, A., Spinillo, C. G., et al. (2018). Are Front-of-Package Warning Labels More Effective at Communicating Nutrition Information than Traffic-Light Labels? A Randomized Controlled Experiment in a Brazilian Sample. *Nutrients, 10*, 688.

Köster, E. P. (2009). Diversity in the determinants of food choice: A psychological perspective. *Food Qual. Prefer., 20*(2), 70-82.

Kuznetsova, A., Brockhoff, P. B., & Christensen, R. H. B. (2017). lmerTest Package: Tests in Linear Mixed Effects Models . *J. Stat. Softw., 82*(13), 1-26.

Lawless, H. (1995). Dimensions of sensory quality: A critique. *Food Qual. Prefer., 6*, 191–199.

Lê, S., Josse, J., & Husson, F. (2008). FactoMineR: An R package for multivariate analysis. *J. Stat. Softw., 25*, 1–18.

Lê, S., Lê, T. M., & Cadoret, M. (2015). Napping and sorted Napping as a sensory profiling technique, in: Rapid Sensory Profiling Techniques and Related Methods: Applications in New Product Development and Consumer Research. Elsevier Inc., pp. 197–213.

Lim, S. Y., Kim, H. J., Yoo, & S. H. (2018). Assessing the external benefits of contaminated soil remediation in Korea: a choice experiment study. Environ. *Sci. Pollut. Res., 25*, 17216–17222.

Lima Filho, T., Della Lucia, S. M., Lima, R. M., & Minim, V. P. R. (2015). Conjoint analysis as a tool to identify improvements in the packaging for irradiated strawberries. *Food Res. Int., 72*, 126-132.

Martins, I. B. A., Rosenthal, A., Ares, G., & Deliza, R. (2020). How do processing technology and formulation influence consumers' choice of fruit juice? *Int. J. Food Sci. Technol., 55*, 2660–2668.

Ministerio de Salud de Santiago de Chile (2015). Ministerio de Salud Decreto número 13, de 2015. Santiago de Chile.

Ministerio de Salud del Perú (2018). El Peruano - Aprueban Manual de Advertencias Publicitarias en el marco de lo establecido en la Ley N° 30021, Ley de promoción de la alimentación saludable para niños, niñas y adolescentes, y su Reglamento aprobado por Decreto Supremo N° 017-2017-SA - DECR. El Peru. 58–63.

Ministerio de Salud Pública de Montevideo (2018). Ministerio de Salud PúblicaDecreto N°272/18 Montevideo.

Pagès, J., & Husson, F. (2013). Multiple factor analysis: Presentation of the method using sensory data, in: Mathematical and Statistical Methods in Food Science and Technology. John Wiley & Sons, Ltd, Chichester, UK, pp. 87–102.

Pan American Health Organization (2016). Nutrient Profile Model. Available in: https://iris.paho.org/bitstream/handle/10665.2/18621/9789275118733_eng.pdf

Piqueras-Fiszman, B., Velasco, C., Salgado-Montejo, A., & Spence, C. (2013). Using combined eye tracking and word association in order to assess novel packaging solutions: A case study involving jam jars. *Food Qual. Prefer., 28*, 328–338.

R Core Development Team (2019). R: A language and environment for statistical computing. Vienna, Austria.

Raz, C., Piper, D., Haller, R., Nicod, H., Dusart, N., & Giboreau, A. (2008). From sensory marketing to sensory design: How to drive formulation using consumers' input? *Food Qual. Prefer., 19*(8), 719-726.

Rebollar, R., Gil, I., Lidón, I., Martín, J., Fernández, M. J., & Rivera, S. (2017). How material, visual and verbal cues on packaging influence consumer expectations and willingness to buy: The case of crisps (potato chips) in Spain. *Food Res. Int., 99*, 239–246.

Roininen, K., Lähteenmäki, L., & Tuorila, H. (1999). Quantification of consumer attitudes to health and hedonic characteristics of foods. *Appetite, 33*, 71–88.

Rojas-Rivas, E., Antúnez, L., Cuffia, F., Otterbring, T., Aschemann-Witzel, J., Giménez, A., & Ares, G. (2020). Time orientation and risk perception moderate the influence of sodium warnings on food choice: Implications for the design of communication campaigns. *Appetite, 147*, 104562.

Román, S., Sánchez-Siles, L. M., & Siegrist, M. (2017). The importance of food naturalness for consumers: Results of a systematic review. *Trends Food Sci. Technol., 67*, 44–57.

Sáenz-Navajas, M. P., Campo, E., Sutan, A., Ballester, J., & Valentin, D. (2013). Perception of wine quality according to extrinsic cues: The case of Burgundy wine consumers. *Food Qual. Prefer., 27*, 44–53.

Saldaña, E., Martins, M. M., Behrens, J. H., Valentin, D., Selani, M. M., & Contreras-Castillo, C.J. (2020). Looking at non-sensory factors underlying consumers' perception of smoked bacon. Meat Sci., 163, 108072.

Saldaña, E., Rios-Mera, J., Arteaga, H., Saldaña, J., Samán, C. M., Selani, M. M., & Villanueva, N. D. M. (2018). How does starch affect the sensory characteristics of mazamorra morada? A study with a dessert widely consumed by Peruvians. *Int. J. Gastron. Food Sci., 12*, 22–30.

Saldaña, E., Saldarriaga, L., Cabrera, J., Siche, R., Behrens, J. H., et al. (2019). Relationship between volatile compounds and consumer-based sensory characteristics of bacon smoked with different Brazilian woods. *Food Res. Int., 119*, 839–849.

Salvador-Reyes, R., & Clerici, M. T. P. S. (2020). Peruvian Andean maize: General characteristics, nutritional properties, bioactive compounds, and culinary uses. *Food Res. Int., 130*, 108934.

Shepherd, R., & Raats, M. (2010). The Psychology of Food Choice, Frontiers in nutritional science. CABI. 384 pp.

Steptoe, A., Pollard, T. M., & Wardle, J. (1995). Development of a Measure of the Motives Underlying the Selection of Food: the Food Choice Questionnaire Department of Psychology , St George ' s Hospital Medical School , London. *Appetite, 25*, 267–284.

Valentin, D., Chollet, S., Nestrud, M., & Abdi, H. (2018). Projective Mapping & Sorting Tasks, in: Kemp, S.E., Hort, J., Hollowood, T. (Eds.), Descriptive Analysis in Sensory Evaluation, Wiley Online Books. John Wiley & Sons Ltd.

Valentin, D., & Gomez-Corona, C. (2018). Using Ethnography in Consumer Research, in: Methods in Consumer Research, Volume 1: New Approaches to Classic Methods. Elsevier, pp. 103–123.

van Kleef, E., van Trijp, H. C. M., & Luning, P. (2005). Consumer research in the early stages of new product development: A critical review of methods and techniques. *Food Qual. Prefer., 16*(3), 181-201.

Varela, P., Antúnez, L., Berget, I., Oliveira, D., Christensen, K., et al. (2017). Influence of consumers' cognitive style on results from projective mapping. *Food Res. Int., 99*, 693–701.

Varela, P., & Ares, G. (2012). Sensory profiling, the blurred line between sensory and consumer science. A review of novel methods for product characterization. *Food Res. Int., 48*(2), 893-908.

Varela, P., Ares, G., Giménez, A., & Gámbaro, A. (2010). Influence of brand information on consumers' expectations and liking of powdered drinks in central location tests. *Food Qual. Prefer., 21*, 873–880.