Perception of beef quality for Spanish and Brazilian consumers

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**Abstract**

Understanding the priorities of beef consumers is important for planning strategies to attract and maintain each customer. Using self-administered interviews with Spanish and Brazilian adults who regularly consume beef, we analyzed their purchasing behaviors in relation to their perceptions and priorities regarding beef quality that guide their choices. The current study identifies the influences of information (labeling and marketing) requirements, concerns about humane production systems, and the intrinsic characteristics of beef. To evaluate the data extracted from the interviews, the questions were grouped into four main factors. While extrinsic factors are the highest valued in both Spain and Brazil, those such as beef freshness and tenderness present inverse concerns between the two countries based on cultural dissimilarities. The data also reveals a clear symmetry among consumers who increasingly seek specific pre-purchase information and products with guaranteed superior quality. Despite other characteristics that differentiate developed and developing countries, the perceptions of quality among consumers in Spain and Brazil are decidedly similar.

1. Introduction

Consumers are the final link in the production chain, and meeting their expectations is an important element of their satisfaction and future purchasing behavior. Therefore, it is important to understand the factors that affect consumer behavior (Font-i-Furnols et al., 2009). Maintaining or increasing demand for meat requires the supply chain to promote improvements in marketing strategies and investments in sustainable food production from three perspectives—economical, environmental, and social—in order to improve returns for producers. Suppliers should also offer high-quality affordable products for consumers (Sañudo, Guerrero, Magalhaes, & Campo, 2017), strengthen all links in the chain and ensure that beef consumers are able and willing to repeat their purchases.

Reinforce the idea that each consumer is unique and that meat from a specific breed, a certain weaning age, and the characteristics of the production process can please one type of consumer while displeasing another (Sañudo et al., 2017). This does not imply that one product is of better or inferior quality compared to another. It is only different, and consumer preferences can be linked to cultural and culinary backgrounds (Font-i-Furnols et al., 2009). Thorough analyses of these features may contribute to strategic coordination of beef supply chains that can be organized in a manner to offer differentiated products to consumers who are willing to pay premium prices for premium beef.

As eating habits constantly change, increased attention is being paid to the emotional state of the human being, such as anger or happiness, even as it applies to the consumption of beef that may be related to festive moments or specific celebrations. According to Schouteten, Steur, Sas, Bourdeaudhuij, and Gellynck (2017) and Thomson and Crocker (2015), consumers trigger positive or negative emotional responses about a product according to their perception of the object and the type of food or brand, all of which are capable of reproducing memories or experiences. These researchers classify memories on two levels, emotional and functional, and they also consider the memories developed from new experiences that may also determine whether the consumer will eventually repeat a product purchase or not. Positive memories tend to encourage return purchases as loyalty begins to build for the product and/or the supplier. This form of positive and festive memory has been linked mainly to beef in both countries, presumably based on its high commercial value for which consumers are less willing to take risks.

At the point of purchase, the consumer evaluates beef in various ways, i.e., size, shape, color, amount of fat and bone, texture, and weight. Price is also a factor that must balance the consumers'
preferences and ability to afford beef that meets their personal and social satisfaction. When key consumer preferences are clear, companies can balance the attributes of their products to meet these targeted market standards (Schnettler et al., 2014).

The preferences of consumers at the point of purchase regarding the quality of the product is based on memory, both extrinsic (e.g., price, origin) and intrinsic (e.g., marbling, color) characteristics that they believe reflect their quality (Banović, Fontes, Barreira, & Grunert, 2012; Banović, Grunert, Barreira, & Fontes, 2009; Hocquette et al., 2012; Troy & Kerry, 2010). Generally, extrinsic quality clues include price, product presentation, origin and brand, labels, breeding system information, feeding policies, animal welfare standards, and indications of environmental care (Henchion, Mccarthy, & Resconi, 2017; Reallini et al., 2013). Intrinsic attributes are based on inherent characteristics of the product that cannot be changed without changing their nature. They are important in determining quality expectations in many fresh food categories, including meat and fat color, fat percentage, and marbling (Henchion et al., 2017; Troy & Kerry, 2010).

Unsurprisingly, the empirical experience of consumers strongly influences future beef purchasing decisions (Banović et al., 2009). However, studies dedicated to understanding this phenomenon must be updated constantly to properly reflect the contemporary expectations of consumers. Therefore, this study identifies the current behavior of Spanish and Brazilian consumers regarding the influence of intrinsic and extrinsic characteristics of beef on decision-making at the time of purchase and on subsequent return purchases.

2. Material and methods

2.1. Participants

The questionnaires were completed by beef consumers in Spain and Brazil in 2017 between May and November. The choice of countries was determined by the commercial markets between the countries, with special consideration for Brazil's large beef production and the exportation of beef to the European Union and Spain. Also were included assessments cultural dimensions that expressed the influences and similarities of various countries on consumer behavior, all measured nationally (Ares, 2018; Hofstede, 2011; Mooij, 2017). To quantify this similarity of cultures between countries, Hofstede (2011) accounted for factors such as economics, modernization, geography, demography, history, politics, sociology, law, religion, medicine, and other scored data. Analyzing Spain and Brazil based on this theory, the authors Hofstede, 2011; Mooij, 2017; Ares, 2018, found significant similarities that allowed an accurate comparison of the consumer behavior of the two cultures.

The data from the questionnaires were collected through self-administered interviews from adult meat consumers with regular beef consumption. In Brazil, 1039 interviews were collected and 314 were received in Spain; both were higher than the desired sample size of 664 interviews for Brazil and 273 for Spain. The sociodemographic characteristics representing each country are presented in Table 1. The minimum number of consumers interviewed was obtained using a simple random sampling formula for non-finite populations ($N > 100,000$, $207$ million according to IBGE (2017) in Brazil; and $47$ million inhabitants according to INE 2017 in Spain), considering $95\%$ confidence, $5\%$ error of estimation, and maximum dispersion (Fernández, 2004).

Invitation emails were sent to potential participants between May–November 2017, including a link to complete the questionnaire online. From there, they were directed to the personal social networks of this paper’s authors. For this type of research, the sampling performed was non probabilistic (Snowball sampling method) by convenience (available for answering the survey by email). Despite the bias presented by this sampling method, the authors opt to send email because of the continental size of Brazil and to achieve a relevant number of respondents in both countries. The Snowball sampling it is indicated when it is difficult to access the subjects with the target characteristics, in this method, the subjects recruit other subjects among their acquaintances (Mahin, Goli, & Ghaljaie, 2017). With the private email invitations, the researchers also expressed their preference for public collaboration. Invites were encouraged to forward the link to research questionnaire to their own contacts, thereby creating an extended network of respondents.

2.2. Questionnaires and data collection

Participants were given instructions on how to complete the questionnaire, and they were informed that the obtained data would only be used for academic research. The questionnaires were completed electronically using Google Forms®. To avoid problems with the language, dual translations (Spanish-Portuguese and Portuguese-Spanish) were used (Dufour et al., 2010). Each question was based on a five-point Likert scale ranging from $1 = “not important”$ to $5 = “extremely important,”$ or $1 = “not influential at all”$ to $5 = “extremely influential”$ (Milošević, Žeželj, Gorton, & Barjolle, 2012).

The questionnaires in both languages were pre-tested with ten native-speaking volunteers to identify possible errors of interpretation or inadequate completion. Upon final approval, the forms were forwarded to beef consumers who answered questions regarding the characteristics of their purchases and factors that might influence their decision-making at the moment of purchase. Basic socioeconomic data was also collected.

2.3. Data analysis

Before starting the statistical analyses, the data was converted by

| Table 1 Sociodemographic characteristics of participants. |
| --- | --- | --- |
| Gender | Brazil ($n = 1039$) | Spain ($n = 314$) |
| Female | 52.5 | 65.9 |
| Male | 47.5 | 34.1 |
| Age |  |  |
| $< 17$ | 0.7 | 0.3 |
| 18–29 | 35.1 | 54.3 |
| 30–39 | 28.6 | 8.0 |
| 40–49 | 15.5 | 14.4 |
| 50–59 | 14.0 | 15.0 |
| $> 60$ | 4.0 | 8.0 |
| No information | 2.1 | — |
| Education of respondent |  |  |
| Elementary school | 0.0 | 1.0 |
| High school | 1.5 | 3.8 |
| University incomplete | 14.1 | 37.0 |
| University completed, or PhD | 84.4 | 57.4 |
| Average household monthly net income |  |  |
| 1 person | 20.4 | 20.4 |
| 2 people | 28.7 | 18.5 |
| 3 people | 26.5 | 22.0 |
| 4 people | 19.4 | 33.1 |
| 5 people | 5.8 | 5.7 |
| 6 people or more | 2.2 | 0.3 |


* Brazil’s minimum national salary in dollars U$ 245.00 (R$ 954.00) in 2018.
** Spain’s minimum national salary in dollars U$ 775.00 (€ 859.00) in 2018.
Table 2
Parameter estimates for generalized linear models (GLM) determining the probability that gender influence in the characteristics of beef choice in Brazil and in Spain. Significant (P < 0.05).

<table>
<thead>
<tr>
<th>Question</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Medium square</th>
<th>F</th>
<th>P. Value</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Medium square</th>
<th>F</th>
<th>P. Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 General appearance</td>
<td>0.023</td>
<td>1</td>
<td>0.023</td>
<td>0.137</td>
<td>0.712</td>
<td>3679</td>
<td>1</td>
<td>3679</td>
<td>0.108</td>
<td>0.907</td>
</tr>
<tr>
<td>2 Fresh Appearance</td>
<td>0.131</td>
<td>1</td>
<td>0.131</td>
<td>0.509</td>
<td>0.024</td>
<td>6864</td>
<td>1</td>
<td>6864</td>
<td>0.586</td>
<td>0.007</td>
</tr>
<tr>
<td>3 Beef color</td>
<td>12.599</td>
<td>1</td>
<td>12.599</td>
<td>16.370</td>
<td>0.00</td>
<td>3741</td>
<td>1</td>
<td>3741</td>
<td>4.028</td>
<td>0.046</td>
</tr>
<tr>
<td>4 Fat color</td>
<td>8.452</td>
<td>1</td>
<td>8.452</td>
<td>11.248</td>
<td>0.001</td>
<td>1980</td>
<td>1</td>
<td>1980</td>
<td>0.924</td>
<td>0.088</td>
</tr>
<tr>
<td>5 Amount of subcutaneous fat thickness</td>
<td>5717</td>
<td>1</td>
<td>5717</td>
<td>3.152</td>
<td>0.076</td>
<td>17.716</td>
<td>1</td>
<td>17.716</td>
<td>13.245</td>
<td>0.000</td>
</tr>
<tr>
<td>6 Amount of marbling</td>
<td>6799</td>
<td>1</td>
<td>6799</td>
<td>8.790</td>
<td>0.003</td>
<td>1403</td>
<td>1</td>
<td>1403</td>
<td>1.697</td>
<td>0.194</td>
</tr>
<tr>
<td>7 Tenderness</td>
<td>17.462</td>
<td>1</td>
<td>17.462</td>
<td>12.173</td>
<td>0.001</td>
<td>12.713</td>
<td>1</td>
<td>12.713</td>
<td>6.512</td>
<td>0.020</td>
</tr>
<tr>
<td>8 Intense red color of beef</td>
<td>4666</td>
<td>1</td>
<td>4666</td>
<td>2.706</td>
<td>0.10</td>
<td>2894</td>
<td>1</td>
<td>2894</td>
<td>6.816</td>
<td>0.045</td>
</tr>
<tr>
<td>9 White color of fat</td>
<td>3594</td>
<td>1</td>
<td>3594</td>
<td>3.109</td>
<td>0.078</td>
<td>2442</td>
<td>1</td>
<td>2442</td>
<td>1.966</td>
<td>0.162</td>
</tr>
<tr>
<td>11 Presence of marbling</td>
<td>325</td>
<td>1</td>
<td>325</td>
<td>0.253</td>
<td>0.615</td>
<td>476</td>
<td>1</td>
<td>476</td>
<td>0.427</td>
<td>0.514</td>
</tr>
<tr>
<td>12 Absence of marbling</td>
<td>14.341</td>
<td>1</td>
<td>14.341</td>
<td>7.989</td>
<td>0.005</td>
<td>5599</td>
<td>1</td>
<td>5599</td>
<td>3.521</td>
<td>0.062</td>
</tr>
<tr>
<td>13 Origin of the animal</td>
<td>5956</td>
<td>1</td>
<td>5956</td>
<td>4.414</td>
<td>0.042</td>
<td>1802</td>
<td>1</td>
<td>1802</td>
<td>1.562</td>
<td>0.212</td>
</tr>
<tr>
<td>14 Sex of the animal</td>
<td>522</td>
<td>1</td>
<td>522</td>
<td>0.205</td>
<td>0.650</td>
<td>320</td>
<td>1</td>
<td>320</td>
<td>0.126</td>
<td>0.723</td>
</tr>
<tr>
<td>15 Age of the animal</td>
<td>12.448</td>
<td>1</td>
<td>12.448</td>
<td>7.847</td>
<td>0.005</td>
<td>1011</td>
<td>1</td>
<td>1011</td>
<td>0.653</td>
<td>0.420</td>
</tr>
<tr>
<td>16 Date and place of slaughter</td>
<td>5.97</td>
<td>1</td>
<td>5.97</td>
<td>0.451</td>
<td>0.502</td>
<td>122</td>
<td>1</td>
<td>122</td>
<td>0.053</td>
<td>0.819</td>
</tr>
<tr>
<td>17 Feed ing system</td>
<td>5.59</td>
<td>1</td>
<td>5.59</td>
<td>0.331</td>
<td>0.565</td>
<td>648</td>
<td>1</td>
<td>648</td>
<td>0.378</td>
<td>0.539</td>
</tr>
</tbody>
</table>

In Spain, 65.9% of the respondents were women, and the remaining 34.1% were men. In Brazil, 52.5% were women and 47.5% were men. The principal age ranges of the interviewees were 18–29 years, with participation rates of 54.3% for Spain and 35.1% to Brazil, the 30–39 years participants rates of 28.6% and 8.0% respectively. The sample was representative of national averages in terms of education, income level, and geographical distribution (IBGE, 2010; INE, 2017). In Brazil, about 84.4% of the interviewees had completed higher education, while the other 14.1% had either not completed higher education or had completed lower levels. The education responses, for the same criteria in Spain were 57.4% and 37%, respectively. Some research’s with meat consumers has higher education level, in Brazil was found levels 42.2% (Vital, Guerrero, Kempinski, et al., 2017) 66.1% (Valente, Fiedler, Heiedmann, & Molento, 2019) of education level and in some Europe countries was 66.7% (Scozzafava, Corsi, Casini, Contini, & Loose, 2016) similar that we found in this research.

When comparing Brazilians national salary (converted to US dollars on June 2018 was $245 national salaries - IBGE, 2017), the majority of respondents (70.6%) stated that their total family salary was derived from four national salaries, considering that Brazilians families are most frequently comprised of three persons (26.5% of all families), the averages found in the questionnaire were the same that the national database reports. The Spanish national salary (converted to US dollars in June 2018 was $775 - INE, 2017), has like the majority of respondents (29.9%) stating that their total family income was derived from either three or four salaries, therefore, the data agreed with the national database.

Spanish consumers on average have higher incomes than Brazilians. Consequently, they tend to buy products of higher quality with better guarantees. The frequency of beef consumption was comparatively very high in both countries, with 48.1% of the Spanish population consuming beef up to three times per week. Brazil consumption frequency was slightly higher, with 54.1% of respondents stating their families consumed beef four or more times per week. Most of the beef consumed in Spain is bought in traditional butcher shops that sell only animal products (44.6%), followed by supermarkets (35.7%). These retail outlets sell products packaged in small daily portions that are easier and faster to prepare. In Brazil, most beef purchases are made through butchers in meat departments inside hyperstores or supermarkets (56.1%), followed by pre-packaged products sold off the shelves in the same establishments (35.7%).

From the GLM statistical analysis, if we observed only the gender group for Brazil and Spain has an influence on the qualitative and quantitative characteristics of beef, presenting similar responses for beef color, fat color, absence of subcutaneous fat, white color of fat. In Brazil, an analysis of GLM for gender influences in amount of numeric system to be able to analyze the data. The statistic were performed using the SPSS statistical package for social sciences (version 21.0, SPSS UK Ltd., Chersey, UK). Frequency analyses (FREQ) were performed to visualize the frequency of each response among the interviewees and to illustrate the beef consumer profile of both countries. The responses for the questionnaires applied in Brazil and in Spain were analyzed by General Linear Model (GLM) procedures with SPSS (version 21.0, SPSS UK Ltd., Chersey, UK), in which the age, gender education level and other qualitative questions were considered the fixed effects and the consumers the random effect.

From the initial analyses, a complementary principal component analysis (PCA) was performed in order to reduce the factors and identify the responses, record the characteristics of beef consumers in each country, and then identify any possible differences between the two groups. The estimated parameters were evaluated by the principle of maximum likelihood with varimax rotation. The validity of significance of the factor loading values considered were values > 0.4 (Hair, Anderson, Tatham, & Black, 2007).

To confirm the model obtained through PCA, a confirmatory factorial analysis (CFA) was performed with the aid of IBM SPSS v22 AMOS software. The factors generated in the factorial analysis were described by the links between the constructs represented by the circles, and the questionnaire items were the rectangles in the developed model. The internal consistency of these latent variables was evaluated by using the Cronbach α coefficient with acceptability set at ≥ 0.60 (Byrne, 2013; Hair, Black, Babin, & Anderson, 2010). The reliability and validity of the measurement model were evaluated first using the recommended procedures. Several indicators were used to assess the adequacy of the fit of the model, including the following: the comparative adjustment index, the adequacy of fit, the adjusted fit adjustment index, and the square root of the mean (RMSEA) model was considered good when these indicators were > 0.90 and the RMSEA was below 0.08 (Byrne, 2013; Kline, 2011).

3. Results

In Spain, 65.9% of the respondents were women, and the remaining 34.1% were men. In Brazil, 52.5% were women and 47.5% were men. The principal age ranges of the interviewees were 18–29 years, with participation rates of 54.3% for Spain and 35.1% to Brazil, the 30–39 years participants rates of 28.6% and 8.0% respectively.
Table 3
Parameter estimates for generalized linear models (GLM) determining the probability that Ranking of Age influence in the characteristics of beef choice in Brazil and in Spain. Significant (P < 0.05).

<table>
<thead>
<tr>
<th>Question</th>
<th>Brazil</th>
<th></th>
<th>Medium square</th>
<th>F</th>
<th>P. Value</th>
<th>Spain</th>
<th></th>
<th>Medium square</th>
<th>F</th>
<th>P. Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 General appearance</td>
<td>1957</td>
<td>7</td>
<td>280</td>
<td>1702</td>
<td>.105</td>
<td>5110</td>
<td>6</td>
<td>.852</td>
<td>2537</td>
<td>.021</td>
</tr>
<tr>
<td>2 Fresh appearance</td>
<td>935</td>
<td>7</td>
<td>134</td>
<td>798</td>
<td>.589</td>
<td>1170</td>
<td>6</td>
<td>.195</td>
<td>1170</td>
<td>.560</td>
</tr>
<tr>
<td>3 Beef color</td>
<td>1830</td>
<td>7</td>
<td>261</td>
<td>1012</td>
<td>.421</td>
<td>3453</td>
<td>6</td>
<td>.575</td>
<td>1030</td>
<td>.406</td>
</tr>
<tr>
<td>4 Fat color</td>
<td>10,446</td>
<td>7</td>
<td>1492</td>
<td>1923</td>
<td>.063</td>
<td>7133</td>
<td>6</td>
<td>1.118</td>
<td>1274</td>
<td>.269</td>
</tr>
<tr>
<td>5 Amount of subcutaneous fat thickness</td>
<td>14,697</td>
<td>7</td>
<td>2100</td>
<td>3126</td>
<td>.003</td>
<td>16,485</td>
<td>6</td>
<td>2.747</td>
<td>2625</td>
<td>.017</td>
</tr>
<tr>
<td>6 Amount of marbling</td>
<td>13,069</td>
<td>7</td>
<td>1867</td>
<td>2014</td>
<td>.051</td>
<td>19,524</td>
<td>6</td>
<td>3.254</td>
<td>3361</td>
<td>.003</td>
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<tr>
<td>7 Tenderness</td>
<td>10,095</td>
<td>7</td>
<td>1442</td>
<td>1912</td>
<td>.064</td>
<td>13,110</td>
<td>6</td>
<td>2.185</td>
<td>3173</td>
<td>.005</td>
</tr>
<tr>
<td>1 Light pink flesh color</td>
<td>28,234</td>
<td>7</td>
<td>4033</td>
<td>2238</td>
<td>.029</td>
<td>5798</td>
<td>6</td>
<td>.966</td>
<td>.691</td>
<td>.657</td>
</tr>
<tr>
<td>2 Intense red color of beef</td>
<td>17,396</td>
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<td>2485</td>
<td>3237</td>
<td>.002</td>
<td>3391</td>
<td>6</td>
<td>.565</td>
<td>.678</td>
<td>.668</td>
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<tr>
<td>3 White color of fat</td>
<td>29,600</td>
<td>7</td>
<td>4229</td>
<td>2955</td>
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<td>4257</td>
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<td>.725</td>
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<td>4 Intense yellow color of fat</td>
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<td>7</td>
<td>3740</td>
<td>2182</td>
<td>.034</td>
<td>16,256</td>
<td>6</td>
<td>.2709</td>
<td>1915</td>
<td>.078</td>
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<tr>
<td>5 Presence of subcutaneous fat</td>
<td>7939</td>
<td>7</td>
<td>1134</td>
<td>977</td>
<td>.445</td>
<td>7418</td>
<td>6</td>
<td>1.236</td>
<td>.992</td>
<td>.431</td>
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<td>6 Absence of subcutaneous fat</td>
<td>13,269</td>
<td>7</td>
<td>1896</td>
<td>1218</td>
<td>.289</td>
<td>5141</td>
<td>6</td>
<td>.857</td>
<td>.601</td>
<td>.730</td>
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<td>7252</td>
<td>7</td>
<td>1036</td>
<td>806</td>
<td>.582</td>
<td>16,426</td>
<td>6</td>
<td>2.738</td>
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<td>8 Absence of marbling</td>
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<td>7</td>
<td>1670</td>
<td>924</td>
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<td>2.386</td>
<td>1503</td>
<td>.177</td>
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<td>1 Origin of the animal</td>
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<td>577</td>
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<td>13,062</td>
<td>6</td>
<td>2.177</td>
<td>1916</td>
<td>.078</td>
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<tr>
<td>2 Sex of the animal</td>
<td>20,031</td>
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<td>2862</td>
<td>1134</td>
<td>.339</td>
<td>11,824</td>
<td>6</td>
<td>1.971</td>
<td>.773</td>
<td>.592</td>
</tr>
<tr>
<td>3 Age of the animal</td>
<td>26,032</td>
<td>7</td>
<td>3719</td>
<td>2350</td>
<td>.022</td>
<td>18,421</td>
<td>6</td>
<td>3.070</td>
<td>2022</td>
<td>.962</td>
</tr>
<tr>
<td>4 Date and place of slaughter</td>
<td>8120</td>
<td>7</td>
<td>1160</td>
<td>.875</td>
<td>.525</td>
<td>37,417</td>
<td>6</td>
<td>6.236</td>
<td>2791</td>
<td>.012</td>
</tr>
<tr>
<td>5 Feeding system</td>
<td>19,748</td>
<td>7</td>
<td>2821</td>
<td>1680</td>
<td>.110</td>
<td>15,287</td>
<td>6</td>
<td>2.548</td>
<td>1502</td>
<td>.177</td>
</tr>
</tbody>
</table>

subcutaneous fat thickness, tenderness, intense red color of beef, absence of marbling, origin of the animal, age of the animal. While in Spain or in genre it affects the general appearance, fresh appearance, light pink flesh color, (Table 2). These characteristics are more considered by the woman's in both countries.

For Brazil and Spain, the amount of subcutaneous fat thickness was the only characteristic capable of influencing both countries when observing age group in GLM and can influence the young respondents until 39 years. In Brazil, the age of the respondents influences the characteristics light pink flesh color, intense red color of beef, white color of fat, intense yellow color of fat and the age of the animal for the group until 39 years. For Spain, the age of the respondents starting to 49 years can influence in the characteristics like the general appearance, amount of marbling, tenderness, presence of marbling and date and place of slaughter (Table 3).

In GLM analysis for scholar level only the age of the animal had an influence in the two countries, being important for people with a college degree or graduate. In Spain, the presence and absence of subcutaneous fat is important for respondents with a complete degree. In Brazil, information about the animal sex and feeding system are important for complete higher education and postgraduate education (Table 4).

A complementary PCA was performed in order to reduce the factors and identify the group of responses for the questions addressed to Brazilian consumers. This enabled the questions to be grouped into four main factors as described below (Table 5).

3.1. Factor 01

This factor included the rearing and slaughtering system and production characteristics, such as feeding practices, age, date and place of slaughter, origin, and gender of the animal. These questions explained 25.16% of the variance of the answers obtained.

3.2. Factor 02

Contributing 16.32% of the explanatory variance of the questionnaire, this factor comprised questions related to freshness and general appearance, including color.

3.3. Factor 03

This included preferences for marbling amount (quantity of marbling), amount of subcutaneous fat thickness, fat color, and the perceived appearance of the beef's tenderness at point of purchase. This factor contributed 11.85% of the explanatory variance of the answers.

3.4. Factor 04

This was the factor with the smallest contribution to the explanatory variance of the answers at only 7.57%. It was related to the intensity of yellow in the fat, the presence of subcutaneous fat, the intensity of red in the beef, and the existence of marbling.

Another complementary PCA was performed in order to reduce the factors and identify the group of responses for the questions addressed to Spanish consumers. After the analysis of factor reduction was employed, it was also possible to see the grouping of questions into four main factors and the different distribution of importance compared to Brazilian consumers (Table 6).

3.5. Factor 01

This factor included the rearing and slaughtering system characteristics and was responsible for explaining 20.07% of the explanatory variance of the answers obtained. It comprised questions related to date and place of slaughter, gender, age, the feeding system, and the origin of the animal.

3.6. Factor 02

This factor comprised questions about marbling, fat color, amount of subcutaneous fat thickness, and the apparent appearance of tenderness that was frequently the most desirable feature at the time of purchase. It contributed an explanatory variance of 16.38% of the answers.

3.7. Factor 03

This factor contributed an additional 14.75% of the explanatory variance of the questionnaire. It comprised questions related to meat color, general appearance, appearance of freshness, and the beef's red intensity as they relate to purchasing decisions.
The measurement model presented adequate internal validity, significant in all scales; therefore, there was convergent validity in the beef being considered for purchase.

12.36%. It comprised questions regarding the presence of subcutaneous fat, the intensity of the fat’s yellow color, and the presence of marbling.

For the Spanish sample, this was also the factor with the smallest factor loading significance, and for this reason they were excluded.

Note: The item numbers refer to the order in which statements were presented in the questionnaire. Some items did not show F loading significance, and for this reason they were excluded.

For variables in Brazil, α Cronbach = 0.82; KMO = 0.776, Bartlett significance = 0.978.

3.8. Factor 04

For the Spanish sample, this was also the factor with the smallest contribution to the explanatory variance of the answers obtained at 12.36%. It comprised questions regarding the presence of subcutaneous fat, the intensity of the fat’s yellow color, and the presence of marbling in the beef being considered for purchase.

In Fig. 1, the position of these priorities across the dimensions formed by the factors of relevance to the beef consumer can be clearly observed, and it explicitly demonstrates the divergence of priorities for choosing beef products between the two countries.

The standardized factor loadings for all items were statistically significant in all scales; therefore, there was convergent validity (Fig. 1). The measurement model presented adequate internal validity, and the CFA model had a good fit of the data. Indices were similar to the minimum values recommended in the literature. The results for Spain were CFI = 0.87, GFI = 0.88, AGFI = 0.83, and RMSEA = 0.08. For Brazil, they were CFI = 0.86, GFI = 0.90, AGFI = 0.87, and RMSEA = 0.08.

The analysis was conducted using the maximum likelihood estimation method and oblique rotation. The correlation (standardized covariance) values between factors for Brazil were significant, albeit low (0.18 for F1 to F4; 0.09 for F1 to F3; 0.04 for F1 to F2; 0.06 for F2 to F3; 0.04 for F2 to F4; and 0.17 for F3 to F4). These results indicate a positive correlation between the four factors. For Spain, the correlation (standardized covariance) values between factors were significant, thus indicating no influence between them. The results of the other factors (0.18 for F1 to F4; 0.07 for F1 to F3; 0.14 for F1 to F2; 0.09 for F2 to F3;
4. Discussions

The results obtained from the questionnaires reveal the concerns of both Brazilian and Spanish beef consumers regarding the attributes related to the extrinsic characteristics of meat. These attributes are often listed on the packaging or highlighted at the point of sale of the product, including the production system from which the animal was raised and brought to market. Consumers then evaluate the intrinsic characteristics of the product in order to select a quality product with their personal qualitative preferences and ethical ideologies.

Non-probability sampling from consumer databases is commonly used to obtain samples that represent the population of each culture in terms of specific socio-demographic characteristics, such as gender, age and educational level. In cross-cultural consumer research, age and gender are the most frequently considered characteristics in non-probability quota sampling (Ares et al., 2016). Meat consumption differs across cultures and Kanerva (2013) further illustrated these cultural differences in the varying significance of demographic factors such as age, gender and education level across the world.

4.1. Factor 01

Beef consumers in both countries are aligned with their attribute priorities related to extrinsic product information, where date, quality labels (including quality assurance marks and symbols), place of purchase, packaging, price, information related to origin, feeding practices, and production/processing systems are highly sought by consumers. This ranking of importance has been previously reported in other studies (Realini et al., 2013). Grunert (2006) found that consumer concerns have been linked to issues related to health, convenience, ethics, and the environmental impact of beef production. Some of these can be seen as “lifestyle” preferences and exemplified by vegetarians, vegans, and naturalist consumers (Grunert, 2006; Henchion, Mccarthy, Resconi, & Troy, 2014; Sañudo et al., 2017; Troy & Kerry, 2010).

Most studies show that consumers in developed countries are increasingly interested in beef production systems, animal welfare, food safety, and other metrics used to measure product quality (OECD-FAO, 2013). The data displayed in Factor 1 demonstrates that Brazilian consumers tend to express the same preferences as consumers in developed countries like Spain. These new requirements require the meat industry to seek a greater understanding of how different consumer groups perceive quality and how such perceptions influence their choices and purchases (Henchion et al., 2014; Troy & Kerry, 2010), how they determine which extrinsic attributes are most important, and what factors need to be refined to ensure reliability and consumer loyalty.

This reevaluation of the industry is due to growing consumer concerns about food quality and related health consequences together with the ongoing debates about the advantages and disadvantages of red beef consumption. After various meat scandals, consumers now pay closer attention to factors related to their quality of life and general health (Grunert, 2006; Grunert, Verbeke, Kügler, Saeed, & Scholderer, 2011; Sañudo et al., 2017). Desirable quality and credibility characteristics are not easily inferred from intrinsic identifiers, thus their additional interest in finding and using the extrinsic quality identifiers expressed on packaging and labels.

Also, according to Grunert (2006), after analyzing the tendencies of beef consumers, the five most important factors were all related to health and characteristics linked to extrinsic information, while none were related to the sensory qualities of the product. As previously mentioned, although this information is responsible for purchases, it is the sensory quality that inevitably defines the behavior of these consumers regarding future purchases because the sensory attributes are responsible for consumption satisfaction (Schnettler et al., 2014).

4.2. Factor 02

Quality perspectives are subjective. Therefore, beef quality measurements differ between individuals, societies, and cultures, and the
industry should be able to exploit this advantageous differentiation (Henchion et al., 2014). As a solution to these differences, Champredonde, Vitrolles, François, and Claire (2014) and Gutiérrez et al. (2015) suggest that each system can focus on an identity, thereby turning weakness into an opportunity. A more flexible system can be tailored to specific potential markets (Barcellos, Oliveira, & Marques, 2016). The perception of meat quality has long been based on intrinsic identifiers such as the color of the meat, the amount of fat, and even the cut (Grunert, 2006). This perception of quality is a growing priority for Brazilian consumers who rate product appearance as a prime factor for their choices.

In Brazil, the use of this method of empirical evaluation based only on the aforementioned factors is used primarily because people create a bond of trust with their butcher or the commercial establishment where they purchase fresh products. Therefore, the consumer believes that their product evaluation based on these characteristics is sufficient to ensure a quality product (Grunert, 2006). This relationship of trust with the establishment has been slowly reestablished and strengthened after a series of major scandals where suppliers misrepresented the contents when packaging inferior quality products to reduce cost, increase production, and improved their profits (Rahmat, Cheong, & Hamid, 2016; Sañudo et al., 2017).

These concerns are even more relevant now as consumer expectations for transparency play an important role in the information provided about products, especially when information is so readily available from multiple sources. Any advertising inconsistencies from suppliers are easily detected and can have major consequences on the relationships between consumers, products, and their brands (Kotler, Kartajeya, & Setiawan, 2016).

The attributes rated by Brazilian consumers also appear among the purchase priorities listed by Henchion et al. (2017) in a worldwide study of beef consumer preferences. Igo et al. (2013) also found that beef quality indicators mentioned most frequently by respondents were appearance related, and it is these visual impressions that ultimately generate consumer expectations (Ardeshiri & Rose, 2018).

Appearance aspects are evaluated and considered for every purchase. When these characteristics meet expectations and are associated with the impression of the product’s trademark, consumer loyalty is strengthened (O’quinn et al., 2016; Spinelli, Masi, Zoboli, Prescott, & Monteleone, 2015). Providing meaningful and effective information allows consumers to make more accurate choices and thereby increases their satisfaction with the product purchased by reducing the cognitive resources, effort, and time required for each decision (Ardeshiri & Rose, 2018).

With growing consumer interest in beef and the prevalent recent tendency to consider beef as a luxury product over other types of meat (De Carvalho, César, Fisberg, & Marchioni, 2014), consumers are increasingly interested in learning more about beef attributes and they expect additional product information, highlighted the preference of Spanish beef consumers for juiciness and tenderness (Alcalde, Ripoll, & Panea, 2013). They justify this preference with the positive effects of fat on beef palatability and acceptability because fat stimulates the salivary glands and thus increases the perceived juiciness of the meat (Savell & Cross, 1988).

This factor signals the concern of the Spanish consumer for information related to the composition and quantity of fat present in all beef offered for purchase. Fat is usually associated with certain diseases, and this is one of the major reasons why people decide to reduce their beef consumption. Red meat in general has often been criticized for its apparent relationship to diseases. However, several positive implications of meat in the human diet are also well established, particularly its high micronutrient content and high biological value (De Smet & Vossen, 2016). Certain fatty acids are essential for human life, and they can only be acquired from animal protein sources (Horcada et al., 2018). For example, conjugated linoleic acid (CLA) has anti-carcinogenic properties, protects against cardiovascular diseases, modulates immune and inflammatory responses, and improves bone mass. CLA also provides benefits for liver functionality, glucose metabolism, and decreased oxidative stress in the meat. (Dílzer & Park, 2011).

In order to demystify these beliefs that red beef is potentially harmful to human health, a worldwide trend has seen stakeholders at various levels of the beef industry launch programs to inform consumers about the benefits of the product, including fat levels, cholesterol, reduced sodium chloride and nitrite content, improved fatty acid profile composition, and incorporated ingredients that improve health. Other campaigns are collaborating to produce grazing animals that can provide better fat properties (Bayram, 2017; Sañudo et al., 2017).

Fat levels not only affect the quality of beef in terms of taste and health but also produce different effects on the quality of certain beef cuts. While excess fat is usually considered negative in ground beef, marbling of fat in a steak is beneficial because it results in a more tender cut (Scozzafava et al., 2016). Attributes such as fat content are more likely to be evaluated in developed countries such as Spain where consumers relate price with product quality at each price point (Henchion et al., 2014, 2017).

4.3. Factor 03

For Spanish beef consumers, products bearing European Union regulatory labels are desirable because EU endorsement implies highly sought quality characteristics. Consumers are confident that the processes required to earn EU recognition are capable of ensuring high-quality products (Hocquinet et al., 2012). Based on these assurances, beef becomes a luxury food for these consumers. The result is consumption of smaller quantities at higher prices, and more importantly for suppliers, enhanced commercial appreciation based on product consistency and premium characteristics (Font-I-Furnols & Guerrero, 2014).

Aspects of appearance, such as water retention, color, firmness, texture, softness, taste, and the juiciness of previous purchases are evaluated and considered for new purchases because these characteristics meet expectations (Beriain, Sanchez, & Carr, 2009). They are associated with brand quality which enhances product loyalty (O’quinn et al., 2016; Spinelli et al., 2015). Meat consumption is generally influenced by interacting factors such as beliefs, traditions, family culture, household income, product pricing, and individual preferences, with any or all of these potentially driving purchases (Font-I-Furnols & Guerrero, 2014). The perspective of quality by the consumer is subjective and may vary between individuals, societies, and cultures (Henchion et al., 2014). It is worth noting that in recent years the evolving dietary patterns of the population are influenced by the time taken to prepare meals. In European countries, this has steadily declined from ninety minutes per day in 1950 to thirty minutes in 2015 (Sañudo et al., 2017). This trend has also become global, particularly in developed countries where time spent preparing meals at home seems to be falling each day.

There are numerous reasons for the decline in the frequency with which food is prepared at home. Average household size has been reduced to about four members, and more women are active in the labor market. Other important factors are the rising income of the population that seeks new food experiences found only in restaurants, the preference for faster-cooking cuts of beef, protein replacements such as chicken and pork that represent less expensive options, and the overall frequency of weekly red beef consumption has decreased (Grunert et al., 2011; Henchion et al., 2014). This trend is still less common in South American countries where families tend to be larger, beef consumption frequency remains at greater than four times per week, and the relatively affordable prices of beef have been able to maintain their market share against protein replacements (Schnettler et al., 2014; Henchion et al., 2014; Ares, 2018).

The time spent preparing meals in Brazilian and other South American families, especially on weekends and holidays, is much longer...
than in most places thanks to the cultural tradition of preparing slow-cooked grilled beef as an event in itself (De Carvalho et al., 2014). For this reason, Brazilian and South American consumers tend to prefer beef cuts that include the bone and yellow subcutaneous fat, the latter which is characteristic of grazing animals and responsible for stronger tasting meat (Champredonde et al., 2014).

With the general increase in food supply and prices, consumers shop more carefully when choosing products, with the evaluation of safety, quality, satisfaction, and other preferences very important at the moment of purchase (Guerrero et al., 2014). In addition to these differentiated factors, EU consumers can associate quality with products based on certifications like the Protected Geographical Indication labels that ensure the origin of foods, and these are often associated with unique characteristics of the products (Yubero, 2011). In developed countries, while examining product quality, extra care is taken primarily from the consumer’s point of view by assessing perceptions based on the emotional and functional dimensions of quality (Henchion et al., 2014). Also, the purchase of local products makes consumers believe that they are contributing to the wellbeing of the community. Therefore, they gain a sense of belonging simply through the products they select. The same connection occurs with local brands and products that included origin indicators (Grunert, 2006).

4.4. Factor 04

Of note is that beef consumers from both countries reported interest in the presence and amount of subcutaneous fat and marbling content, as reported by Realini et al. (2014). The presence and amount of fat can trigger a sensory pleasure of beef consumption. This in turn is related to various traits, including visual appearance as well as perceptions of both texture and taste. Studies have shown that these preferences are not homogeneous (Font-I-Furnols & Guerrero, 2014). The desire to satisfy the sensory pleasure of beef consumption is comparatively recent, and this awareness of consumer concerns about marbling and subcutaneous fat content prompted industries to start using alternatives for compliance programs. Another problem is the intensive processing of the carcass when the animal has excessive subcutaneous fat, thus raising the production costs of producers. One of the alternatives to complying with the prerequisites in these programs is the use of earlier breeds in fat deposition. This is already being developed by breed associations in the United States, Australia, and Japan (O’quinn et al., 2016; O’quinn, Legako, Brooks, & Miller, 2018).

In international markets, the definition of visual standards to determine cut marbling as well as muscle and fat color are helpful tools to indicate the quality of the product to the consumer by informing them beforehand of the tenderness classification on the packaging. This strategy allows the consumer to combine their product preferences to a specific classification. This method is widely used in American, European, and Australian markets to inform consumers about what they can reasonably expect from their beef purchases (Holleran, Bredahl, & Zaibet, 1999; Ferrier & Lamb, 2007; Tatum, 2015).

5. Conclusion

Both Spanish and Brazilian consumers are primarily concerned with extrinsic beef characteristics that serve as the most decisive factors when choosing products. This concern may be associated with recent major scandals involving dubious suppliers who misrepresented their products to consumers. By analyzing this information, beef consumers can choose products that please them and eventually develop loyalty with these characteristics as well as the suppliers who consistently offer products that meet their expectations.

Consumers from Brazil and Spain tend to have inverted priorities when evaluating beef characteristics. While Brazilians are more concerned with the overall appearance of the product, apparent freshness, product color, and shorter time to prepare the meat, Spanish consumers look for beef with guaranteed tenderness, juiciness, and flavor. The Brazilian consumer worries was based on the lack of standard in their meat, while in Spain it does not occur, and the consumer can be pre-occupied with this other points.

Declaration of Competing Interest

Please be advised that there is no public or private conflict of interest for this publication. The order of the authors capable edit was convenient by all. An initiative of the Universidade Federal do Rio Grande Sul (UFRGS) and Department of Animal Production and Food Science, Instituto Agroalimentario de Aragón - (Universidad de Zaragoza-CITA) confirms that the ethics standards and the information contained in the publication do not pose risks and damages to participants.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.meatsci.2020.108312.

References


