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Original Article

Taste and smell in the perception of restaurant diners in Lima

El gusto y olfato en la percepción del comensal de un restaurante de Lima

Ana S. Córdova Nanette Feraldo Roberto Pastor

ascordova11@gmail.com

Universidad Le Cordon Bleu, Lima, Peru

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ABSTRACT

The objective of this study was to determine the influence of taste and smell on diners' perceptions in a restaurant in Lima, focusing on two emblematic dishes of Peruvian gastronomy: arroz con pato (duck with rice) and ceviche caliente (hot ceviche). The research was conducted under a quantitative approach, with a correlational and cross-sectional design. The sample consisted of 378 diners from Fiesta Restaurant, selected using a finite population formula with a 95% confidence level. Data were collected through a structured eight-question digital questionnaire, and results were analyzed using descriptive and inferential statistics. Findings indicate that 97% of respondents considered aroma an important factor during dish tasting, while 100% identified taste as a decisive element in their dining experience. Additionally, 66% reported a very high level of perception related to taste, and 52% expressed a high perception regarding aroma. These results confirm that taste and smell are closely linked in shaping gastronomic experiences, reinforcing the theoretical contributions of neurogastronomy and gastrophysics. The study provides empirical evidence in the Peruvian context, highlighting the relevance of sensory dimensions in culinary evaluation and suggesting that restaurants may design multisensory strategies to enhance customer satisfaction and strengthen gastronomic innovation.

Keywords: Perception, gastrophysics, smell, taste, neurogastronomy.

RESUMEN

El presente estudio tuvo como objetivo determinar la influencia del gusto y el olfato en la percepción del comensal en un restaurante de Lima, tomando como referencia dos platos emblemáticos de la gastronomía peruana: el arroz con pato y el ceviche caliente. La investigación se desarrolló bajo un enfoque cuantitativo, con diseño correlacional y de corte transversal. La muestra estuvo compuesta por 378 comensales del restaurante Fiesta, seleccionados mediante fórmula para poblaciones finitas con un nivel de confianza del 95

%. El instrumento de recolección fue un cuestionario estructurado de ocho preguntas, aplicado en formato digital, cuyos resultados se analizaron con estadística descriptiva e inferencial. Los hallazgos indican que el 97 % de los encuestados consideró importante el aroma en la degustación de los platos, mientras que el 100 % valoró el sabor como factor determinante en su experiencia culinaria. Asimismo, el 66 % reportó un nivel de percepción muy alto en relación con el sabor, y el 52 % manifestó una percepción alta respecto al aroma. Estos resultados confirman que los sentidos del gusto y el olfato se encuentran estrechamente vinculados en la construcción de experiencias gastronómicas, aportando evidencia para el desarrollo de estrategias multisensoriales en restaurantes y contribuyendo al campo de la neurogastronomía y la gastrofísica.

Palabras clave: Percepción, gastrofísica, olor sabor, neurogastronomía.

INTRODUCTION

A culinary experience is the reflection of a complex process in which multiple sensory stimuli intervene, ultimately impacting the diner's perception. While taste is the traditional sense associated with food, research conducted in recent years has shown that the evaluation of a dish does not depend exclusively on the basic flavors, but on the simultaneous interaction of other senses such as smell, sight, touch, and even hearing. In this context, neurogastronomy and gastrophysics have gained greater relevance as means to analyze the impact that sensory stimuli have within gastronomic perception, allowing an explanation of why the same dish can be perceived differently depending on the context in which it is consumed.

Among the senses involved, taste and smell occupy a central place in the construction of this perception. Physiology demonstrates that both are closely linked through the tongue, as is olfactory memory, which is responsible for associating aromas with previous experiences. Spence (2017) maintains that smell contributes to generating lasting emotional memories, while García (2018) asserts that the brain simultaneously integrates gustatory and olfactory signals to produce a comprehensive perception of food. This multisensory interaction explains why, in the absence of smell, taste is perceived in a limited way.

Various international studies support this perspective. Castany (2017) demonstrated that factors such as music, colors, and aromas present in a restaurant can modify the perception of the flavor of the same dish. Similarly, Duran-Badillo *et al*. (2020) confirmed the complementary relationship between smell and taste in food perception, concluding that the absence of one significantly reduces sensory evaluation. Villanueva (2017) evidenced that aromas are part of sensory marketing strategies in the gastronomic industry, having a direct influence on customer satisfaction and loyalty. These findings help to understand that gastronomic perception is a multisensory phenomenon in which physiological, psychological, and environmental factors all intervene.

In the Peruvian context, gastronomy is consolidated as an element of cultural identity and a driver of tourism development, recognized worldwide today. This positioning has led restaurants to seek differentiation not only through the quality

of their ingredients but also through their ability to create memorable experiences by stimulating the senses. Understanding the role of taste and smell in the diner's perception is fundamental to improving the gastronomic offer of our country and meeting the expectations of an increasingly demanding public.

The present research was conducted at the Fiesta restaurant in Lima, specialized in gourmet Chiclayo cuisine, which represents a significant space for the analysis of multisensory culinary experiences. The study aimed to determine the relationship between taste and smell in the diner's perception, identify the evaluation of the senses during tasting, and analyze perception differences according to age and gender. Thus, the research seeks to provide empirical evidence for Peruvian gastronomy, generating knowledge easily applicable in the field by students, entrepreneurs, researchers, and restaurant managers interested in designing innovative and memorable experiences.

MATERIALS AND METHODS

Methodological design

The model used is a quantitative correlational research design. According to Babativa (2017), this research model is used to find the relationship between two variables, in this case between taste and smell with respect to the level of diner perception. On the other hand, the design employed is a non-experimental cross-sectional one, since data collection occurs at a single point in time, with the study sample encompassing different ages.

Object and study site

The study was carried out at the Fiesta-Lima restaurant, which operates under the concept of gourmet Chiclayo cuisine. Two dishes from the menu were selected to evaluate the level of diner perception. The dishes studied were arroz con pato (duck with rice) and ceviche caliente (hot ceviche) .

Data collection technique

After evaluating the optimal moment to apply the data collection instrument, a survey was chosen. The survey included both open and closed questions to obtain the necessary information for the present research.

Data analysis

Regarding the procedure, the techniques used for information analysis included statistical analysis through correlation coefficients. The survey was administered via Google Forms, allowing diners to access the corresponding link and complete it with the requested data.

After administering the survey, the results were tabulated in spreadsheets, where in a first review cases with incomplete information or incoherent responses were eliminated. The data are presented through frequency distribution tables, bar graphs, or pie charts with their respective interpretations. Subsequently, inferential statistics were applied along with hypothesis testing to verify the research hypotheses, considering a two-tailed significance level of less than 0.05.

Population

The Fiesta restaurant has 23,040 annual diners, according to information provided by the establishment and taking into account comparative data from previous years.

Sample

To establish the sample, the formula for small populations was used, with a con-

fidence level of 95%, employing a probability in favor of 0.5, a probability against of 0.5, and a maximum error of 5%.

$$n = \frac{p * q * N * Z^2}{e^2 * N + p * q * Z^2}$$

N = Population size

Z = Confidence level

e = Maximum allowable error

p = q = Population variance

Solution:

N = 23,040

Z = 95% = 1.96

e = 5% = 0.05

p = 0.5

q = 0.5

$$n = \frac{0.5 * 0.5 * 23040 * 1.96^2}{0.05^2 * 23040 + 0.5 * 0.5 * 1.96^2} = 378$$

The result obtained shows that for the present research, the sample will consist of 378 diners.

RESULTS AND DISCUSSION

For this study, which aims to determine the diner's perception when tasting an arroz con pato or a ceviche caliente, associated with taste and smell at Fiesta-Lima restaurant, 378 diners were surveyed, of whom 59% were men and 41% women, of various ages.

The results obtained from the survey were as follows:

Table 1.
Dish ordered at Fiesta restaurant by gender

	Gender – Dish Ordered					
Dish	Female	Percentage	Male	Percentage	Total	Percentage
Arroz con pato (Duck with rice)	101	66 %	136	61 %	237	63 %
Ceviche caliente (Hot ceviche)	33	21 %	67	30 %	100	26 %
Other	20	13 %	21	9 %	41	11 %
Total	154	100 %	224	100 %	378	100 %

Table 1 shows that 63% of the diners ordered duck with rice, while 26% ordered the hot ceviche, and finally, a minority ordered another dish.

In Table 2, it can be observed that 52% of the diners at the restaurant had a high level of aroma perception, meaning that the dish they ordered was very aromatic.

Table 3 shows that 66% of the restaurant attendees had a very high level of taste perception while tasting their dish, and 56% of the 249 people who reported a very high taste perception were male.

Table 2.
Diner's aroma perception level during tasting by gender

Gender – Aroma perception						
Level of perception	Female	Percentage	Male	Percentage	Total	Percentage
Very high	68	44 %	53	24 %	121	32 %
High	69	45 %	129	58 %	198	52 %
Neutral	15	10 %	41	18 %	56	15 %
Low	1	1 %	1	0 %	2	1 %
Very low	1	1 %	0	0 %	1	0 %
Total	154	100 %	224	100 %	378	100 %

Table 3.
Diner's taste perception level during tasting by gender

Gender – Taste perception						
Level of perception	Female	Percentage	Male	Percentage	Total	Percentage
Very high	109	71 %	140	63 %	249	66 %
High	36	23 %	74	33 %	110	29 %
Neutral	8	5 %	10	4 %	18	5 %
Low	0	0 %	0	0 %	0	0 %
Very low	1	1 %	0	0 %	1	1 %
Total	154	100 %	224	100 %	378	100 %

In Table 4, it can be seen that among the respondents who chose duck with rice, 234 had a high or very high perception, representing 98.73% of the respondents in that group. Among those who chose hot ceviche, 70 had a high or very high perception, representing exactly 70% of that group.

For respondents who chose other dishes, 15 had a high or very high perception, representing 36.59% of that group, 56.10% had a neutral perception, and only 7.31% had a low or very low aroma perception.

In Table 5, the group that chose duck with rice, 100% had a high or very high taste perception. Similarly, respondents who chose hot ceviche also showed 100% high or very high taste perception. Finally, among those who chose other dishes, 53.66% had a high or very high taste perception, 43.90% had a neutral perception, and the rest had a very low taste perception.

Table 4.
Aroma perception level according to the dish chosen

Aroma perception - Chosen dish						
Dish	Very high	High	Neutral	Low	Very low	Total
Arroz con pato (Duck with rice)	111	123	3	0	0	237
Ceviche caliente (Hot ceviche)	7	63	30	0	0	100
Other	3	12	23	2	1	41
Total	121	198	56	2	1	378

Table 5.
Taste perception according to the dish chosen

Taste perception – Chosen dish						
Dish	Very high	High	Neutral	Low	Very low	Total
Arroz con pato (Duck with rice)	206	31	0	0	0	237
Ceviche caliente (Hot ceviche)	38	62	0	0	0	100
Other	5	17	18	0	1	41
Total	249	110	18	0	1	378

Inferential Analysis

Hypothesis Testing

In the descriptive analysis, it was observed that the majority of respondents had a high or very high perception level regarding the tasting of duck with rice and hot ceviche. Therefore, in this section, it is tested whether this characteristic holds for the population.

Aroma perception level in the tasting of duck with rice

H0: The population proportion of diners who consider their aroma perception when tasting duck with rice to be high or very high is equal to 80%.

H1: The population proportion of diners who consider their aroma perception when

tasting duck with rice to be high or very high is greater than 0%.

Using a 95% confidence level for a one-tailed test with the normal distribution, the acceptance region will be:

$$R.A. = < -\infty ; 1.64 >$$

To perform the test, we have n = 237, π0 = 0.5, and x = 234. The test statistic used was zc and was obtained as follows:

H0: The population proportion of diners who consider their aroma perception when tasting hot ceviche to be high or very high is equal to 50%.

H1: The population proportion of diners who consider their aroma perception when tasting hot ceviche to be high or very high is exceeds 50%

Using a 95% confidence level for a one-tailed test with the normal distribution, the acceptance region will be:

$$R.A. = < -\infty ; 1.64 >$$

To perform the test, we have n=100, π0=0.5, and x=70. The test statistic used was zc and was calculated as follows:

$$Z_c = \frac{x - n\pi 0}{\sqrt{n\pi 0(1-\pi 0)}} = \frac{70 - 100 * 0.5}{\sqrt{100} * 0.5(1-0.5)} = 4$$

4 does not fall within the acceptance region. Therefore, H0 is rejected.

In conclusion, there is statistically significant evidence to affirm that the population proportion of diners who consider their aroma perception when tasting hot ceviche to be high or very high is greater than 50%.

Taste perception level in the tasting of duck with rice

H0: The population proportion of diners who consider their taste perception when tasting duck with rice to be high or very high is equal to 50%.

H1: The population proportion of diners who consider their taste perception when tasting duck with rice to be high or very high is greater than 50%.

To perform the test, we have n = 237, π0 = 0.5, and x = 237. The test statistic used was zc and was obtained as follows:

$$Z_c = \frac{x - n\pi 0}{\sqrt{n\pi 0(1-\pi 0)}} = \frac{237 - 237 * 0.5}{\sqrt{237} * 0.5(1-0.5)} = 15.39$$

15.39 does not fall within the acceptance region. Therefore, H0 is rejected.

The statistical evidence supports the claim that more than 50% of diners perceive the taste of duck with rice as high or very high. In other words, there is strong evidence to affirm that the majority of people who taste this dish experience a favorable gustatory perception.

Taste perception level in the tasting of hot ceviche

H0: The population proportion of diners who consider their taste perception when tasting hot ceviche to be high or very high is equal to 50%.

H1: The population proportion of diners who consider their taste perception when tasting hot ceviche to be high or very high is greater than 50%.

Using a 95% confidence level for a one-tailed test with the normal distribution, the acceptance region will be:

$$R.A. = < -\infty ; 1.64 >$$

To perform the test, we have n = 100, π0 = 0.5, and x = 100. The test statistic used was zc and was obtained as follows:

$$Z_c = \frac{x - n\pi 0}{\sqrt{n\pi 0(1-\pi 0)}} = \frac{100 - 100 * 0.5}{\sqrt{100} * 0.5(1-0.5)} = 10$$

10 does not fall within the acceptance region. Therefore, H0 is rejected.

In conclusion, there is statistically significant evidence to affirm that the population proportion of diners who consider their taste perception when tasting hot ceviche to be high or very high is greater than 50%.

Specific Hypothesis

H0: The population proportion of diners who prefer duck with rice is equal to 50%.

H1: The population proportion of diners who prefer duck with rice is greater than 50%.

Using a 95% confidence level for a one-tailed test with the normal distribution, the acceptance region will be:

$$R.A. = < -\infty ; 1.64 >$$

To perform the test, we have n=237, π0=0.5, and x=378. The test statistic used was zc and was calculated as follows:

$$Z_c = \frac{x - n\pi 0}{\sqrt{n}\pi 0(1 - \pi 0)} = \frac{237 - 378 * 0.5}{\sqrt{378} * 0.5(1 - 0.5)} = 4.94$$

4.94 does not fall within the acceptance region. Therefore, H0 is rejected.

The results show that more than 50% of diners prefer duck with rice, as supported by statistically significant evidence.

According to Castany (2017) and García (2018), the chef must be concerned with the experience they intend to provide to the diner, from the moment they enter the restaurant, while tasting the dishes, until they leave. Gastronomy is a combination of several factors; it is not just about cooking dishes, but also about knowing which tableware to use, the restaurant's decoration, background music, etc.

CONCLUSIONS

Based on the results, the general objective of this study was to determine the diner's perception when tasting duck with rice or hot ceviche, associated with taste and smell. The specific objective was identifying the dish most consumed by customers at Fiesta-Lima restaurant.

The results indicate that diners' perception when tasting duck with rice or hot ceviche was positive, as shown in Tables 4 and 5, where restaurant attendees have a high or very high level of perception when tasting the dishes considered in the study. The hypothesis test shows that for both duck with rice and hot ceviche, the levels of aroma and taste are very high or high, exceeding 50%.

Duck with rice is the most requested dish at Fiesta restaurant, as evidenced in Table 1, where 63% of diners chose this option. Accordingly, the hypothesis test determined that there is statistically significant evidence that the population proportion of diners who prefer duck with rice is greater than 50%.

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Author Contribution Statement

- Sofía Cordova: Methodology; statistics; review and editing.
- Nanette Feraldo–Remón: Data analysis and original draft.
- Roberto Pastor: Conceptualization; methodology; project administration.