



Comparison of two sensory profiling techniques based on consumer perception

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ABSTRACT

Eight chocolate milk desserts with different formulation were evaluated by two groups of consumers. Fifty consumers evaluated the samples and indicated their overall liking and answered a CATA question. Meanwhile, 40 consumers elicited up to four words to describe the desserts and completed a projective mapping task. Projective mapping and the check-all-that-apply question provided very similar sensory profiles for the evaluated milk desserts. Differences in the sensory characteristics of the samples were explained by differences in their formulations, which suggest the validity of the sensory profiles given by consumers. Projective mapping and the CATA question consisted on valuable tools to understand their perception of the sensory and hedonic characteristics of the desserts. These methodologies could consist on useful and interesting complimentary techniques to trained assessors' data, being CATA question easier to understand and less time consuming for consumers.

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1. Introduction

Sensory profiling is a powerful tool for the food industry as it provides important information for the development and marketing of new products, the reformulation of existing products and the optimization of manufacturing processes (Meilgaard, Civille, & Carr, 1999; Stone & Siedel, 1985). Traditionally, this methodology has been performed with a group of trained assessors who objectively provide a quantitative description of the sensory characteristics of food products (Jelinek, 1985; Stone & Siedel, 1985). Although quantitative descriptive analysis provides detailed, reliable and consistent results, it has some drawbacks. The application of quantitative descriptive analysis remains a very time-consuming approach since the vocabulary and associated training must be adapted to each product. Moreover, trained assessors could describe the product differently or take into account attributes that may be irrelevant for consumers (ten Kleij & Musters, 2003). Thus, there is industrial pressure to develop alternative methods that obviate the need to train a sensory panel, as well as to gather information from consumers (Faye et al., 2006).

For decades, consumers have been considered only capable of hedonic judgement (Meilgaard et al., 1999; Stone & Siedel, 1985).

However, in order to design food products that meet consumer sensory expectations, food companies need information about how consumers perceive the sensory characteristics of the product (Guinard, Uotani, & Schlich, 2001; ten Kleij & Musters, 2003). Therefore, although descriptive data is essential to product development, the best way to understand consumer preferences is consumer data (Risvik, McEwan, & Rodbotten, 1997). In this context, several methods have been used to gather information about consumer perception of the sensory characteristics of a food product such as intensity scales, just-about-right (JAR) scales and attribute liking questions (Popper, Rosenstock, Schraidt, & Kroll, 2004). However, there is concern that these types of questions could be a source of bias, for example by making certain product attributes especially salient in consumers mind (Popper et al., 2004). Another alternative is the use of check-all-that-apply questions (CATA). A CATA question consists of a list of words or phrases from which respondents should select all the words they consider appropriate to describe a product. This type of questions has been used in consumer studies to determine which sensory attributes consumers perceive in a food product (Adams, Williams, Lancaster, & Foley, 2007; Meullenet, Lee, & Dooley, 2008). Compared to just-about-right or intensity questions, CATA seem easier for consumers and might have a smaller effect on consumer perception of the product (Adams et al., 2007).

Several alternative methodologies have also been developed to gather information about consumers' perception of food products.

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These methodologies include: traditional profiling using consumers (Husson, Le Dien, & Pagès, 2001), repertory grid (Kelly, 1955), free choice profiling (Narain, Paterson, & Reid, 2004), free sorting (Faye et al., 2006) and open-ended questions (ten Kleij & Musters, 2003).

Another alternative to traditional profiling are similarity scaling techniques. Risvik, McEwan, Colwill, Rogers, and Lyon (1994) introduced the idea of projective mapping to quantify individual perception of overall similarity and dissimilarity between products. This methodology could be carry out with consumers or trained assessors, who are asked to provide a two dimensional projection of a group of samples, according to their own criteria (Risvik et al., 1997). This technique could consist of a useful and simple way to evaluate consumer perception of food products. However, it has been mainly used with small group of semi-trained sensory assessors or experts (Pagès, 2005; Perrin et al., 2008; Risvik et al., 1994, 1997). One of the disadvantages of this methodology is that the differences between the samples are difficult to explain. Thus, the addition of a description phase to this task could provide complimentary information that could help understanding consumers' perception of samples (Pagès, 2005).

The aims of the present work were: (a) to obtain a sensory profile of eight chocolate milk desserts based on consumer perception, using projective mapping with a description phase and a check-all-that-apply question, and (b) to compare results from both methodologies.

2. Materials and methods

2.1. Milk desserts

Milk desserts were prepared in tap water using 12% powdered skimmed milk, commercial sugar, modified cooked up tapioca starch (National Frigex, National Starch, Trombudo Central, Brazil), cacao, polydextrose (Litesse® two, Danisco Sweeteners Ltd., Surrey, United Kingdom), vanilla aroma, carragenan (TIC PRETESTED Colloid 710 H Powder, TIC Gums, Belcamp, USA), and 0.1% sodium triphosphate. The rest of the formulation consisted of water up to 100%.

Milk desserts with different texture and flavour characteristics were formulated following a $L_8 2^7$ Taguchi design (Gacula, 1993). Six two-level variables were considered in the study: starch, cacao, sugar, carragenan, polydextrose and vanilla concentrations. Variables and levels are presented in Table 1.

Desserts were prepared by mixing the solid ingredients with water and poured into a Thermomix TM 31 (Vorwerk Mexico S. de R.L. de C.V., México D.F., México). The dispersion was heated at 90 °C for 5 min under strong agitation (1100 rpm). The desserts were placed in glass containers, closed, cooled to room temperature (25 °C) and then stored refrigerated (4–5 °C) for 24 h prior to their evaluation.

Table 1
Ingredient percentage composition of the eight samples of milk desserts formulated following a $L_8 2^7$ Taguchi design.

Sample	Ingredient (%)					
	Starch	Cacao	Sugar	Carragenan	Polydextrose	Vanilla
1	2	2	12	0.04	0	0
2	2	2	14	0.05	3	0.05
3	2	3	14	0.05	0	0
4	2	3	12	0.04	3	0.05
5	3	2	14	0.04	0	0.05
6	3	2	12	0.05	3	0
7	3	3	12	0.05	0	0.05
8	3	3	14	0.04	3	0

2.2. Consumer panel

Ninety consumers, ages ranging between 18 and 60, were recruited from the city of Montevideo, Uruguay. Participants were 38% male and 62% female and were regular milk dessert consumers, since they consumed milk desserts at least once a week. Participants were randomly divided into two groups: one group of 40 people, who evaluated the desserts using projective mapping task, and a second group of 50 consumers who evaluated the desserts using a nine-point hedonic scale followed by a check-all-that-apply question.

The eight milk dessert samples were presented to consumers following a balanced and unique order for each participant (MacFie, Bratchell, Greenhoff, & Vallis, 1989). Thirty grams of desserts were served in 60-mL odorless plastic containers at 10 °C, codified with three-digit random numbers. Water was available for rinsing. The testing was carried out in a sensory laboratory that was designed in accordance with ISO 8589 (1988). Evaluations were performed under artificial daylight type illumination, temperature control (between 22 and 24 °C) and air circulation.

2.2.1. Check-all-that-apply

For each sample, consumers had to score their overall liking using a nine-point hedonic scale and to answer a check-all-that-apply (CATA) question with 17 hedonic and sensory attributes that they consider appropriate to describe the desserts. The words were selected based on results from a previous study in which consumers used an open-ended question to describe vanilla milk desserts (Ares, Giménez, Barreiro, & Gámbaro, 2009). The attributes were the following: sweet, yummy, soft, thick, intense chocolate flavour, vanilla flavour, creamy, delicious, rough, not much sweet, disgusting, very thick, very sweet, not much thick, not much chocolate flavour, bitter and not much creamy.

2.2.2. Projective mapping

Consumers were first asked to try each of the desserts and to provide up to four words they consider appropriate to describe them. After this, consumers were asked to place the samples on an A3 white sheet (60 × 40 cm), according to the similarities or dissimilarities between them. Consumers were explained that they had to complete the task according to their own criteria and that there was no right or wrong answers. They were also explained that two samples close together on the sheet would correspond to very similar samples and that if they perceived two samples as very different they had to locate them very distant from each other. For each consumer map, the X and Y coordinates of each sample was determined, considering the left bottom corner of the sheet as origin of the coordinate system.

Table 2
Mean consumer liking scores of the eight evaluated chocolate milk desserts.

Sample	Mean consumer liking ^A scores
1	5.1 ^d
2	5.3 ^{c,d}
3	6.1 ^{a,b}
4	5.5 ^{c,d}
5	6.2 ^a
6	5.7 ^{b,c}
7	6.0 ^{a,b}
8	6.0 ^{a,b}

Means with different superscripts are significantly different according to Tukey's test ($p < 0.05$).

^A Evaluated in a nine-point hedonic scale.

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