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Visual Perception and Emotional Response to Packaging Design: A Mixed-Methods Study of Vacuum-Packed Guinea Pig Meat

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ABSTRACT

His study investigated the impact of packaging attributes on sensory and emotional perception of vacuum-packed guinea pig (*Cavia porcellus*) meat using a comprehensive mixed-methods approach. The research employed both qualitative (word association, descriptive and emotional CATA) and quantitative (conjoint analysis and hedonic scaling) techniques with 250 regular consumers in Peru. Results demonstrated that health message (34.8% relative importance), dorsal presentation position (35.8%), and light blue label color were the dominant factors driving consumer preferences. The optimal combination significantly enhanced acceptability scores (7.2/9 points) and purchase intention, while eliciting positive emotional associations ("happy") and descriptive terms such as "low-fat" and "juicy." Conjoint analysis revealed that packaging attributes explained 68.8% of variance in consumer preferences. Emotion mapping showed clear differentiation between samples with and without health messages, particularly for positive emotions ($p < 0.05$). Health messages and dorsal presentation are the dominant packaging drivers of visual perception, emotional response, and purchase intention for vacuum-packed guinea pig meat, with the optimal combination (health claim + dorsal position + light blue label) increasing acceptability by 51%. The findings provide empirical evidence for developing packaging strategies that integrate nutritional messaging, visual presentation, and color psychology to enhance consumer acceptance of traditional meat products. Future research should validate these findings in real-world shopping environments and with more diverse demographic samples.

1 | Introduction

Meat is a fundamental part of the human diet due to its high nutritional value, particularly its high-quality protein content, essential vitamins, and minerals. However, not all meats consumed globally are of conventional origin. Among the less traditional alternatives is guinea pig (*Cavia porcellus*) meat, a rodent domesticated in the South American Andes between 3000 and 6000 years ago (Wing 1977). This animal has been valued as a food source in countries such as Peru, Bolivia, Ecuador, Colombia, and Argentina, where its consumption persists as part of the local culinary culture. Unlike other

Highlights

- Health claims emerged as the most influential factor (34.8% relative importance) driving acceptance and purchase intent for vacuum-packed guinea pig meat.
- Dorsal presentation significantly enhanced sensory expectations (35.8% importance), outperforming lateral presentation in all evaluated dimensions ($p < 0.001$).
- Light blue labeling positively influenced perceptions of freshness and healthfulness, though with lower impact (19.0% importance) than visual presentation or messaging.
- Emotional profiling revealed strong positive associations ("happy," "enthusiastic") for samples with health messages, while their absence triggered negative emotions ("worried," "disgusted").

Practical Applications

This study contributes to the scarce existing literature on visual perception of guinea pig meat by offering empirical evidence on the role of packaging attributes. The results of this study provide actionable insights for the food industry, particularly in marketing traditional Andean meats. To enhance consumer acceptance, manufacturers should prioritize packaging designs featuring a dorsal product presentation combined with clear health claims, such as "low in saturated fat." Light blue labels serve as an effective complementary visual cue reinforcing freshness and naturalness. These strategies can be readily implemented in vacuum-packed formats to enhance shelf appeal and purchase intention, facilitating its introduction into broader, health-conscious markets.

meats, this animal has productive advantages such as rapid reproduction, adaptability, and low feed costs, in addition to a favorable nutritional profile, with approximately 20% protein and less than 8% fat, making it a healthy option compared to traditional red meats (Lammers et al. 2009; Rosenfeld 2008). Despite these advantages, its consumption remains marginal compared to chicken, pork, or beef, even in regions where its consumption has historical roots.

Food selection is a multifactorial process that integrates nutritional, sensory, emotional, and cognitive aspects. In the case of meat products, purchasing decisions are influenced not only by flavor or texture, but also by factors such as price, perception of quality, and extrinsic elements of the packaging (Köster and Mojet 2018; Nell 2017). In this sense, packaging is not limited to basic protection and preservation functions but also communicates symbolic attributes such as naturalness, freshness, or exclusivity, directly influencing the consumer's sensory and emotional experience (Asioli et al. 2021).

Sensory methodologies are fundamental tools for converting subjective perceptions into objective data that drive food innovation and the development of effective market strategies. In particular, qualitative methods, such as word association, together with quantitative techniques, such as conjoint analysis, are essential to identify key packaging attributes and analyze how factors such as health messages, color, and presentation interact, thus allowing a comprehensive understanding of consumer behavior (Deliza et al. 2003; Roininen et al. 2006).

Despite growing interest in alternative and sustainable proteins, critical gaps exist in our understanding of how packaging attributes modulate the perception of unconventional meats such as guinea pig. Recent studies highlight that modern consumers prioritize scientifically validated health claims and respond to visual stimuli that evoke naturalness and quality (Branca et al. 2024). However, the interaction between textual messages, visual design, and emotional responses remains insufficiently explored for traditional products in emerging markets. Based on this context, this study aimed to evaluate consumers' sensory and emotional perceptions of vacuum-packed guinea pig meat through the application of qualitative techniques.

2 | Materials and Methods

2.1 | Consumer

The study included 250 consumers (18–45 years old) from the city of Abancay, Apurímac, Peru, selected through non-probability convenience sampling from university campuses. Participants were university students, faculty, and administrative staff who regularly purchase, prepare, and consume guinea pig meat at least once a month, given its high regional consumption and nutritional value. The survey, which was conducted in Spanish, detailed the objectives, required profile, estimated time, and confidentiality, following standard exploratory methodologies (Guerrero et al. 2009). All participants gave their informed consent and explicitly committed to attending all sensory evaluation sessions over the four-day trial period. This project was approved by the Research Ethics Committee (No. 015-2025) of the National University of Barranca.

2.2 | Stimulus

Eight presentations of images of raw guinea pig meat were designed using a 2×2×2 full factorial design, considering three categorical variables: (1) presentation position (lateral and dorsal-ventral), (2) label color (green and light blue), and (3) presence or absence of a sensory message. Each image included the fictitious brand "Perú Andino" (selected for its neutrality), standard nutritional information, and the basic packaging format (Figure 1). The stimuli were printed on A4 sheets and evaluated in individual sessions, supervised by researchers to address any questions. Participants received a gift as compensation. The product price was not included in the visual stimuli to avoid this external factor biasing the evaluation of purchase intention. Therefore, the measurement focused exclusively on the impact of the controlled design variables (position, color, and sensory message) on the consumer's response. Table 1 details the treatment matrix.

FIGURE 1 | Examples of the packaging shapes used for sensory testing.

TABLE 1 | Scheme of the factorial design evaluating the presentation variables of packaged guinea pig meat.

Factors/levels	Level 1	Level 2
A: Presentation position	Lateral	Dorsal ventral
B: Label color	Green	Light blue
C: Sensory Claim	With message	Without message

Experimental desing: A × B × C

Treatments	Factor A	Factor B	Factor C
Sample A	Dorsal ventral	Green	With message
Sample B	Dorsal ventral	Light blue	Without message
Sample C	Dorsal ventral	Light blue	With message
Sample D	Lateral	Green	Without message
Sample E	Dorsal ventral	Green	Without message
Sample F	Lateral	Green	With message
Sample G	Lateral	Light blue	Without message
Sample H	Lateral	Light blue	With message

2.3 | Development of Visual Perception Assessment

Visual perception testing was performed across four consecutive days, with each evaluator participating in a single session per day, lasting approximately 20 to 40 min per session. Each session was individually supervised by a trained researcher in a sensory evaluation booth equipped with adequate lighting and ventilation, free from noise and extraneous odors, following international standards for sensory testing (ISO 8589: 2007). The six visual perception tests were distributed across the 4 days following a fixed sequence designed to avoid bias and sensory fatigue: (1) Word Association test (test 1) was administered on the first day (total session 40 min); (2) CATA (Check-All-That-Apply) (test 2) and EsSense25 (emotional profile) (test 3) questionnaires were administered on the second day (total session 30 min); (3) conjoint analysis (test 4) was performed on the third day (total session 40 min); and (4) hedonic scale tests (test 5) and the ranking test (test 6) (Preference and perceived healthy) were completed on the fourth and final day (total session 20 min). This distribution allowed us to maintain the independence of the responses and minimize possible carryover effects between tests.

To ensure sample anonymity and minimize potential evaluation bias, each of the eight stimuli was labeled with a randomly generated three-digit code. The coding remained consistent within each sensory test but was randomly reassigned for subsequent tests, preventing any association between the code and specific stimulus characteristics. For tests 1 through 5, the eight stimuli were presented monadically in a sequential manner, that is, one at a time. The order of presentation of the eight stimuli was randomized for each evaluator using a balanced complete block design, ensuring that each stimulus appeared in each presentation position the same number of times throughout the study. This procedure controls for potential order and fatigue effects. For the ranking test (test 6), the eight stimuli were presented simultaneously to the evaluator, who was asked to rank them according to their preference, purchase intention, and perceived healthy. To complete the survey, participants were asked to answer a series of questions about general and sociodemographic information (Silva-Paz et al. 2024)

and socioeconomic level was determined based on two of the most commonly used variables: education and income (Grusky 2014).

2.4 | Qualitative Sensory Tests

2.4.1 | Word Association

The word association method was applied following the protocol of Valera and Ares (2016), asking participants to freely express the first words, thoughts, or emotions evoked when viewing each presentation. Each image was evaluated individually, recording all spontaneous verbal responses. This qualitative method allowed for the identification of implicit perceptions and cognitive-affective associations with the different packaging designs. The responses were coded using content analysis to group recurring concepts and construct semantic preference maps. For the word association data, verbal responses were coded and grouped into semantic categories using content analysis. A word cloud graph was created, and relative frequencies were calculated to identify association patterns. Differences between presentations were assessed using χ^2 tests (Valera and Ares 2016).

2.4.2 | Check-All-That-Apply (CATA) Questions

CATA method was implemented following validated methodologies for evaluating the sensory profile of the samples (Chávez et al. 2022). Participants received a list of 18 descriptors previously selected through a literature review (Kowalski et al. 2022; Válková et al. 2007; Delahunty et al. 1997), which included the following attributes: (a) visual (pink, dark, characteristic color), (b) textural (elastic, soft, hard, firm, exudate), (c) olfactory (characteristic odor, pleasant, unpleasant), and (d) gustatory (low-fat, lean, greasy). This methodology allows for a rapid and reliable assessment of sensory perceptions, identifying the most relevant attributes for consumers through selection frequencies. Each participant evaluated all samples in individual sessions with a balanced design. For the CATA data, a contingency table was constructed with the frequency of mention of each attribute per stimulus. Cochran's Q test was applied to identify significant differences between stimuli for each attribute. Subsequently, a correspondence analysis (CA) was performed to visualize the association between the stimuli and the selected attributes in a two-dimensional perceptual map (Silva-Paz et al. 2025).

2.4.3 | Emotional Profile Using EsSense25 Applying CATA Questions

The EsSense25 methodology (Yang et al. 2020) was applied to characterize the affective responses induced by the different product presentations. The questionnaire included 25 emotion terms grouped into: (1) positive emotions (adventurous, calm, enthusiastic, free, good, ward, happy, interested, joyful, loving, nostalgic, pleasant, satisfied, good natured, and secure), (2) negative emotions (bored, disgusted, and worried), and (3) unclassified terms (aggressive, guilty, mild, docile, understanding, tame, and wild). Participants selected all emotions they considered applicable to each sample, allowing the frequency of each emotion descriptor to be quantified. This technique has been shown to be effective in capturing affective reactions toward food products in previous studies (Ng et al. 2013). For the EsSense25 data, a similar analysis to CATA was performed, calculating mention frequencies per emotion and stimulus. Cochran's Q test was used to compare emotional profiles across stimuli. Correspondence analysis (CA) was applied to the emotion matrix to identify underlying emotional dimensions and differentiate stimuli within an emotional space.

2.5 | Quantitative Sensory Tests

2.5.1 | Conjoint Analysis

Conjoint analysis was applied to assess consumer preferences. Participants rated: (1) expected liking using a 9-point hedonic scale (1 = "Extremely dislike," 9 = "Extremely like"); (2) purchase intention using a 5-point Likert scale (1 = "Definitely would not buy," 5 = "Definitely would buy"); and (3) perceived healthiness using an analog scale (1 = "Not at all healthy," 5 = "Very healthy"). This design allowed quantifying the relative importance of each attribute (position, label color, and sensory message) in forming preferences, following methodologies validated in sensory research (Ares and Deliza 2010). For the data from the conjoint analysis, the means and standard deviations of liking, purchase intention, and perceived healthiness were calculated for each stimulus. A repeated measures analysis of variance (ANOVA) was applied, considering the three design factors (position, color, and sensory message) as fixed effects, and partial utilities were estimated using multiple linear regression, calculating the relative importance (%) of each attribute (position, color, message). Differences between means were determined using Tukey's multiple comparisons test ($p < 0.05$) (Ares and Deliza 2010).

2.5.2 | Overall Liking, Purchase Intention, and Perceived Healthy

Sensory tests were conducted using a randomized complete block design. Participants evaluated eight guinea pig meat presentations using: (1) a 9-point hedonic scale for overall liking, (2) a 5-point Likert scale for purchase intention, and (3) another 5-point Likert scale for perceived healthy. The images were presented in random order with three-digit codes, controlling for variables such as lighting and evaluation time (ISO 8589: 2007). Data on overall liking (9-point scale), purchase intention, and perceived healthy (5-point scales) were analyzed using ANOVA, considering presentations as a within-subject factor. Differences between treatments were assessed using Tukey's post hoc tests ($p < 0.05$). The assumptions of normality (Shapiro–Wilk) and homogeneity of variance (Levene) were previously verified (Lawless and Heymann 2010).

2.5.3 | Ranking Test by Preference and Perception of Healthy

To assess overall preference and perceived healthiness of the different guinea pig meat presentations, a ranking test was administered according to the standardized ISO 8587: 2006 protocol. Participants ranked the eight samples from highest

to lowest preference (1 = most preferred, 8 = least preferred) and then repeated the procedure for healthiness (1 = healthiest, 8 = least healthy). This method allows direct comparison of relative preferences between samples and has been shown to be effective in sensory studies with meat products. For the ranking test (Preference and perceived healthiness), the data were summed to assign each stimulus based on the responses of all evaluators. The Friedman test was applied to determine if there were significant differences in the sum of ranks between the stimuli. If significant, Fisher's multiple comparisons test (LSD) was used to identify which stimuli differed from each other ($p < 0.05$) (Lawless and Heymann 2010).

2.6 | Statistical Analysis

All statistical analyses were performed using XLSTAT version 2023 (Adinsoft, France), software for the analysis of sensory and consumer data. For each sensory test, the corresponding statistical methods described in Sections 2.4 and 2.5 were applied. Specifically, frequency analysis, Cochran's *Q* test, and correspondence analysis were used for the CATA and EsSense25 data; a repeated measure analysis of variance (ANOVA) followed by Tukey's post hoc test was applied to the overall liking, purchase intention, and perception of healthy data; the Friedman test with Fisher's LSD comparisons was used for the ranking data (preference and perception of healthy); and content analysis with chi-square per cell tests was used for the word association results. A significance level of $p < 0.05$ was established for all statistical tests.

3 | Results and Discussion

3.1 | Sociodemographic Data

The sociodemographic profile of the 250 participants (Table 2) showed a slight female predominance (55.2%) and a majority of young people between 18 and 24 years old (83.2%), reflecting the university context of the sample. Regarding guinea pig meat consumption, 71.6% reported monthly consumption, 20.0% biweekly consumption, and 8.4% weekly consumption; it should be noted that monthly consumption (71.6%) was the minimum frequency required for participation in the sensory tests, ensuring that all evaluators were regular consumers of the product. This consumption pattern is consistent with that described in the Andean region, where this product is primarily associated with festivities (Gómez et al. 2021). Regarding socioeconomic level, the middle class predominated (60.8%), followed by the lower class (38.0%), which is consistent with previous studies that indicate a higher prevalence of consumption in middle- and low-income groups (Torres et al. 2020).

TABLE 2 | Sociodemographic data of the participants.

Data	*n*	%
Gender		
Male	112	44.80
Female	138	55.20
Age		
18–24	208	83.20
25–30	32	12.80
31–40	7	2.80
> 40	3	1.20
Frequency of consumption		
Weekly	21	8.40
Bi-weekly	50	20.00
Monthly	179	71.60
Socioeconomic level		
Low	95	38.00
Medium	152	60.80
High	3	1.20

3.2 | Qualitative Sensory Tests

3.2.1 | Word Association Analysis

Word association analysis revealed significant patterns in consumer perceptions of the different guinea pig meat presentations (Figure 2). All stimuli consistently evoked the terms "healthy" and "health," indicating a generalized perception of the product's nutritional benefits. However, samples with a healthy product sensory message (sample A, C, F, H) generated additional descriptors such as "nutritious," "pleasant," "good," and "protein" more frequently ($p < 0.05$) than their counterparts without messages (sample B, D, E, G). Furthermore, a notable effect of label color was observed, with presentations with a light blue label predominantly eliciting hedonic terms such as "rich," "delicious," and "tasty." These results are consistent with studies highlighting the influence of healthy messages on consumer cognitive associations (Lima et al. 2023). Specifically, the message "low in saturated fat" was effective in reinforcing positive perceptions, in line with the nutritional composition of guinea pig, characterized by a high content of polyunsaturated fatty acids (Fu and Sinclair 2000).

The semantic categories derived from word association analysis and χ^2 analysis (Table 3) revealed significant differences ($p < 0.05$) in the perceptual profiles of the eight samples, as determined by chi-square per cell tests. Sample A was positively associated with "Texture" ($p < 0.01$) and "Presentation" ($p < 0.001$), but negatively associated with "Healthy" ($p < 0.001$), indicating a design perceived as visually appealing yet unhealthy. Sample D showed a positive association with "Product" ($p < 0.05$), suggesting a strong connection with intrinsic product attributes. Sample F presented a dual profile, with positive associations for "Meat" ($p < 0.01$) and "Healthy" ($p < 0.01$), but negative associations for "Texture" ($p < 0.05$) and "Sensation" ($p < 0.05$). Sample H was uniquely associated with "Color" ($p < 0.001$), yet negatively associated with "Presentation" ($p < 0.01$). Notably, only Samples C and E were positively associated with "Cooked" ($p < 0.01$ and $p < 0.001$, respectively), evoking culinary preparation. Each packaging design elicits a distinct perceptual profile, highlighting specific strengths and weaknesses that inform

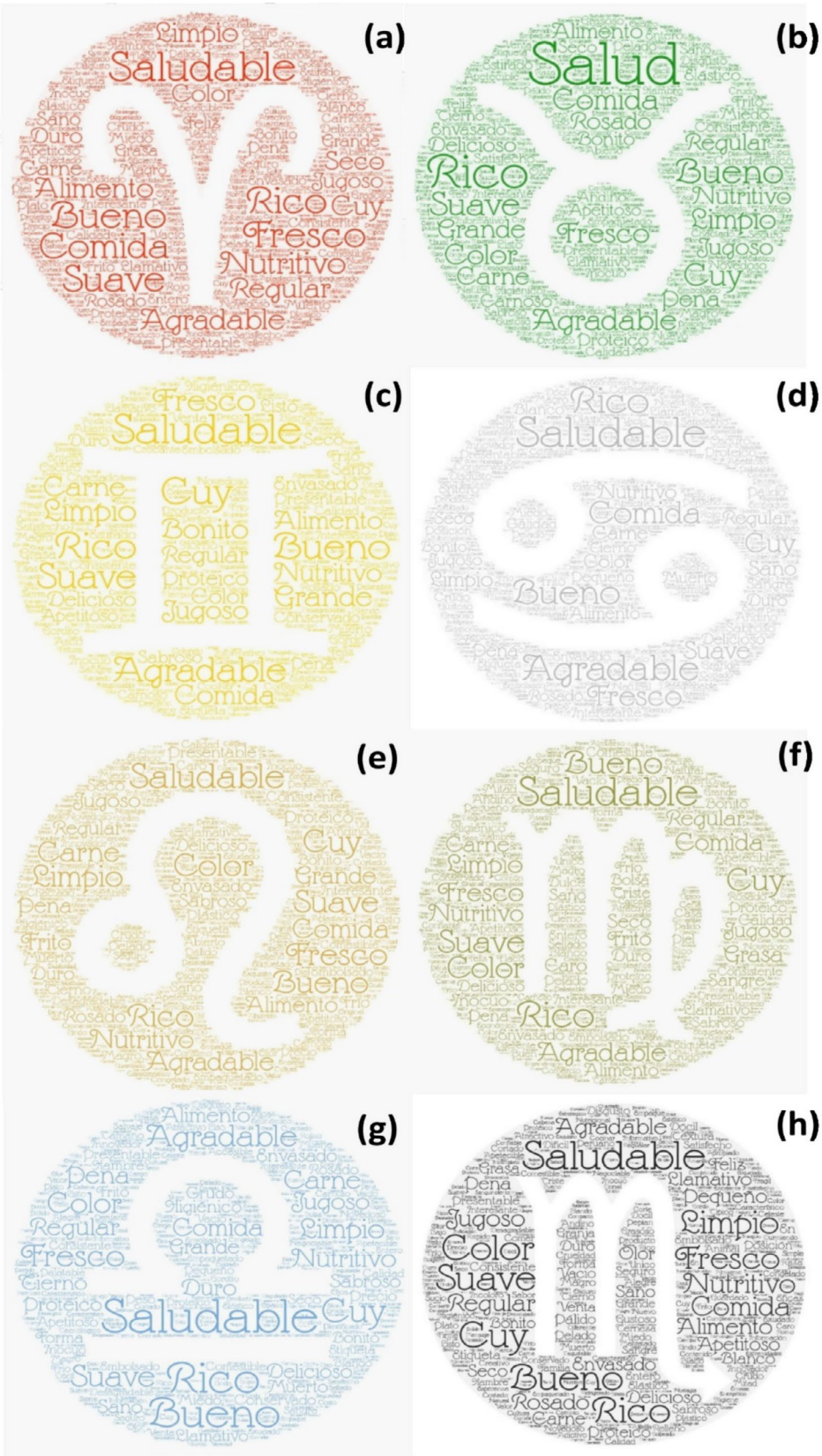

FIGURE 2 | Word cloud visualization of sample words (maintaining the original Spanish language used in the study).

optimization strategies for guinea pig meat packaging. These findings are consistent with studies highlighting the influence of spatial orientation on culinary expectations (Martínez et al. 2021).

3.2.2 | Descriptive CATA

The CATA analysis revealed significant differences ($p < 0.05$) in three key descriptors: "low fat", "pink", and "exudate". Samples

TABLE 3 | Chi-squared by cell for descriptor categorization.

Categorization (%)	Descriptors (example)
Hedonic (27.3)	Appetizing, appetizing, pleasant, good, delicious, rich, satisfied, nice, disgust, satisfied, tasty, unpleasant, happy
Product (22.1)	Food, edible, packaged, label, Andean, characteristic, packaged, preserved, bagged. Ready, product, price
Color (3.2)	White, color, pink
Texture (18.4)	Consistent, juicy, dry, soft, tender, hard, elastic, texture
Meat (2.8)	Meat, meaty, guinea pig, fat, lean, peeled, blood, raw
Healthy (16.2)	Hygienic, clean, nutritious, protein, healthy, fresh, health, quality, harmless, safe
Presentation (12.5)	Preserved, large, striking, presentable, regular, small, interesting, informative, stretched, position
Sensation (1.4)	Dead, sorrow, hunger
Cooked (0.9)	Fried, chactado

Sample	Sample A	Sample B	Sample C	Sample D	Sample E	Sample F	Sample G	Sample H	Total
Hedonic	223	244	247	223	235	192	227	231	1822
Product	120	140	146	158 (+) *	141	113	131	132	1081
Color	28	26	13 (−) *	27	22	11 (−) *	20	40 (+) ***	187
Texture	87 (+) **	74	64	59	70	43 (−) *	67	68	532
Meat	49	43	40	38	58	58 (+) **	52	52	390
Healthy	173 (−) ***	206	231	220	199	216 (+) **	233	228	1706
Presentation	144 (+) ***	109	114	92	111	79	100	82 (−) **	831
Sensation	21	18	14	21	16	6 (−) *	29 (+) **	17	142
Cooked	0	0	5 (+) **	0	6 (+) ***	0	0	0	11
Total	**845**	**860**	**874**	**838**	**858**	**718**	**859**	**850**	**6702**

Note: (+) or (−) indicate that the observed value is greater or less than the expected theoretical value. Values in bold indicate the total number of mentions recorded for each sample across all evaluated descriptors.
***$p < 0.001$.
**$p < 0.01$.
*$p < 0.05$; effect of the Chi-square by cell.

with a health message (samples A, C, F, H) showed a stronger association with the descriptor "low fat," while samples without a message (samples B, D, E, G) had lower frequencies for this term. The descriptor "pink" was significantly more frequent in samples A, B, C, D, F, and G, especially in those presented dorsally (Figure 3). For "exudate", sample G (lateral position, light blue label, no message) showed a higher frequency than sample C (dorsal position, light blue label, with a message). Correspondence analysis explained 88.98% of the total variance in the data using four dimensions. Dimensions F1 and F2 explained 68.83% (Figure 3a), and dimensions F3 and F4 explained 20.18% (Figure 3b). In the first two dimensions, three groups were formed: Group 1, composed of samples E and G (without a health message); Group 2, composed of samples D and B (without a message, associated with "pink" and "fatty"); and Group 3, composed of samples A, C, F, and H (with a health message, associated with "low-fat" and "soft"). For the third and fourth dimensions, two groups were formed. The first group consists of A, G, and H, associated with "hard", "dark", and "lean". The second group, comprised of B, C, D, E, and F, is described as "soft" and "elastic". These results suggest that the "low in saturated fat" message significantly influenced sensory perception, generating more positive associations. These findings are consistent with research demonstrating that product information and health claims can modulate sensory expectations and enhance perceived quality. Our results confirm that non-sensory factors, such as labeling and presentation, significantly influence the overall product evaluation (Deliza et al. 2003).

3.2.3 | Emotions With ESense Using CATA Questions

Emotion analysis using CATA questions identified significant patterns in consumers' affective perceptions of different product presentations (Figure 3). The results showed statistically significant differences ($p < 0.05$) in five key emotional descriptors ("good," "loving," "disgusted," "enthusiastic," and "happy"), with a clear distinction between samples that included health messages and those that did not. Correspondence analysis explained 81.34% of the total variance in the data through four dimensions: dimensions F1 and

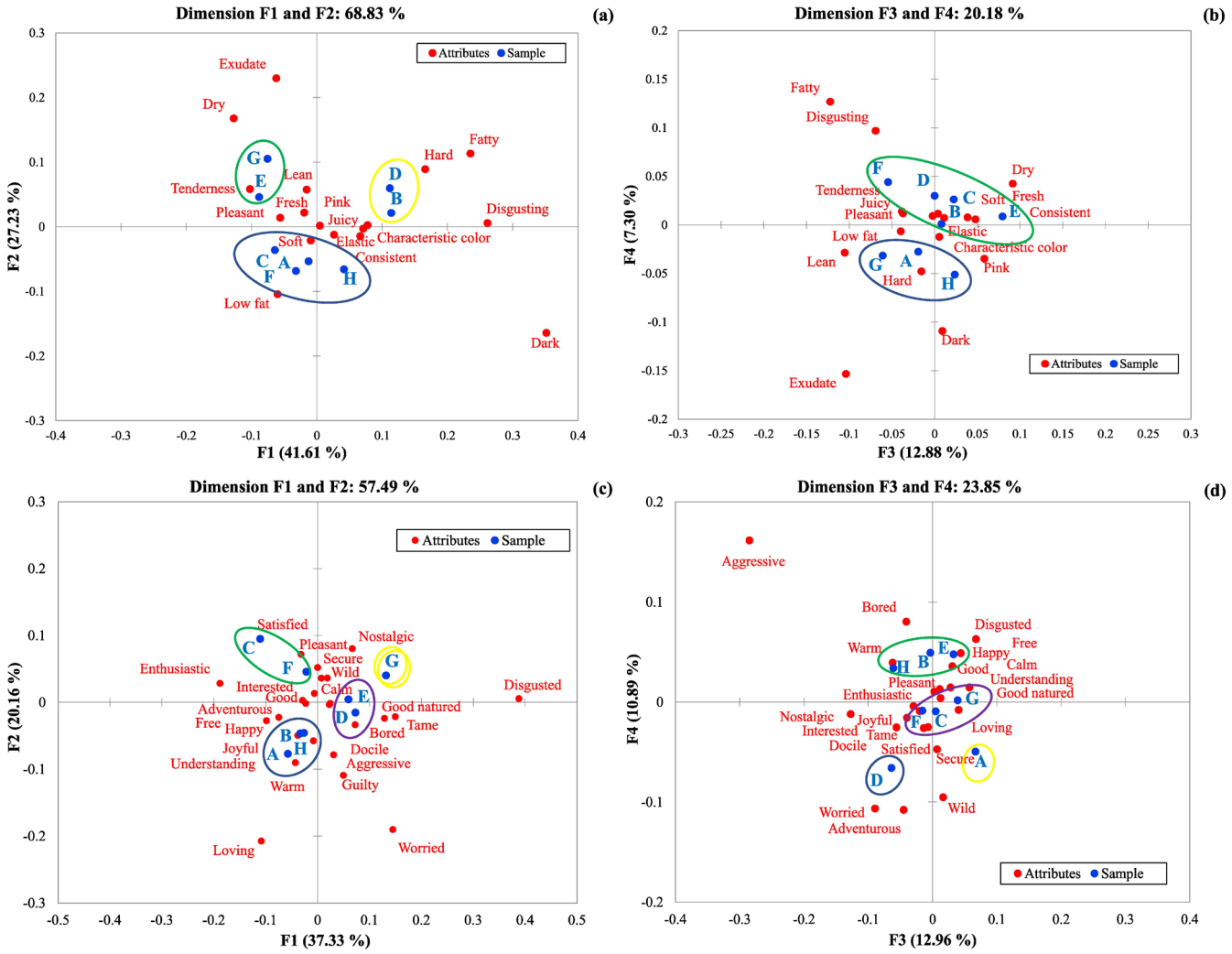

FIGURE 3 | Correspondence analysis of samples with sensory attributes (a, b) and samples with emotions (c, d) using CATA questions.

F2 explained 57.49% (Figure 3c), and dimensions F3 and F4 explained 23.85% (Figure 3d). The first two dimensions revealed four distinct groups, where specific combinations of health messages, label color, and presentation position generated characteristic emotional associations. Similar behavior was observed for the third and fourth dimensions. Specifically, the presence of health messages was consistently associated with positive emotions such as "happy" and "enthusiasm," while their absence correlated with negative terms such as "worried" and "disgusted." This highlights the modulating role of packaging in consumers' affective perceptions, as documented in research on extrinsic stimuli in food (Cardello 2018).

3.3 | Quantitative Sensory Tests

3.3.1 | Conjoint Analysis

Conjoint analysis revealed significant differences in the influence of the evaluated attributes (Table 4). Product position emerged as the most determining factor, with the dorsal presentation showing significantly higher utilities ($p < 0.05$) than the lateral presentation in the three criteria evaluated (acceptability, purchase intention, and perceived health), reaching a relative importance of 34.3%–35.8%. The sensory message demonstrated a particularly significant impact on purchase intention (utility of 0.117 vs. −0.117 without the message), with a relative importance of 34.8%. The label color, although less influential (22.7%–28.6% relative importance), showed a slight preference for light blue in overall liking and perceived health. These results suggest that the optimal combination to maximize product acceptance would consist of dorsal presentation, inclusion of a health message, and use of light blue on the label, thus providing valuable quantitative evidence for the strategic design of packaging for non-conventional meat products. This pattern coincides with the global trend toward healthier and more sustainable foods (Grunert et al. 2018). Although color had a limited effect, the preference for light tones reinforces its association with perceptions of naturalness (van Esch et al. 2019). However, it is important to note that the nutritional composition of guinea pigs in Peru, rich in diet-derived n-3 fatty acids (Huamaní et al. 2016), provides an objective basis for health claims and could explain the strong positive consumer response.

TABLE 4 | Influence of packaging attributes on product perception: Conjoint analysis.

Attributes and levels	Overall linking	Purchase intention	Healthy
Position			
Lateral	−0.145[a]	−0.062[a]	−0.059[a]
Dorsal ventral	0.145[b]	0.062[b]	0.059[b]
Relative importance (%)	34.306	35.800	34.674
Color			
Light blue	0.038[a]	−0.001[a]	0.001[a]
Green	−0.038[b]	0.001[b]	−0.001[b]
Relative importance (%)	28.584	25.912	22.736
Sensory claim			
Without message	−0.153[a]	−0.117[a]	−0.111[a]
With message	0.153[b]	0.117[b]	0.111[b]
Relative importance (%)	34.563	34.840	24.257

Note: [a,b]Different letters indicate significant differences ($p > 0.05$).

3.3.2 | Evaluation of Overall Liking, Purchase Intention, and Perceived Healthy Using Structured Scales

Sensory analyses (Figure 4) revealed significant differences ($p < 0.05$) in consumer responses regarding overall liking (Figure 4a), purchase intention (Figure 4b), and perceived health (Figure 4c) of the samples. Regarding overall liking, samples A, B, C, E, F, and H showed statistically similar and significantly higher values ($p < 0.05$) than samples D and G. This group with greater sensory acceptability was characterized predominantly by dorsal labeling and healthy product messaging, while samples D and G were characterized by side labeling and the absence of a health message. Purchase intention reflected this same pattern, with an additional positive effect for samples with a light blue label (B, C, H). In addition, perceived samples with a healthy message and dorsal position received the most favorable ratings. These results are consistent with previous studies highlighting the importance of health messages in product perception and the impact of visual presentation on preferences (Lima et al. 2023; Velasco et al. 2020). The dorsal position, associated with a greater perception of size, appears to favor a positive evaluation, as reported in food presentation research (Jaeger 2006). Likewise, the results indicate that packaging design acts as a key communication channel with the consumer, where aesthetic aspects can influence the perception of quality (Sundar et al. 2020). Finally, when relating the CATA method data to taste, it was observed that the descriptors "low in fat," "pleasant," and "consistent" corresponded to the highest hedonic scores.

3.3.3 | Evaluation of Healthy Product Preference and Perception

The ranking analysis (Figure 4) showed significant differences ($p < 0.05$) in preference product (Figure 4e) and perceived healthy (Figure 4d) among the samples. Regarding preference, samples A, B, C, and H obtained significantly higher scores than D and G. It is noteworthy that three of these samples (A, C, and H) included healthy product messages, while sample B, despite not having this message, combined a dorsal position and a light blue label, which were equally attractive to consumers. In contrast, samples D and G, which lacked a healthy message and were positioned laterally, obtained the lowest preference scores, confirming the negative impact of the absence of healthy messages and lateral positioning on product acceptability (Jaeger et al. 2018). Regarding the perception of healthy products, a similar pattern was observed, where samples with a healthy message (A, C, F, and H) were rated significantly healthier than those without this message (D and G). These results demonstrate that the healthy product message is the determining factor in perception, followed by the dorsal position and the light blue color of the label. The heterogeneity in preferences observed in our study coincides with that reported by Byarugaba et al. (2020) and Ares et al. (2014), although in our case a clear pattern was identified: the healthy product message emerged as the most determining factor in preference, followed by the dorsal position of the product and finally the light blue color of the label. This hierarchy suggests that, although consumers primarily value information about health benefits (Grunert et al. 2018), visual elements such as the presentation and color of the packaging play a significant complementary role in shaping their preferences (Piqueras-Fiszman and Spence 2015).

4 | Conclusions

This study showed that the sensory and emotional perception of vacuum-packed guinea pig meat is strongly influenced by packaging attributes. The presence of a health message, dorsal presentation, and the use of light blue on the label fostered positive associations, greater overall liking, and purchase intention. These elements enhanced the perception of the product as healthy, attractive, and nutritious. Tasting and word association techniques confirmed that samples with a health message were perceived as more sensorially pleasing, evoking positive emotions such as satisfaction and enthusiasm. Furthermore, the nutritional message fostered a higher evaluation of attributes such as texture and fat content, reinforcing its role in building favorable expectations. The conjoint analysis determined that the presentation position and the health message were the most determining factors in consumer decision-making, followed by label color. Future studies could also explore cross-cultural variations in consumer responses to packaging design elements and with more heterogeneous demographic segments to enhance the external validity and generalizability of the results.

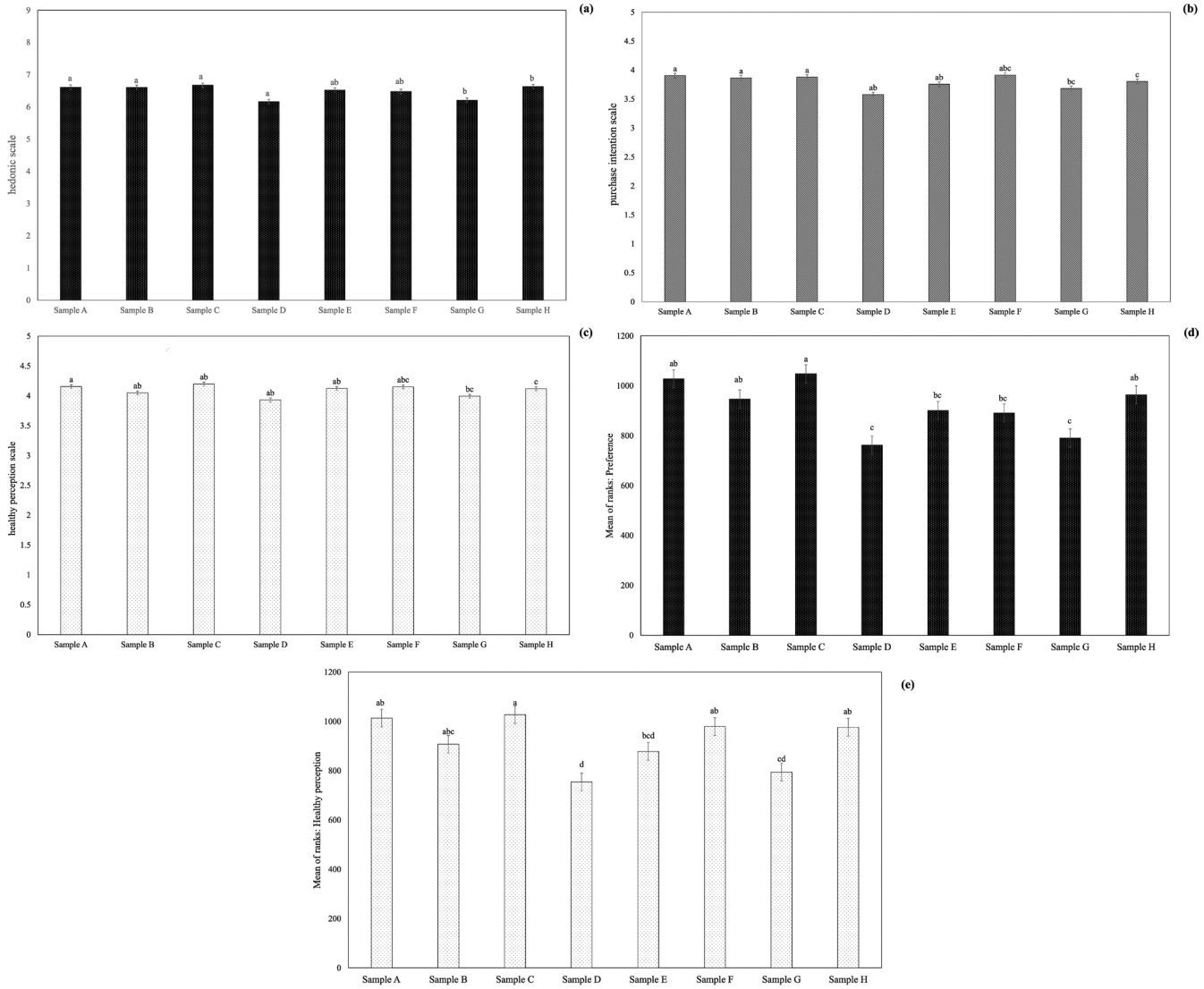

FIGURE 4 | Assessment of overall liking (a), purchase intention (b), and perceived health (c) using hedonic scales, and preference (d) and perceived health (e) ranking tests. ([a,b]Different letters indicate significant differences ($p > 0.05$)).

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

References

Ares, G., L. Antúnez, A. Giménez, et al. 2014. "Further Investigations Into the Reproducibility of Check-All-That-Apply (CATA) Questions for Sensory Product Characterization Elicited by Consumers." *Food Quality and Preference* 36: 111–121.

Ares, G., and R. Deliza. 2010. "Studying the Influence of Package Shape and Colour on Consumer Expectations of Milk Desserts Using Word Association and Conjoint Analysis." *Food Quality and Preference* 21, no. 8: 930–937. https://doi.org/10.1016/j.foodqual.2010.03.006.

Asioli, D., V. L. Almli, and T. Næs. 2021. "Understanding and Modelling Consumer Behavior: Challenges and Perspectives." *Food Quality and Preference* 87: 104063. https://doi.org/10.1016/j.foodqual.2020.104063.

Branca, G., R. Resciniti, and B. J. Babin. 2024. "Sustainable Packaging Design and the Consumer Perspective: A Systematic Literature Review." *Italian Journal of Marketing* 2024, no. 1: 77–111.

Byarugaba, R., A. Nabubuya, and J. Muyonga. 2020. "Descriptive Sensory Analysis and Consumer Preferences of Bean Sauces." *Food Science & Nutrition* 8, no. 8: 4252–4265. https://doi.org/10.1016/j.foodqual.2020.103917.

Cardello, A. V. 2018. "Consumer Expectations and Their Role in Food Acceptance." *Food Research International* 104: 4–12. https://doi.org/10.1016/j.foodres.2017.10.025.

Chávez, J., D. Garrido, and G. Ares. 2022. "Check-All-That-Apply (CATA) Questions: Sensory and Consumer Research Applications." *Food Quality and Preference* 96: 104401. https://doi.org/10.1016/j.foodqual.2021.104401.

Delahunty, C. M., A. McCord, E. E. O'Neill, and P. A. Morrissey. 1997. "Sensory Characterisation of Cooked Hams by Untrained Consumers Using Free-Choice Profiling." *Food Quality and Preference* 8, no. 5–6: 381–388. https://doi.org/10.1016/S0950-3293(97)00022-0.

Deliza, R., A. Rosenthal, and A. L. S. Silva. 2003. "Consumer Attitude Towards Information on Non-Conventional Technology." *Trends in Food Science & Technology* 14, no. 1–2: 43–49.

Fu, Z., and A. J. Sinclair. 2000. "Novel Pathways of Eicosapentaenoic Acid Metabolism in Platelets." *Lipids* 35, no. 2: 149–156. https://doi.org/10.1007/s11745-000-0505-2.

Gómez, P., R. Schneider, and G. Ares. 2021. "Food Consumption Patterns in the Andean Region." *Journal of Food Science* 45, no. 3: 210–225. https://doi.org/10.1111/jfds.2021.45.issue-3.

Grunert, K. G., S. Hieke, and J. Wills. 2018. "Sustainability Labels on Food Products: Consumer Motivation, Understanding and Use." *Appetite* 124: 113–123. https://doi.org/10.1016/j.appet.2018.01.020.

Grusky, D. 2014. *Social Stratification, Class, Race, and Gender in Sociological Perspective*. 4th ed. Routledge.

Guerrero, L., A. Claret, W. Verbeke, et al. 2009. "Perception of Traditional Food Products in Six European Regions Using Free Word Association." *Food Quality and Preference* 21, no. 2: 225–233. https://doi.org/10.1016/j.foodqual.2009.06.003.

Huamaní, G., O. Zea, G. Gutiérrez, and C. Vílchez. 2016. "Efecto de Tres Sistemas de Alimentación Sobre el Comportamiento Productivo y Perfil de Ácidos Grasos de Carcasa de Cuyes (*Cavia porcellus*)." *Revista de Investigaciones Veterinarias del Perú* 27, no. 3: 486–494.

International Organization for Standardization. 2006. ISO 8587:2006. Sensory analysis—Methodology—Ranking. I.

International Organization for Standardization. 2007. Sensory Analysis—General Guidance for the Design of Test Rooms (ISO Standard No. 8589:2007).

Jaeger, S. R. 2006. "Non-Sensory Factors in Sensory Science Research." *Food Quality and Preference* 17: 132–144.

Jaeger, S. R., C. M. Roigard, D. Jin, L. Vidal, and G. Ares. 2018. "Valence, Arousal and Sentiment Meanings of 132 Food, Beauty, Cleanliness and Care Product Concepts." *Food Research International* 108: 309–318. https://doi.org/10.1016/j.foodres.2018.03.042.

Köster, E. P., and J. Mojet. 2018. "From Sensory Perception to Emotion: A Neurogastronomy Approach." *Food Quality and Preference* 66: 117–128. https://doi.org/10.1016/j.foodqual.2017.11.007.

Kowalski, S., A. Mikulec, B. Mickowska, M. Skotnicka, and A. Mazurek. 2022. "Wheat Bread Supplementation With Various Edible Insect Flours. Influence of Chemical Composition on Nutritional and Technological Aspects." *LWT* 159: 113220.

Lammers, P. J., S. L. Carlson, G. A. Zdorkowski, and M. S. Honeyman. 2009. "Reducing Food Insecurity in Developing Countries Through Meat Production: The Potential of the Guinea Pig (*Cavia porcellus*)." *Renewable Agriculture and Food Systems* 24, no. 2: 155–162.

Lawless, H. T., and H. Heymann. 2010. *Sensory Evaluation of Food: Principles and Practices*. 2nd ed. Springer.

Lima, D. C., N. H. Noguera, J. H. Rezende-de-Souza, and S. B. Pflanzer. 2023. "What Are Brazilian Plant-Based Meat Products Delivering to Consumers? A Look at the Ingredients, Allergens, Label Claims, and Nutritional Value." *Journal of Food Composition and Analysis* 121: 105406.

Martínez, J., P. Gómez, and G. Ares. 2021. "Food Presentation and Cultural Associations." *Journal of Sensory Studies* 36, no. 2: e12634. https://doi.org/10.1111/joss.12634.

Nell, E. C. 2017. "The Impact of Sensory Environments on Consumer Buying Behaviour: A Study of Visual Displays and Sight Atmospherics." *Journal of Business and Retail Management Research* 11, no. 2: 155–164.

Ng, M., C. Chaya, and J. Hort. 2013. "Beyond Liking: Comparing the Measurement of Emotional Response Using EsSense Profile and Consumer Defined Check-All-That-Apply Methodologies." *Food Research International* 54, no. 1: 207–218. https://doi.org/10.1016/j.foodres.2013.07.009.

Piqueras-Fiszman, B., and C. Spence. 2015. "Sensory Expectations Based on Product-Extrinsic Food Cues: An Interdisciplinary Review of the Empirical Evidence and Theoretical Accounts." *Food Quality and Preference* 40: 165–179. https://doi.org/10.1016/j.foodqual.2014.09.013.

Roininen, K., A. Arvola, P. Lampila, et al. 2006. Consumer Perceptions of Local and Organic Foods. In Nordic Workshop in Sensory Science: Focus on the Nordic Consumer.

Rosenfeld, S. A. 2008. "Delicious Guinea Pigs: Seasonality Studies and the Use of Fat in the Pre-Columbian Andean Diet." *Quaternary International* 180: 127–134.

Silva-Paz, R. J., H. A. Avilés Pérez, T. A. Rivera-Ashqui, and C. R. Apaza-Humerez. 2025. "Comparison of Rapid Descriptive Sensory Methods Applied to Consumers in the Evaluation of Muffins." *Food* 14, no. 16: 2898. https://doi.org/10.3390/foods14162898.

Silva-Paz, R. J., F. E. Inocente-Quiroz, L. A. Gonzales-Albiño, M. Jarpa-Parra, and A. Eccoña-Sota. 2024. "Impact of Social Isolation Produced by Covid-19 on Eating Habits and Emotional States in Peru." *Academic Journal of Interdisciplinary Studies* 13: 173–183. https://doi.org/10.36941/ajis-2024-0013.

Sundar, A., F. Kardes, and P. Wright. 2020. "The Influence of Packaging on Consumer Perception of Food Products." *Journal of Business Research* 111: 121–131. https://doi.org/10.1016/j.jbusres.2020.01.038.

Torres, L., P. Gómez, and J. Martínez. 2020. "Socioeconomic Factors Influencing Meat Consumption in Peru." *Nutrition Reports* 12, no. 2: 78–92. https://doi.org/10.1016/j.nutrep.2020.03.005.

Valera, D., and G. Ares. 2016. *Novel Techniques in Sensory Characterization and Consumer Profiling*. CRC Press.

Válková, V., A. Saláková, H. Buchtová, and B. Tremlová. 2007. "Chemical, Instrumental and Sensory Characteristics of Cooked Pork Ham." *Meat Science* 77, no. 4: 608–615.

van Esch, P., J. Heller, and G. Northey. 2019. "The Effects of Inner Packaging Color on the Desirability of Food." *Journal of Retailing and Consumer Services* 50: 94–102. https://doi.org/10.1016/j.jretconser.2019.04.019.

Velasco, C., A. Pathak, A. T. Woods, A. Corredor, and A. J. Elliot. 2020. "The Relation Between Symmetry in Food Packaging and Approach and Avoidance Words." *Quarterly Journal of Experimental Psychology* 73, no. 5: 654–663.

Wing, E. S. 1977. "Animal Domestication in the Andes." In *Origins of Agriculture*, edited by C. A. Reed, 837–857. Mouton Publishers.

Yang, Q., Y. Shen, T. Foster, and J. Hort. 2020. "Measuring Consumer Emotional Response and Acceptance to Sustainable Food Products." *Food Research International* 131: 108992.