

# CONSUMERS' CREAMINESS CONCEPT PERCEPTION: A CROSS-CULTURAL STUDY IN THREE SPANISH-SPEAKING COUNTRIES

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## KEYWORDS

Consumer studies, creaminess, cross-cultural studies, free listing

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## ABSTRACT

Creaminess is a complex sensory attribute that is critical for consumer liking in a wide range of products. For this reason, it is crucial to understand consumers' expectations when trying a creamy product. The aim of the present work was to study consumers' creaminess perception in three different Spanish-speaking countries.

Between 107 and 120 consumers were recruited from Argentina, Spain and Uruguay. Participants were asked to provide a definition of creaminess and to list all the creamy products they knew and all the sensations they perceived when consuming a creamy product.

Results from the present work suggest that consumers' perception of creaminess seems to be mainly related to tactile and kinesthetic sensations such as smoothness, viscosity, melting and softness. Differences were found between the outcomes from consumers in the three countries, which indicate that even within the same language, cultural differences exist in consumers' understanding of the term "creaminess."

## PRACTICAL APPLICATIONS

Results from the present work could contribute to a greater knowledge of consumers' creaminess perception and particularly about the textural attributes and sensations that consumers expect to find when they try creamy products. Understanding what consumers expect from a creamy product and what expectations are raised when thinking of creaminess, could assure that consumers' expectations are fulfilled, increasing the success of new products, including salty food items as soups or vegetable purees. Moreover, results could also be useful when selecting key instrumental or sensory measurements to predict consumers' perceived creaminess.

## INTRODUCTION

Considering the high competitiveness of today's markets, food products that are launched to the market place should be aligned with consumers' preferences as much as possible (Van trijp *et al.* 2007). For this reason, food industries are increasingly basing their product development, positioning, advertisement and communication strategies on consumer perception (Faye *et al.* 2006).

Creaminess is a complex sensory attribute that is crucial for consumer acceptance of several food products (Daget *et al.* 1987; Elmore *et al.* 1999; Richardson-Harman *et al.* 2000; Bourne 2002; Kilcast and Clegg 2002; Frøst and Janhøj 2007; Tournier *et al.* 2007). The design of advertising campaigns and product labels focusing on attracting consumers' attention while shopping has been extensively based on the association between creaminess and consumers' liking (Richardson-Harman *et al.* 2000).

“Creamy” is a term used by consumers to describe several characteristics (flavor-related, textural and hedonic) of food products, often not distinguishing between them (Kirkmeyer and Tepper 2003). It is therefore important to understand how consumers perceive creaminess and what they expect when a product is described as creamy.

Consumers expect certain characteristics (hedonic, sensory) when facing a creamy food product; when the product is tasted, these expectations are unconsciously compared with the product’s real attributes, leading to their confirmation or disconfirmation (Deliza and MacFie 1996). When the sensory characteristics of the product are as expected by the consumer, he/she will likely repeat the product purchase or consumption, while failure of the product to fulfil his/her expectations will very likely cause disappointment in the consumer, who will probably not repeat the experience (Deliza and MacFie 1996). When designing a creamy food, it is therefore critical to understand what consumers expect from a product that is said to have this characteristic, and how to market it, using words and attributes relevant to consumers.

Even though creaminess is a highly desirable characteristic in several food products, there is no agreement upon which attributes determine if a product is creamy or not. This term has various connotations and it has not been clearly defined. The definitions of creaminess presented in English and Spanish dictionaries associate this attribute with milk cream, probably because of its etymology. Several authors (Civille and Lawless 1986; Richardson-Harman *et al.* 2000; Frøst and Janhøj 2007; Tournier *et al.* 2007) have agreed on the fact that creaminess is a complex attribute with several dimensions, such as texture, flavor and appearance. The definitions used in most published studies consider mostly texture requirements for a product to be considered creamy. However, this attribute has also been related to flavor perception, particularly to vanilla, sweetness and fat-related flavors (Elmore *et al.* 1999; De wijk *et al.* 2003; Frøst 2006; Tournier *et al.* 2007). When asking French consumers to define creaminess, Tournier *et al.* (2007) found that creaminess was associated with pleasure, with terms related to pleasantness being mentioned when participants were asked to define this attribute.

According to Drake (1989), there is a common psychological space for creaminess that extends across language and cultural barriers. Nevertheless, cultural differences may exist between consumers’ perception of sensory terms, even within the same language. According to the pioneering texture studies of Szczesniak (Szczesniak and Kahn 1971), consumers’ attitudes to texture are affected by their social and cultural background. In view of the various and significant changes that have occurred in eating habits, lifestyles and foods available, which have become more varied, of higher quality and much more publicized, the updating of cross-cultural studies that investigate consumers’ expectations regarding texture seems necessary (Szczesniak 2002). Most studies about

creaminess perception have been carried out in English- or French-speaking countries; no studies were found reporting the study of how Spanish-speaking consumers perceive this attribute (Kilcast and Clegg 2002; Kirkmeyer and Tepper 2003; Tournier *et al.* 2007). The fact that Spanish is the second most important language in terms of native speakers in the world, with over 350 million native speakers, makes the understanding of complex sensory terms, such as creaminess, in that language necessary (Varela *et al.* 2008).

The objective of this study was to get an insight of how consumers from Spain, Uruguay and Argentina, three Spanish-speaking countries with different consumption habits, define creaminess, which food items they consider possess this attribute and the sensations they perceive when consuming such food products.

## MATERIALS AND METHODS

### Participants

The study was conducted in the cities of Buenos Aires (Argentina), Montevideo (Uruguay) and Valencia (Spain). Buenos Aires and Montevideo correspond to national capital cities and Valencia corresponds to a regional capital city. Participants were recruited in each city using a convenient intentional and reasoned sampling with predetermined quotas (Guerrero *et al.* 2010). Convenience samples are usually used in qualitative studies when the aim of the research is to get an approximation to a research subject and involves recruiting available participants who meet specific criteria (Kinnear and Taylor 1993). In the present work, instead of randomly recruiting participants, specific quotas were defined to avoid differences in the participants’ age and gender distribution between the three countries.

One-hundred and ten participants were recruited in Buenos Aires, 120 participants in Montevideo, whereas 107 participants were recruited in Valencia. All participants were randomly recruited at shopping areas, universities campuses and public places. The first criterion for selecting participants was their interest in participating in the study. At the recruitment stage, no information about the specific aim of the study was provided. Secondly, age and gender quotas were considered for selecting consumers. Participants’ age should range between 18 and 80 years old. Besides, in each city, a minimum of 20 males and females should be more than 35 years old and a minimum of 20 males and females should be 34 years old or less. Table 1 shows the gender and age distribution of the recruited participants in Buenos Aires, Montevideo and Valencia. No significant differences were found in the gender and age distribution of the consumer samples recruited from Buenos Aires, Montevideo and Valencia ( $\chi^2 = 1.7$ ,  $P = 0.89$ ). Consumers in the three countries were distributed according to their age in the following: 18–27

Participants	Valencia (Spain)	Montevideo (Uruguay)	Buenos Aires (Argentina)
Total of participants	107	120	110
Females			
18–34 years old	30%	25%	29%
More than 35 years old	23%	24%	27%
Males			
18–34 years old	24%	25%	24%
More than 35 years old	23%	26%	20%

**TABLE 1.** GENDER AND AGE DISTRIBUTION OF THE CONSUMER SAMPLES IN EACH CITY

years old (18–27%), 28–34 years old (27–33%), 35–49 years old (26–33%) and more than 50 years old (20–31%). The mean age and its corresponding standard deviation for consumers in Argentina, Spain and Uruguay was  $35.9 \pm 12.9$ ,  $37.1 \pm 12.6$  and  $38.3 \pm 13.5$ , respectively,

### Consumer Study

Questionnaires were self-administered. Consumers were given written instructions and were asked to complete the task in less than 15 min.

First, participants were asked to provide a definition of the term “creaminess” (“cremosidad” in Spanish) by answering the following open-ended statement: “Please give a definition of what creaminess is.”

After completing this first part of the study, participants were asked to complete two free listing tasks. Free listing is a simple qualitative technique widely used in anthropology (Rusell Bernard 2005) and introduced to food consumer science by Hough and Ferraris (2010). It consists of asking participants to “list all the X they know about,” where X could be anything from food items to brands, animals or feelings (Rusell Bernard 2005). According to several authors, the terms with the higher number of mentions are the ones most relevant for consumers (Henley 1969). In the present study, participants were asked to list *all the sensations they experienced when eating a creamy food* and *all the creamy food products they knew*.

### Data Analysis

Participants’ creaminess definitions were analyzed following the methodology proposed by Ten-Kleij and Musters (2003) to analyze open-ended questions. The first step of the analysis consisted of deleting stopwords such as “a,” “and,” “or” or “the,” and words that were included in the proposal such as “creaminess” or “creamy.” Then, words with similar meaning were grouped in the same category. This classification was performed independently by three of the researchers who authored the study, considering personal interpretation of the meaning of the words and synonymy as determined by a Spanish dictionary. After individually evaluating the data, a

meeting of the researchers was undertaken to check the agreement between their classifications. The final categories were consensually determined by the researchers. This triangulation technique has been used by other authors dealing with qualitative techniques (Wadsworth 2000; Modell 2005; Guerrero *et al.* 2010). Then, frequency of mention of each category was determined by counting the number of participants that used those words to define creaminess. Categories mentioned by more than 10% of the participants were considered (Dung 2000). Chi-square was performed to study differences in the definitions of Argentinean, Spanish and Uruguayan consumers.

Regarding data from the free listing tasks, all the words elicited by participants were considered for the analysis. First, the number of terms elicited by each participant was counted. The average number of elicited terms and the total number of elicited terms were determined for consumers in each country. Chi-square test was applied to study the differences in the total number of terms elicited in Argentina, Spain and Uruguay, whereas analysis of variance was carried out to investigate significant differences in the average number of elicited terms between consumers of the three countries.

Then, the elicited terms were qualitatively analyzed for each country. A search for recurrent terms was performed, grouping words into different categories, as previously explained for data of the creaminess definition task. Finally, categories were grouped into different dimensions following the same criteria. Categories mentioned by more than 10% of the participants were considered, and their frequencies were determined by counting the number of participants that used those words in each country. Chi-square was performed to study differences in the associations of Argentinean, Spanish and Uruguayan consumers.

All data analyses were performed using XL-Stat 2009 (Addinsoft, Brooklyn, NY).

## RESULTS AND DISCUSSION

### Creaminess Definition

The salient words, mentioned by more than 10% of the participants in each of the three countries are presented in

**TABLE 2.** FREQUENCY OF MENTION OF SALIENT WORDS (IN ENGLISH AND SPANISH) PROVIDED BY PARTICIPANTS IN THE CREAMINESS DEFINITION TASK IN ARGENTINA, SPAIN AND URUGUAY

Word (English–Spanish)†	Country		
	Spain (n = 107)	Uruguay (n = 120)	Argentina (n = 110)
Smooth– <i>suave</i>	32 (30%)	64 (53%)	56 (51%)
Texture– <i>textura</i>	39 (36%)	32 (27%)	26 (24%)
Mouth– <i>boca</i>	20 (19%)	25 (21%)	37 (34%)
Thickness– <i>consistencia</i>	15 (14%)	23 (19%)	12 (11%)
Easy– <i>fácil</i>	8 (7%)	16 (13%)	12 (11%)
Greasy– <i>graso</i>	8 (7%)	16 (13%)	13 (12%)
Palate– <i>paladar</i>	9 (8%)	15 (13%)	7 (6%)
Sensation– <i>sensación</i>	17 (16%)	15 (13%)	29 (26%)
Eat– <i>comer</i>	6 (6%)	14 (12%)	4 (4%)
Liquid– <i>líquido</i>	25 (23%)	13 (11%)	4 (4%)
Soft– <i>blando</i>	10 (9%)	12 (10%)	5 (5%)
Characteristic– <i>característica</i>	13 (12%)	12 (10%)	6 (5%)
Unctuous– <i>untuoso</i>	3 (3%)	2 (2%)	22 (20%)
Solid– <i>sólido</i>	12 (11%)	10 (8%)	2 (2%)
Delight– <i>deleite</i>	11 (10%)	0 (0%)	0 (0%)
Thick– <i>espeso</i>	16 (15%)	5 (4%)	4 (4%)

† Words elicited by more than 10% of the participants in at least one country are presented.

Table 2. As shown, most of the words provided by consumers when defining creaminess were related to texture characteristics (e.g., *smooth*, *soft*, *thick*) or to food intake and its manipulation in the mouth (*mouth*, *palate*, *easy*, *eat*). This suggests that most Argentinean, Spanish and Uruguayan consumers have a clear understanding of the fact that creaminess is a texture characteristic of food products.

It is interesting to notice that words related to flavor characteristics were not salient and that words related to hedonics were only mentioned in Spain, with a 10% of participants using the word *delight* when defining creaminess. Spanish-speaking consumers mainly used texture-related words to define creaminess. These results are not in agreement with the findings of Tournier *et al.* (2007), who reported that French consumers frequently used words related to flavor and hedonics when defining what a creamy product is. Therefore, cultural differences seem to exist in the understanding of what a creamy product is and consequently, in creaminess perception. However, it should be taken into account that in the study performed by Tournier *et al.* (2007), consumers first received and tasted 13 dairy products and rated their overall liking, and then, after a 10-min break, performed a free association and a definition task. Furthermore, differences in how consumers were asked to define creaminess in both studies could have led to differences in consumers' responses. In the present study, consumers were just asked to define what creaminess is, whereas Tournier *et al.* (2007) asked consumers to explain what a creamy product is, by giving definitions, synonyms, examples and counter-examples after tasting creamy products. Differences in the instructions given to consumers could also have caused the abovementioned differences.

As shown in Table 2, participants associated creaminess with *smoothness*, which was the texture characteristic most frequently mentioned in the three countries, which suggests that smoothness is a key attribute affecting consumers' creaminess perception. Besides, participants also mentioned words related to thickness when defining creaminess, such as *soft*, *thick*, *liquid* and *solid*. It should be noted that the words *liquid* and *solid* were always associated with a negation such as *not* or were associated to each other in a phrase like *neither liquid nor solid*. Thus, participants associated creaminess with products that have intermediate thickness, being neither too liquid nor too thick. This has been also reported by Tournier *et al.* (2007). Regarding terms related to food manipulation, participants in the three countries used the words *mouth* and *palate* when defining creaminess, suggesting that consumers associated creaminess with an oral texture parameter, implying tongue handling or movements. Aside from this, the word *easy* was always related to other words such as *manipulate* or *swallow*, which suggests that participants considered that a creamy product should be easy to manipulate in the mouth and to swallow.

Considering all the salient words in the definition, Spanish-speaking consumers seem to associate creaminess with an oral texture attribute that is characterized as smooth and with an intermediate thickness, being easily manipulated in the mouth.

According to results of the chi-square test, significant differences in the frequency of mention of the words existed between the three countries ( $\chi^2 = 133.4$ ,  $P < 0.0001$ ). This indicates that cultural differences, even within the same language, might affect the terms used by consumers when defining creaminess in their own words and the textural

characteristics they expect to perceive when trying a creamy product. Another relevant issue worth considering is that these cultural differences could also lead to differences in how consumers use and understand each of the identified texture terms, apart from causing differences in the texture characteristics associated with creaminess. Therefore, further studies should be carried out to understand how consumers in the three considered countries understand and use the texture terms associated with creaminess.

On the other hand, these results suggest that heterogeneity exists in the characteristics that consumers expect when trying a creamy product and in the relative importance of different texture attributes in creaminess perception.

As shown in Table 2, differences were found in the frequency by which participants in the three countries mentioned most of the words related to texture characteristics such as *smooth*, *thick*, *greasy*, *easy*, *soft*, *unctuous* and *liquid*. It is interesting to take into account that consumers spontaneously defined creaminess, which assures that the most salient texture attributes were mentioned. For this reason, differences in creaminess definition between consumers from the three considered Spanish-speaking countries might be exclusively related to cultural differences. Thus, results from the present work show the importance of performing cross-cultural studies when studying consumers' understanding of complex sensory terms.

Moreover, results from the present work could be compared with those reported by Tournier *et al.* (2007) when asking French consumers to define what a creamy product is. French consumers also included in their definition most of the words elicited in the present study, particularly words related to texture characteristics (*not liquid* and *thick*) and to food manipulation in the mouth (*mouth*, *palate*, *eat*). However, several differences were found between both studies, confirming the existence of cultural differences in the understanding of the term creaminess. First, French consumers did not mention smoothness when defining creaminess; instead they used the complex term *doux*, which has no direct translation to English or Spanish, and is related to both smoothness and sweetness. Apart from the term *doux*, French consumers also mentioned the word *tasty*, which also refers to flavor which is a characteristic that was not mentioned at all by Spanish-speaking consumers in the present study when providing a creaminess definition. Another relevant difference is that 20% of French consumers mentioned the word *pleasant*, whereas only Spanish consumers mentioned hedonic-related terms and did so with a lower frequency. Finally, another important difference is that Spanish-speaking consumers used several texture-related words with relevant frequency, which was not mentioned by French consumers. These words include *texture*, *soft*, *solid*, *thickness* and *smooth*.

The abovementioned differences suggest that, whereas creaminess is clearly perceived as a texture characteristic by

**TABLE 3.** TOTAL, AVERAGE, MINIMUM AND MAXIMUM NUMBER OF TERMS ELICITED BY CONSUMERS WHEN THINKING OF THEIR PERCEIVED SENSATIONS WHEN CONSUMING CREAMY FOODS IN ARGENTINA, SPAIN AND URUGUAY

Country	Number of terms mentioned	Number of terms mentioned per consumer		
		Average	Minimum	Maximum
Spain	78	2.8	1	9
Uruguay	96	2.9	1	9
Argentina	120	3.2	1	12

Spanish-speaking consumers, French consumers define it using also flavor and hedonic characteristics. These differences between results from Spanish-speaking and French consumers could be due to the fact that French consumers were asked to rate their liking of a series of creamy foods prior to giving their definition. On the contrary, Spanish-speaking consumers spontaneously elicited their definition without trying any product or having any external stimuli.

### Sensations When Consuming Creamy Food Products

The total number of terms mentioned by the consumers, as well as the average, minimum and maximum number of sensations mentioned per consumer are summarized in Table 3. Even though no significant differences were found between the average number of terms mentioned by participants from Argentina, Uruguay and Spain ( $F = 2.46$ ,  $P = 0.09$ ), significant differences were found in the total number of terms mentioned in the three countries ( $\chi^2 = 9.0$ ,  $P = 0.0109$ ), with participants from Argentina listing more sensations than those from Uruguay and Spain.

The terms that were mentioned by more than 5% of the participants in at least one of the considered countries were grouped into categories, and the resulting categories into dimensions, as shown in Table 4. Nineteen categories were determined, of which the ones with the highest frequency were *Pleasure*, mentioned by more than 65% of the participants of the three considered countries, and *Smooth*. This last category had a much higher frequency of mention by Argentinean (62%) and Uruguayan consumers (59%) than by the Spanish participants (43%), which shows that the importance that participants give to smoothness when evaluating creaminess might be higher in the former countries. These results stress the importance of smoothness in creaminess perception and the important association between creaminess and consumers' hedonic reaction toward food products.

As shown in Table 4, the determined categories were grouped into five dimensions: *Texture characteristics*, *Feelings*, *Flavor characteristics*, *Digestion* and *Temperature*. All of the dimensions were mentioned in the three countries, with

**TABLE 4.** FREQUENCY OF MENTION OF THE DIMENSIONS AND CATEGORIES DETERMINED BY GROUPING THE TERMS MENTIONED IN THE FREE LISTING OF SENSATIONS WHEN CONSUMING A CREAMY FOOD TASK IN ARGENTINA, SPAIN AND URUGUAY

Dimensions and categories (English–Spanish)	Number of mentions (percentage of mention in each country)		
	Spain (n = 107)	Uruguay (n = 120)	Argentina (n = 110)
Texture characteristics	120	130	148
Viscous/Thick– <i>Viscoso/Espeso</i>	9 (8%)	7 (6%)	3 (3%)
Unctuous– <i>Untuoso</i>	6 (6%)	2 (2%)	18 (16%)
Smooth– <i>Suave</i>	46 (43%)	71 (59%)	68 (62%)
Loss of viscosity– <i>Pérdida de viscosidad</i>	4 (4%)	6 (5%)	9 (8%)
Pasty– <i>Pastoso</i>	5 (5%)	0 (0%)	5 (5%)
Soft/Thin– <i>Blando/Ligero, poco espeso</i>	12 (11%)	9 (8%)	8 (7%)
Greasy– <i>Grasoso, grasiento</i>	4 (4%)	5 (4%)	5 (5%)
Easiness to swallow– <i>Facilidad para tragar</i>	22 (21%)	11 (9%)	0 (0%)
Coating– <i>Recubrimiento</i>	1 (1%)	2 (2%)	10 (9%)
Others	11 (10%)	17 (14%)	22 (20%)
Feelings	119	128	122
Pleasure– <i>Placer</i>	70 (65%)	80 (67%)	77 (70%)
Relaxation– <i>Relajación</i>	11 (10%)	12 (10%)	14 (13%)
Happiness/Joy– <i>Felicidad/Alegría</i>	11 (10%)	3 (3%)	4 (4%)
Satisfaction– <i>Satisfacción</i>	10 (9%)	13 (11%)	6 (5%)
Wellbeing– <i>Bienestar</i>	7 (7%)	6 (5%)	2 (2%)
Others	10 (9%)	14 (12%)	19 (17%)
Flavor characteristics	31	34	22
Sweet– <i>Dulce</i>	15 (14%)	11 (9%)	9 (8%)
Tasty– <i>Sabroso</i>	12 (11%)	19 (16%)	10 (9%)
Others	4 (4%)	4 (3%)	3 (3%)
Digestion	13	16	14
Satiety– <i>Saciedad</i>	7 (7%)	10 (8%)	9 (8%)
Others	6 (6%)	6 (5%)	5 (5%)
Temperature	7	25	10
Fresh/Cold– <i>Fresco/Frío</i>	7 (7%)	20 (17%)	8 (7%)
Warm– <i>Tibio</i>	0 (0%)	5 (4%)	2 (2%)

*Texture characteristics* and *Feelings* dimensions being the ones that exhibited the highest frequency of mention in all of them; stressing the clear understanding that creaminess is a texture characteristic and showing the association between this attribute and pleasure.

When comparing the results from this question with those from the creaminess definition task, it can be seen that, even when consumers associated several types of sensations (of texture, of flavor, of temperature, related to digestion and feelings) with creaminess, their definition of creaminess was based exclusively on texture characteristics. This indicates that, even though all the elicited sensations affect consumers' creaminess perception, the ones considered essential by the participants of the present study were those related to the food product's texture.

The fact that consumers elicited texture terms such as *viscous/thick* or *soft/thin* stresses the fact that they associated creamy food products with intermediate viscosities, being neither solid nor liquid, as mentioned in the creaminess definition.

It is also interesting to notice that Spanish-speaking consumers did not frequently mention greasy sensations when

thinking of creaminess; this Spanish term (*grasiento*) is normally considered a negative factor associated to an excessive amount of oil or fat.

According to chi-square test, significant differences were found in the frequency of mention of the identified dimensions ( $\chi^2 = 18.8$ ,  $P = 0.0137$ ). As shown in Table 5, highly significant differences were also found in the frequency with

**TABLE 5.** LEVELS OF SIGNIFICANCE OF CHI-SQUARE TEST FOR COMPARISON OF FREQUENCY OF MENTION OF THE CATEGORIES WITHIN DIFFERENT DIMENSIONS AMONG ARGENTINA, SPAIN AND URUGUAY FOR THE FREE LISTING OF SENSATIONS PERCEIVED WHEN CONSUMING CREAMY FOODS TASK

Dimension	$\chi^2$	$P$
Texture characteristics†	66.1	<0.000,1
Feelings <sup>ns</sup>	15.4	0.118
Flavor characteristics <sup>ns</sup>	2.1	0.715
Digestion <sup>ns</sup>	0.4	0.840
Temperature <sup>ns</sup>	1.7	0.432

† Significant difference ( $P < 0.0001$ ).

<sup>ns</sup> Non-significant difference ( $P > 0.05$ ).

which participants from Uruguay, Spain and Argentina elicited categories within the *Texture characteristics* dimension. Thus, consumers clearly associated creaminess with texture as previously discussed, and also to the pleasure they experienced when consuming creamy products, which indicates that creaminess is clearly a key driver of liking for consumers.

Consumers elicited words within the *Smooth* category when listing the sensations they perceived when trying creamy food products with a significantly higher frequency in Uruguay and Argentina than in Spain. It was also found that consumers from Argentina elicited the texture characteristic *Unctuous* far more frequently than those from Uruguay and Spain, where this word is not very used. Another difference was found in the frequency of association of creaminess with the texture characteristic *Easiness to swallow*, which was higher for Spanish and Uruguayan participants compared with Argentinean consumers. This is not consistent with the higher frequency of mention exhibited by Argentinean participants of the term *Easy* in the creaminess definition task, which suggests that they used the term “easy” to describe the sensation.

Between 5 and 10% of the participants of the present study mentioned the category *Loss of viscosity*, which is consistent with the mention of the word *Liquid*, associated with a relatively fast loss of viscosity in the mouth, in the creaminess definition task.

The texture characteristics elicited by consumers when asked to list the sensations they perceived when consuming creamy products are in agreement with several studies that have been carried out to assess the relationship between creaminess and simpler texture terms, in their definition and measurement (Jowitt 1974; Kokini and Cussler 1983; Frøst and Janhøj 2007). According to these studies, creaminess is related to smoothness and thickness. Frøst (2006) described creaminess as related to a relatively high viscosity, a smooth mouthfeel and fatty after-feel. On the other hand, De wijk *et al.* (2003) considered that creaminess was related to a compact, smooth, not rough, not dry texture and with a velvety (not oily) coating, and a moderate disintegration rate.

It is important to take into account that the elicited texture attributes might have been different if another methodology were used. The advantage of the free listing task is that consumers spontaneously elicited their words without the use of any predefined list of attributes or external influence, which might have changed their perception or modified their vocabulary.

A dimension corresponding to *Feelings* was identified, which resulted particularly relevant with at least one mention per consumer in average. Within this dimension, the category most mentioned by consumers was *Pleasure*, elicited by 65–70% of the participants. Consumers also mentioned *Relaxation, Happiness/Joy, Satisfaction* and *Wellbeing*, all of

them positive sensations. The relevance for consumers of this hedonic aspect of creaminess highlights the importance of this sensory attribute for the acceptance of different products. Thus, despite the fact that consumers did not use hedonic terms to define creaminess, they frequently elicited this type of terms when thinking of the sensations they perceived when eating creamy foods.

A dimension corresponding to *Flavor characteristics* was also found, in which the salient categories were *Sweet* and *Tasty*, which would indicate that these attributes could stress consumers' perception of creaminess.

The *Temperature* dimension had a high frequency of mention only in Uruguay, with a particularly high frequency of elicitation of the category *Fresh/Cold* by Uruguayan consumers compared with those of the other considered countries, perhaps related to the consumption of ice cream (or other products that are consumed cold) and the association between them and creaminess. In both Argentina and Uruguay, ice cream is consumed all-year-round, whereas in Spain it is a typical summer product. Ice cream consumption could also be related to the mention of the category *Loss of viscosity* by consumers, in the sense that this product melts in the mouth.

Finally, the *Digestion* dimension, which mainly referred to *Satiety*, was mentioned by under 20% of the participants, and could also be associated with the fullness sensation after consuming a sweet dessert.

## Creamy Food Products

The results of the question of “known creamy foods” are summarized in Table 6. The maximum, minimum and average number of mentioned terms was similar for the three studied countries. The relatively high number of foods that were listed in Argentina, Spain and Uruguay indicates that the consumers of the three countries recognize a number of food products as creamy. There were no significant differences in the average ( $F = 1.25, P = 0.287$ ) and total ( $\chi^2 = 2.0, P = 0.37$ ) number of mentioned terms among the three countries.

Given the great variety of mentioned foods, it was necessary to group them in categories, which were considered rel-

**TABLE 6.** TOTAL NUMBER OF TERMS MENTIONED BY PARTICIPANTS IN THE FREE LISTING OF CREAMY FOODS TASK IN ARGENTINA, SPAIN AND URUGUAY

Country	Number of terms mentioned	Number of terms mentioned per consumer		
		Average	Minimum	Maximum
Spain	82	5.9	1	14
Uruguay	72	6.0	2	14
Argentina	90	5.5	2	16

**TABLE 7.** FREQUENCY OF MENTION OF DIMENSIONS AND CATEGORIES THAT WERE DETERMINED BY GROUPING THE FOODS THAT WERE MENTIONED BY CONSUMERS IN ARGENTINA, SPAIN AND URUGUAY

Dimensions and categories	Number of mentions and percentage of mention in each country		
	Spain (n = 107)	Uruguay (n = 120)	Argentina (n = 110)
Dairy products	386	492	395
Shakes	9 (8%)	6 (5%)	1 (1%)
Milk cream	45 (42%)	58 (48%)	69 (63%)
Ice-cream	58 (54%)	86 (72%)	44 (40%)
Milk	8 (7%)	2 (2%)	8 (7%)
Caramel/Sweetened condensed milk	5 (5%)	47 (39%)	31 (28%)
Butter	18 (17%)	10 (8%)	27 (25%)
Dairy desserts	103 (96%)	151 (126%)	65 (59%)
Cheeses	58 (54%)	74 (62%)	104 (95%)
Yogurt	82 (77%)	58 (48%)	46 (42%)
Sauces and dressings	47	62	55
White sauce	8 (7%)	18 (15%)	14 (13%)
Mayonnaise	12 (11%)	19 (16%)	9 (8%)
Sauces	19 (18%)	23 (19%)	25 (23%)
Others	8 (7%)	2 (2%)	7 (6%)
Cakes and desserts	40	46	62
Pastry cream	13 (12%)	8 (7%)	19 (17%)
Meringue	11 (10%)	13 (11%)	4 (4%)
Pie	16 (15%)	13 (11%)	14 (13%)
Others	0 (0%)	12 (10%)	24 (22%)
Purées and vegetable creams	50	30	9
Purée	24 (22%)	26 (22%)	7 (6%)
Vegetable creams	26 (24%)	4 (3%)	2 (2%)
Soups	4	35	18
Chocolate	22	7	11
Sweets	6	16	7
Paté	18	1	9
Others	40	26	37

evant when mentioned by more than 5% of the consumers of one of the considered countries. This way, a total of 21 categories were determined.

The categories that presented the highest frequency of mention were *Desserts* in Uruguay and Spain, and *Cheeses* in Argentina.

To achieve a better interpretation of the results, the categories were reduced to different dimensions. The eight dimensions that were obtained by consensus between the three researchers that carried out the data analysis are shown in Table 7. The identified dimensions were *Cakes and desserts*, *Soups*, *Sauces and dressings*, *Paté*, *Dairy products*, *Purées and vegetable creams*, *Sweets* and *Chocolate*. All the dimensions were mentioned in the three countries, with *Dairy products* being the one with the highest frequency of mention in all of them. This highlights the importance of creaminess for consumers when consuming dairy products. The importance of creaminess for texture perception of milk products is in agreement with results reported by several authors (Richardson-Harman *et al.* 2000; Kilcast and Clegg 2002; Tournier *et al.* 2007; Kirkmeyer and Tepper 2003).

Consumers' elicited creamy food products were mainly semi-solid foods, in agreement with several authors that have

stated that creaminess is a relevant texture attribute in semi-solid foods (Kilcast and Clegg 2002; De wijk *et al.* 2006; Frøst and Janhøj 2007). Apart from dairy products, creaminess has been considered a relevant texture characteristic of chocolate, desserts, sauces, dressings and soups (De wijk *et al.* 2006; Frøst and Janhøj 2007).

According to chi-square test, significant differences were found in the frequency of mention of the identified dimensions ( $\chi^2 = 99.5$ ,  $P < 0.0001$ ). As shown in Table 8, highly sig-

**TABLE 8.** LEVELS OF SIGNIFICANCE OF CHI-SQUARE TEST FOR COMPARISON OF FREQUENCY OF MENTION OF THE CATEGORIES WITHIN DIFFERENT DIMENSIONS AMONG ARGENTINA, SPAIN AND URUGUAY FOR THE FREE LISTING OF CREAMY FOODS TASK

Dimension	$\chi^2$	P
Dairy products†	114.9	<0.0001
Sauces and dressings <sup>ns</sup>	10.0	0.127
Cakes and desserts†	28.7	<0.0001
Purées and vegetable creams‡	13.9	0.015

† Significant difference ( $P < 0.0001$ ).

‡ Significant difference ( $P < 0.05$ ).

<sup>ns</sup> Not significant difference ( $P > 0.05$ ).

nificant differences were also found in the frequency with which participants from Uruguay, Spain and Argentina mentioned categories within the following dimensions: *Cakes and desserts*, *Dairy products* and *Purées and vegetable creams*.

As shown in Table 7, the dimension that presented the highest frequency of mention was *Dairy products*, with each participant mentioning, in average, at least three dairy foods. This could be related to the relationship between creaminess and milk cream derived from its etymology. Differences were observed in the frequency of mention of the various dairy foods included in this dimension by the participants of the three countries. Uruguayan consumers had a particularly high frequency of mention of dairy products, of which they mentioned *Ice-cream*, *Caramel/Sweetened condensed milk (Dulce de leche)* and *Dairy desserts* categories more frequently than the participants from Spain and Argentina. In average, each Uruguayan participant mentioned at least one dairy dessert. The higher frequency of elicitation of ice creams by Uruguayan participants is consistent with the fact that this was the only country in which the category *Fresh* of the *Temperature* dimension was relevant in the free listing of sensations perceived when consuming a creamy food task. Spanish consumers also mentioned *Dairy desserts* with a high frequency (95% of the participants), but the frequency of mention of this category by Argentinean consumers was, though important, significantly lower (59% of consumers). The lower number of mentions of the category *Caramel/Sweetened condensed milk* by Spanish consumers was expected given the fact that *dulce de leche*, the most relevant product in this category, is not as popular in Spain as it is in Argentina or Uruguay. For the same reason, the relatively high difference in frequency of mention of this category between the participants of Argentina and Uruguay was not expected. Spanish consumers mentioned with a significantly higher frequency the category *Yogurts* than the considered Latin-American countries. This could be explained by the differences between the sensory characteristics of the commercial products available in the markets of the three countries, with a very similar offer of commercial yogurts in Uruguay and Argentina, and a wider variety in Spain, including a number of varieties such as “creamy,” “Greek,” “cream enriched,” etc., that are not available in Uruguay and Argentina. Another difference that was observed within this dimension was the higher frequency of mention by Argentinean participants of the *Cheese* and *Butter* categories.

The dimension *Cakes and desserts* had a high frequency of mention in the three countries, particularly in Argentina, which was also the country in which a larger variety of foods within this category was mentioned.

The *Sauces and dressings* dimension was also frequently mentioned by the participants of the three countries, being the only one in which no significant differences were found in the frequency of mention by Spanish, Argentinean and Uruguayan participants.

Only Spanish participants mentioned with a significant frequency the category *Vegetable creams* of the *Purées and vegetable creams* dimension. This could be explained by the fact that vegetable creams and creamy legume preparations, as lentils or beans, are traditional dishes in Spain, whereas their consumption is less common in Argentina and Uruguay. The similarity of eating habits and commercially available products in this two countries does not explain, however, the significantly lower frequency of mention of the category *Purées* in Argentina compared with Uruguay. A similar behavior was observed in the dimension *Soups*.

The dimension *Paté* was mainly mentioned by Spanish consumers. The importance of this dimension in Spain, as well as the relatively high frequency of mention of the category *Vegetable creams* in this country compared with Uruguay and Argentina, suggest that Spanish consumers can regard products that are not smooth as creamy but with a given consistency (viscous/thick, liquid/thin, unctuous). This is consistent with the significantly lower relevance that participants from this country gave to the texture characteristic *Smooth* in the creaminess definition task.

The dimension *Chocolate* was mainly mentioned by participants from Spain, with only a few references by Uruguayan and Argentinean consumers. This result was probably linked to the fact that in Spain, “chocolate,” besides the classical chocolate bar, means also a very well-known, traditional beverage made by dissolving chocolate bars in hot milk giving a thick, creamy beverage which is consumed hot.

A dimension corresponding to *Sweets*, which included products such as honey and jams, was found when grouping the mentioned foods into dimensions. Even though these products were mentioned by only a few participants, it was still surprising to identify this dimension because it comprises products that would not be considered, in principle, creamy.

Finally, the mention of sweet foods over salty foods was remarkable, with a ratio of almost 2:1 of sweet foods to salty foods. This is consistent with the fact that a *Sweet* category was found within the *Flavor characteristics* dimension in the free listing of sensations perceived when consuming creamy products task, while consumers did not refer to sensations of, for example, saltiness.

## CONCLUSIONS

Argentinean, Spanish and Uruguayan consumers mainly elicited texture characteristics when defining creaminess, which suggests that consumers have a clear understanding that creaminess is a texture attribute and considered that certain textural characteristics are required for a product to be considered creamy. On the other hand, when thinking about the sensations they perceived when consuming creamy products consumers mainly mentioned both texture and hedonic characteristics. It would be interesting to compare consumers'

elicited terms when thinking of creamy products with those perceived when describing the texture of different food products they are asked to taste.

Considering the results from the present work, consumers' perception of creaminess seems to be mostly related to tactile and kinesthetic sensations such as smoothness, viscosity, melting and softness, as well as hedonic, pleasant sensations. It is also important to highlight the correlation that was found between creaminess and sweetness as well as the high association that exists between creaminess and pleasure.

Understanding what consumers expect from a creamy product and what expectations are raised when thinking of creaminess could help ensure that expectations are fulfilled, thus increasing the probability of success of new products, and also helping to market them, identifying the attributes relevant to the consumers that can be used to claim the benefits of the product.

Dairy products seem to be the ones that consumers most frequently expect to be creamy in the three countries, suggesting that creaminess might be a key driver of liking of these products.

Differences were found between results from Argentinean, Spanish and Uruguayan consumers, which indicate that, even within the same language, cultural differences in consumers' understanding of the term creaminess exist. This might be particularly important when defining communication and marketing strategies of creamy products, designed to be commercialized in different countries.

Moreover, results from the present work contribute to a greater knowledge of the texture attributes and sensations that consumers expect to find when they try creamy products. This should also be taken into account when selecting key instrumental or sensory measurements to follow relevant quality parameters when manufacturing or defining product specifications, as well as to predict consumers' perceived creaminess.

Further studies should be carried out to understand which specific texture characteristics are required to perceive different specific products as creamy, and to study if differences exist between the different types of products deemed creamy.

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