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From sensory marketing to sensory design: How to drive formulation using consumers' input?

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ABSTRACT

Companies need to continuously innovate to maintain market leadership. When the market is overloaded the challenge consists in creating innovative products able to attract and satisfy consumers. The general aim of this research is to set-up an operational protocol that aids in creating innovative products using a sensory marketing approach, i.e. involving consumers at different stages of the process and demonstrates the validity of this protocol.

The chosen product – a specific category of drink – has been duplicated by many competitors; therefore, it is necessary to create again differentiation by improving its sensory characteristics. First, a qualitative phase explored the concerned food universe and the possible sensory variations of the product across the five senses. Following this phase, a limited number of factors were selected for sample formulation: colour intensity (4 intensities), flavouring (3 types), label type (soft touch vs. hard) and pack size (standard vs. oversize). Next, a statistical experimental design was used to select a partial number of all combinations to be tested quantitatively. Finally, a quantitative phase allowed for evaluating the liking and concept fitting of 12 scenarios from the experimental design and data was analyzed with a conjoint approach. The results showed that the main factors which drive consumer preference for this concept are colour intensity and flavouring. Pack size and label type are taken into account by the consumer to a lesser extend. The ideal combination of the studied factors was also determined and lead to an agreement between product developers and marketers.

This experiment showed the feasibility of the proposed multi-sensory design method based on mixed qualitative and quantitative approaches.

1. Introduction

New materials, new tastes, and new functionalities: companies have to continuously innovate to maintain market leadership. In an overloaded market, the challenge consists in creating innovative products able to attract and satisfy consumers.

1.1. Sensory marketing

Sensory marketing can be defined as a group of key levers which are controlled by the producer and/or by the distributor to create a specific multi-sensory atmosphere around the product or the service either by focusing on sale outlet environment or product environment, and the communication or characteristics of the product itself (Filser, 2003). Sensory marketing strategies are specifically proposed by product categories: ordinary/common, complex/technological, hedonist/identity where a set of various methodologies are readily available (Giboreau & Body, 2007). Consumers' judgments are needed to exploit new markets based on preference understanding (Ruan & Zeng, 2004) while sensory experts are a useful tool for category appraisals and competitive surveys regarding the sensory offer of the market (Giboreau, Garrel, & Nicod, 2004). Once the marketing concept is defined, consumers can be used as the final product choice. For instance, Lee and O'Mahony (2005) studied the fit to concept of commercial toothpastes according to their appearance linked to freshness using a simple ranking task with consumers.

Qualitative and quantitative studies carried out by sensory marketing agencies help clients to identify the factors that drive consumer liking, providing companies the understanding needed to optimize new products and to enhance the profitability of existing ones. Specific methodologies of sensory market research are developed for consumer needs exploration, product benchmarking, category appraisals, product optimization, and concept-product fit studies.

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In our research, the methodology aims at creating innovative food products through a sensory marketing approach using both qualitative (focus groups) and quantitative (conjoint analysis) methods integrating concept and product definitions.

1.2. Focus groups

Focus groups emerged in behavioural science research as a distinctive member of qualitative research family, which among others includes individual in-depth interviewing, ethnographic participant observation and projective methods (Stewart, Shamdasani, & Dennis, 1990). In qualitative marketing studies, the use of focus groups has grown steadily since the 1970s, and today, business expenditures on focus groups are estimated to account for at least 80% of the $1.1 billion spent annually on qualitative research in the US (Wellner, 2003).

Groups usually consist of 8–10 people recruited and brought together based on pre-specified characteristics. There are a wide variety of uses for focus groups. The most common uses are: testing advertising, positioning products or services, testing new concepts, testing usability of a product, generating ideas (Edmunds, 1999). Focus groups can be self-contained, or can be used as an adjunct to another research method (Puchta and Potter, 2004). In this work, focus groups are used to explore the different senses in conjunction with a given marketing concept. As a pre-requisite for a quantitative phase, it is helpful to know the relevant sensory characteristics the new product has to offer to please the targeted consumers.

1.3. Conjoint analysis

Conjoint analysis is a technique for measuring psychological judgments. It is used frequently in marketing research to measure consumer preferences (Green & Srinivasan, 1978). Also called trade-off analysis, it is one of the most popular marketing research technique used to determine which features a new product should have, by conjointly measuring consumers trade-offs between discretized factors – or attributes (Chapelle & Harchaoui, 2005). The objectives of this method are as follows (Saporta, 1996):

- to measure the importance for the consumers of the various attributes for the definition of a product (i.e. the formulation, the brand or the type of packing);
- to measure the respective utilities of the levels taken by a given attribute for the consumers. The level of an attribute is either a degree of intensity or an option (i.e. the valorization of a brand compared to others considered to be less attractive);
- to describe and quantify the prospect customers for a given product;
- to determine the characteristics of an ideal product for a group of consumers.

Conjoint analysis is extensively used in marketing research to evaluate industrial products and services and is being increasingly used in the study of food choices by consumers (Haddad et al., 2007). The reasons why many authors adopted this approach are multiple:

(1) A conjoint analysis is the appropriate market research tool to handle the psychological matter like extracting attributes that are in the uppermost minds of respondents (Baek, Ham, & Yang, 2006). Asking consumers what is important can shows highly skewed data, which can also be difficult to analyze (Lewis, Ding, & Geschke, 1991). When asked to choose the attributes they would like, most customers will choose everything on the wish list. A conjoint analysis can better predict the overall consumer preference by aggregating the utility scores of each product attribute (Levy, 1995). The value of conjoint analysis may not be that it forces the respondent to attend closely to the element, but in fact just the reverse (Moskowitz, Beckley, & Minkus-McKenna, 2004). In a conjoint task, most respondents do not take the time to intellectualize the task. They simply act instinctively, on an intuitive basis. Consequently, only those elements that are very strong rise to the top.

(2) A conjoint analysis is great in identifying and understanding the combined effects of product attributes on preferences for a product/service (Green & Srinivasan, 1978; Hobbs, 1996; Louviere, 1988). Understanding the relative importance of product attributes influencing food choice at the point of sale is important to the success of new product development (Enneking, Neumann, & Henneberg, 2007). Different kinds of factors can be evaluated thanks to conjoint analysis, for example: formulation attributes (Ares & Adriana, 2007), label attributes (Carneiro et al., 2005; Geiger, Fakler-Pauley, & Mayer, 1995; Jaeger, 2000) and origin (Hollebeek, Jaeger, Brodie, & Balemi, 2007; Poelman, Mojet, Lyon, & Sefa-Dedeh, 2008; Schnettler, Ruiz, Sepúlveda, & Sepúlveda, 2007). Cheng, Clarke, and Heymann (1990), Vickers (1993), Solheim and Lawless (1996), Grunert (1997) and Moskowitz, Silcher, Beckley, Minkus-McKenna, and Mascuch (2005) chose conjoint analysis as a method to test the conjoint effect of sensory characteristics and marketing factors.

(3) A conjoint analysis has strong predictive power of consumer choices among multiattribute product alternatives (Baek et al., 2006). This method enables to re-create new combinations and estimate their total utility value by summing the utilities of the components (Moskowitz et al., 2005).

(4) The conjoint analysis offers the advantage of modeling consumers' preference from a sub-range of actually tested samples, which reduces considerably the number of prototypes. Thanks to a fractional factorial experimental plan based on concept and product factors, sensory and non-sensory ones, respondents evaluate alternative products or scenarios that display varying levels of selected factors (Dennis & Grove, 2005). The scenarios are varied systematically so that a range of factor combinations are considered, with some profiles containing high levels of certain factors, and other containing low levels of those factors.

(5) Conjoint analysis can be used in several different applications, such as novel products and packaging development, estimation of market segmentation for a particular product, ingredient composition, determination of the favorite brand, market segmentation based on consumer preference and consumer preference simulation (Malhotra, 1998). Integrating sensory differences as factors in conjoint analysis may be of great value for selecting the food product with optimal sensory quality and product information for the target consumer group (Helgesen, Solheim, & Næs, 1998).

The general aim of this research is to set-up an operational protocol to create innovative products using a sensory marketing approach and to demonstrate the validity of this protocol.

The chosen product – a specific category of drink – has been copied by many competitors; therefore it is necessary to create again differentiation by improving its sensory characteristics.

2. Materials and methods

The proposed methodology aims at optimizing visual, gustative, olfactory, tactile and sound qualities of a food product from an integrated marketing concept. The objective is not only to innovate

but also to ensure of the marketing-mix coherence: concept, brand, sensory characteristics of the product and of the packaging. The overall approach is a conjoint analysis (product and pack factors) through an experimental design, preliminary defined using a qualitative phase.

The concept is integrated in all steps of the consumer study: through the qualitative exploration (usage, evocation, sensory identity) and the quantitative scenarios' evaluation (concept and universe introduction to the respondents).

In our research, the product is a drink. The concept, chosen by Danone, is confidential: in this paper, we name it *Concept X*. This concept is associated to *Brand Y*.

2.1. Preliminary step: Focus groups

2.1.1. Objectives

The qualitative step aims at better understanding the concept from a consumer point of view and at defining the factors and levels to be integrated in the experimental design of the conjoint analysis. *Concept X* and all the sensations associated to it are deeply explored using different qualitative techniques.

2.1.2. Participants

The qualitative step in the two focus groups consists of nine persons each. Subjects are recruited using Adriant consumer's database. Individuals belong to the target chosen by Marketing, according to their socio-demographical characteristics (women, 18–65 years, Nantes inhabitants, half with children, half without children) and the brand they consume (loyal consumers of *Brand Y* and consumers who switch from one brand to another).

2.1.3. Stimuli

The use of stimuli are necessary to offer subjects sensory experiences, to go beyond rationality and aid in getting innovative ideas and realistic opinion on what are the possible sensations associated to the proposed concept. Stimuli are offered through various levels (see Fig. 1).

2.1.3.1. View. Ambiance boards help generate evocations: landscapes, fruits, colours, materials and so on. In our research, we present one board of the *Brand Y* and 8 ambiance boards evoking the concept as illustrated in Fig. 2. Six coloured drinks are also used to cover the possible colour range.

2.1.3.2. Olfaction. Fourteen foods are packaged in small opaque plastic bottles so that respondents can smell them without seeing. An opaque plastic film covers the bottle and 5 min before the presentation of the stimuli, little holes are made with a needle. Through pressure on the container, aromas are released.

2.1.3.3. Texture in mouth. In order to define the expected in-mouth texture of the beverage, three beverages prepared using the same fruit juice (diluted or enriched) are presented.

2.1.3.4. Packaging touch. Eleven different packs are used to evaluate the expected touch of both the label and the bottle.

All together consumers are exposed to about 30 stimuli during the focus group. Stimuli choice and creation is a key point of our qualitative exploratory phase. The more original and numerous the stimuli are the more the creativity and imagination of the consumers will be enhanced.

2.1.4. Moderation guide

Each focus group lasts between 2.5 and 3 h. During these focus groups, the moderator, an experienced psychologist, use different techniques like free association, collage, product profiling, and consumer profiling. After presentation of the concept, the moderation investigates physical characteristics, use properties and symbolic content of the new product and packaging.

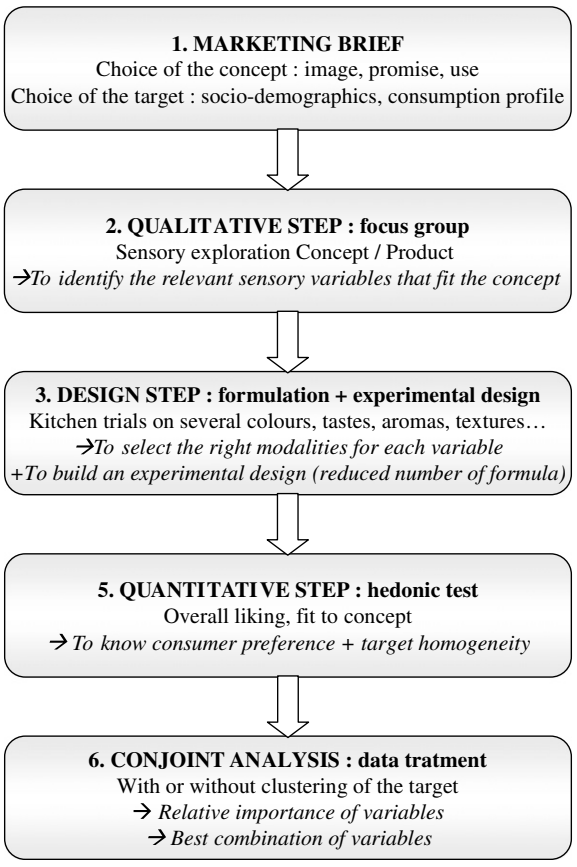

Fig. 1. Overall methodological approach.

Fig. 2. Example of an ambiance board used in the qualitative generation phase.

2.1.5. Content analysis: elaboration of the experimental design for the quantitative step

Eventually, thanks to an in-depth analysis of the respondents' exchanges, the qualitative phase enables to identify factors and levels which are at the same time important for the consumers (key attributes) and in appropriateness with *Concept X*. For each attribute, 2–4 levels are chosen.

A detailed description of the concept, including brand values, is written with consumer words and selected images for the introduction phase of the hedonic test.

2.2. Quantitative phase

2.2.1. Objectives

Conjoint analysis represents a suitable technique for achieving the following purposes:

- measuring the importance of each studied attribute taken into account by the consumer,
- ranking the different levels for each attribute,
- determining the optimum combination (preferred combination and the one that fits best the tested concept).

This method has been chosen as conjoint analysis is an appropriate market research tool to handle the psychological matter, it is great in identifying and understanding the combined effects of product attributes, it has a strong predictive power of consumer choices among multiattribute concept/product alternatives, and it makes it possible to reduce the number of tested prototypes.

In this work, the preliminary sensory qualitative phase allows to better know the concept from a consumer point of view and thus to identify which factors and levels are relevant for the experimental design. The benefit for the company is important: the experimental design is built thanks to consumers' language and symbolic perception, and not according to preconceived ideas or arbitrary decisions. More, the concept is presented to the consumers at the beginning of the questionnaire in order to make them answer accordingly to the product universe in terms of usage and symbolic identity.

2.2.2. Participants

For the quantitative phase, 163 women were recruited via phone. Adriant consumers' database allowed the use of a screener enabling to check age (18–65), consumption profile (one time a month and more), purchased brands (tested brand and other brands available on the market). Half of the participants lived in Nantes, the other half in Paris.

2.2.3. Experimental design and tested products

The number of scenarios depends on the number of factors and levels. In our study, 4 attributes are tested: colour intensity (4 levels), fruit flavouring (3 levels), bottle size (2 levels) and label type (2 levels); yielding a complete experimental design made of 48 combinations ($48 = 4 \times 3 \times 2 \times 2$).

To decrease the number of combinations, a fractional design is performed. Incomplete orthogonal design is manually obtained from the complete one. The number of products of this design (=12) is the smaller multiple of all the number of levels (4, 3 and 2). Orthogonal means that all the couples of levels are observed the same number of times. The design is presented in Table 1 and prototypes are created for each scenario.

Table 1
Experimental design of the quantitative test

	Colour	Aroma	Packaging (l)	Label
Scenario 1	Intermediate	Cooked	1	Hard label
Scenario 2	Light	Raw 2	1.5	Hard label
Scenario 3	Colourless	Raw 1	1	Hard label
Scenario 4	Deep	Cooked	1.5	Soft label
Scenario 5	Intermediate	Raw 2	1.5	Soft label
Scenario 6	Light	Raw 1	1	Soft label
Scenario 7	Colourless	Cooked	1.5	Hard label
Scenario 8	Deep	Raw 2	1	Hard label
Scenario 9	Intermediate	Raw 1	1.5	Soft label
Scenario 10	Light	Cooked	1	Soft label
Scenario 11	Colourless	Raw 2	1	Soft label
Scenario 12	Deep	Raw 1	1.5	Hard label

2.2.4. Test and questionnaire

During a 1.5-h session, 163 women evaluate the 12 scenarios. The brand values and the concept are presented in the briefing using images and claims in order to include usage and symbolic concept identity in the frame of product evaluation.

For each tested beverage, three steps are followed during the session: (1) the bottle filled with the tested drink is showed, (2) a glass filled with the drink is served and tasted and (3) the label (stuck on a bottle) is placed behind a curtain in order to evaluate its touch.

The questionnaire is worked out to be as short as possible to avoid halo effect and weariness. It is made up of two closed questions: liking score, and fit to *Concept X*. Both questions regarding the entire product (not specifically colour, flavour, touch, etc.) are asked only after the three steps are completed.

- Overall liking: *"This is a beverage Brand Y with the promise Concept X. Observe carefully this bottle, touch it, smell it, and taste it. Now, give us your overall impression of this product*". Consumers responded using a unlabelled 9 points-scale (1: I don't like it at all; 9: I like it very much).
- Appropriateness to *Concept X*: Marking is also done on an unlabelled 9 points-scale (1: Do not fit the concept at all; 9: Perfectly fits the *Concept X*).

2.2.5. Data treatment

2.2.5.1. Conjoint analysis. Conjoint analysis is a specific multiple regression to predict an ordinal value (appreciation score or concept appropriateness) by qualitative attributes. The model for this paper is linear and "Ordinary Least Square" method is used. Utilities and importances are the two conjoint analysis' results to modelize preferences' consumer by attributes consumer used.

Individual utilities are defined per consumer for each level of attributes. From a mathematical point of view, they represent the linear coefficients of regression carried out on the preference, i.e. they consider algebraic preferably the variations around the average for each consumer and a level. The utilities are dependant from each other: there are relative (and not absolute) because the variables in one particular dimension are, by definition, collinear.

The average utilities are the average of the individual utilities of the level of the attributes.

The second results are the importances, which mathematically are given by calculating the quotients of the ranges of the attributes. They are expressed in percentages and thus the sum of the importances for all the attributes is 100%. They are calculated from the individual utilities of each level.

For the utilities $U_{i,j}$ (level j and attribute i), the importance I_i for the attribute i is calculated as follows:

$$I_i = \frac{\Delta U_{ij}}{\sum_{i=1}^{n} \Delta U_{ij}}$$

where U_{ij} is the range of the utilities for the attribute and $\sum_{i=1}^{n} \Delta U_{ij}$ is the range of the utilities for n attributes.

The procedure used in SAS® software is "transreg".

Finally the ideal product is defined, which is a combination of four levels (one by attribute) which will profit from the maximum utility.

2.2.5.2. ANOVA analysis. ANOVA analysis indicates if significant differences exist between levels of the tested products.

2.2.5.3. Hierarchical clustering. Individual liking scores are submitted to a hierarchical clustering procedure using Euclidian distance and Ward criteria. Data treatments using these procedures are performed using Fizz® and SAS® programs.

3. Results

3.1. Preliminary phase: qualitative exploration

Focus groups give rich information about *Brand Y*, *Concept X*, possible characteristics of the product/packaging and consumer target. Table 2 shows examples of verbatim for each step of the focus group. With the help of this step, the attributes and levels of the conjoint analysis experimental design are chosen.

The brand exploration based on consumers' discussion shows that the identity of *Brand Y* is clearly defined in consumers' mind. Women evoke positive images like nature, vitality, purity, freshness, confidence, well-being.

The second part of the focus group consists of product profiling without stimuli: physical, symbolic and use characteristic of the product are built step by step by the respondents with the aid of the moderator. The association *Brand Y/Concept X* implies organoleptic characteristics of the product in terms of colour, taste, texture: in consumers' mind, this new product is manufactured from natural ingredients, without any additives. Evoked images are nature, health and pleasure. This drink is consumed in-between-meals, and is suitable for women (main target), children and possibly men, if they care about a healthy diet.

The presentation of stimuli inspires respondents' imagination and helps defines the expected characteristics of the product with tangible elements. Some attributes are consensual: the viscosity and the transparency are similar to the ones of water, and the bottle is made of plastic. Other attributes are not consensual among women: colour of the drink (colourless, light or deep), flavour (raw or cooked), label type (hard or soft) and packaging size (standard or oversized).

Collage technique is an effective way to check that the identity of the "new product" is in line with the brand and to the target. The main images evoked are nature, health and vitality (see Fig. 3).

Table 2
Example of consumers' verbatim during focus groups

Phase	Examples of verbatim
(0) Group rules and self introduction to make people feel comfortable	"*I am 31, I have 2 boys. I consume this kind of beverage at least once a week. My favourite brands are Brand Y and Brand Z*".
(1) Brand image: presentation of one concept board of the brand	"*Brand Y makes me think about vitality, nature, family and sun.*"
(2) Product exploration: without stimuli	"*For me this beverage would be red and thick. Its smell is not too strong, natural.*" "*I would consume it with my family, not with friend! It is not a beverage to invite people.*" "*This beverage makes me think about a healthful, beautiful body, someone with a lot of energy.*"
(3) Product profile with stimuli	"*In my opinion the colour of the beverage must be the one of sample A... the smell should be the one of sample S4...*"
(4) Identity of the beverage	"*I have chosen this image of women because she's in good shape, she's laughing... and this is thanks to the beverage*"
(5) Position in competitive universe	"*This beverage is better than the others because it is completely natural*"
(6) Packaging	"*I would prefer a 1litre-bottle and a plastic label*"

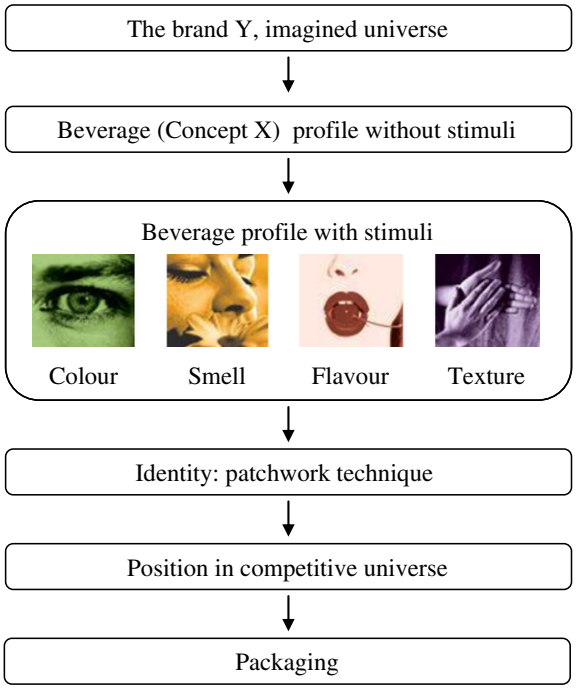

Fig. 3. Structure of the moderation guide.

Physical and psychological advantages of the new offer are pointed out by women: this drink is natural, good for body, and brings well-being, energy. Moreover, it is less sweet, more natural than competitive products. These arguments can be useful to Marketing when communicating to consumers.

In the quantitative phase it was chosen to focus on the colour of the drink (4 colours), the size of the bottle (2 sizes), the type of the label (2 types) and the flavour of the drink (3 aromas). Please see experimental design in Table 1.

3.2. Conjoint analysis results

The regression coefficients (average utilities) for both overall liking and appropriateness to *Concept X* are shown in Table 3.

3.2.1. Importance of each studied attribute taken into account by the consumers

Importance calculation allows measuring the weight of each attribute in consumers' appreciation and in concept appropriateness.

The main attributes explaining overall liking are the flavour (explaining 42.8%) and the colour intensity of the drink (32.1%)

Table 3
Regression coefficients ($N = 163$)

Attribute	Level	Overall liking (mean)	Concept appropriateness (mean)
	Intercept	6.0660	5.8947
Colour	Colourless	0.2075	0.2953
	Light	0.1608	−0.4121
	Intermediate	−0.0426	0.2479
	Deep	−0.3257	−0.1310
Aroma	Raw1	0.0590	0.1162
	Raw2	0.1609	0.2059
	Cooked	−0.2199	−0.3222
Packaging	1 l	0.0560	0.0488
	1.5 l	−0.0560	−0.0488
Label	Hard label	−0.0018	0.0094
	Soft label	0.0018	−0.0094

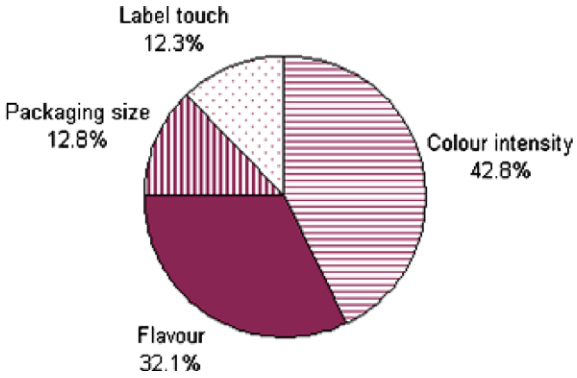

Fig. 4. Importances of each factor in overall liking (N = 163 consumers).

(Fig. 4). The packaging criteria (packaging size and label type) are of less importance.

Importance scores for concept appropriateness are very similar to those of overall liking: 43.2% for colour intensity, 32.0% for flavour, 12.5% for label type and 12.3% for packaging size.

3.2.2. Ranking of the different levels for each attribute

Individual utilities calculations given, for each respondents (N = 163 respondents):

- His/her preferred colour, aroma, bottle size and label touch.
- The colour, aroma, bottle size and label touch which fit best *Concept X*.

Table 4 shows the preferred levels and the ones which are in best appropriateness with *Concept X*.

For instance, concerning flavour, 38% of the consumers preferred aroma "*Raw 1*", 32% aroma "*Raw 2*" and 30% preferred aroma "*Cooked*", these differences are not significant (Fig. 5). Another example is the "label type" attribute, which shows that 52% of consumers prefer "hard touch", while 48% prefer "soft touch" (Fig. 6) showing no significant different.

The results revealed a significantly better appropriateness of the colour intensities between "colourless" and "light" than "intermediate" and "deep" (Fig. 7); showing 41% of consumers believe that the intensity which fits best the concept is "colourless", whereas for 32% is "light", 13% "intermediate" and for 14% is "deep".

3.2.3. Optimum combination

The ideal product and pack combination which is preferred the most and fits the best, *Concept X,* is a colourless beverage Raw1-flavoured, 1-l or 1.5-l packaging and a soft or hard label.

Table 4
Consumer preferences and Concept X appropriateness

Attribute	Level	Consumers preferences		Concept X appropriateness	
		Number of consumers (N = 163)	%	Number of consumers (N = 163)	%
Colour	Colourless	54	33.1	67	41.1
	Light	54	33.1	52	31.9
	Intermediate	29	17.8	21	12.9
	Deep	25	15.3	23	14.1
Aroma	Raw1	62	38.0	65	39.9
	Raw2	52	31.9	61	37.4
	Cooked	47	28.8	37	22.7
Packaging	1 l	85	52.2	89	54.6
	1.5 l	78	48.9	74	45.4
Label	Hard label	85	52.2	77	47.2
	Soft label	78	48.9	81	49.7

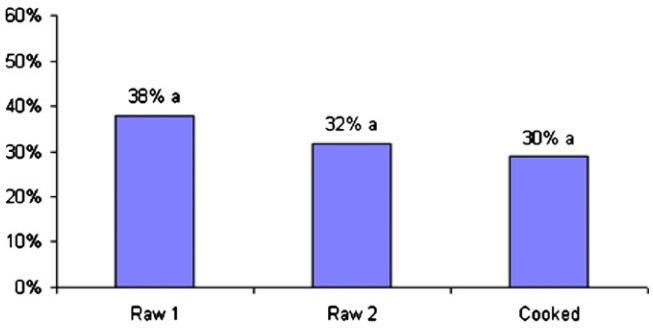

Fig. 5. Overall appreciation to flavours (N = 163 consumers).

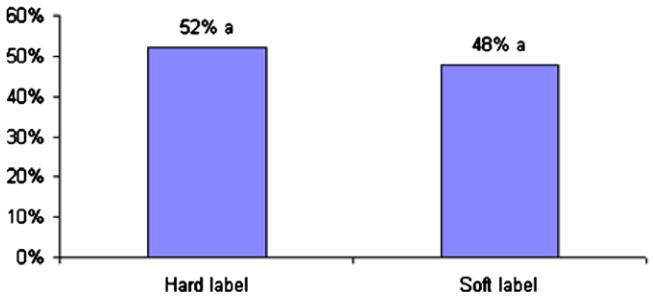

Fig. 6. Overall appreciation to label type (N = 163 consumers).

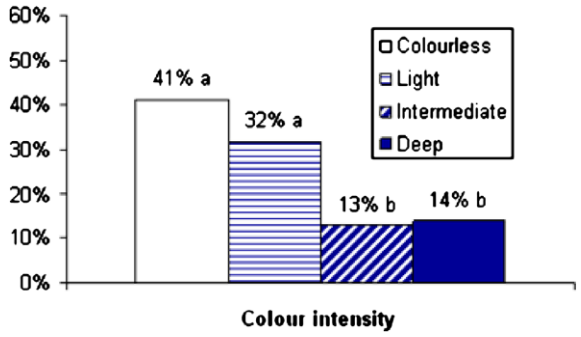

Fig. 7. Appropriateness to the concept of colour intensities (N = 163 consumers).

3.3. Clustering

A cluster analysis is conducted on the importance scores of overall liking. The objective is to determine if the most important attributes are the same for all the consumers. Hierarchical classification allows for the determination of four clusters, which can be characterized by the barycentre coordinates (Table 5):

- Cluster 1 (N = 28): For consumers of this group colour intensity is the most important criteria, beyond flavour and packaging size.

Table 5
Barycentre coordinates of "factor importance" clusters (N = 163 consumers)

Cluster	Colour intensity	Flavour	Packaging size	Label type
1	41.18	22.52	25.94	10.35
2	29.38	31.79	12.42	26.39
3	28.68	53.39	12.43	5.49
4	51.05	31.12	8.69	9.12

- Cluster 2 ($N = 32$): Colour intensity, Flavour and Label type are important.
- Cluster 3 ($N = 17$): Flavour is the most important criteria.
- Cluster 4 ($N = 86$): For the larger part of consumers, colour intensity is the most important criteria; while flavour comes in second.

This analysis suggests a possible line extension that offers various products specifically designed for each population segment. However, the distribution observation mainly shows unimodal distributions (Fig. 8). The relatively low number of people in three subgroups does not allow concluding on the relevance of population clustering. Moreover, it is not the current aim of the Marketing Department to develop several formulas.

4. Discussion

This experiment proposed a multi-sensory design method based on mixed qualitative and quantitative approaches.

First, these results confirmed the essential step of the brand and concept initial presentation to set a precise mental context, i.e. one could like a flavour but considers it inappropriate for the tested concept. Congruent combinations of sensory properties are immediately recalled from the symbolic values of the concept. Links between colours and flavours are well known (e.g. a mint drink should be green for most consumers, a white wine has more acidic, less fruity notes than red wines (Morrot & Brochet, 2004) and such cognitive links exist for all sensations. Thus, all sensory design studies should pay in-depth attention to the unconscious symbolic strength of the proposed concept, brand and imagined usage of the product.

Second, the proposed qualitative exploration allows identifying the main attributes which drive targeted consumers' preference and the sensory characteristics of the ideal product adequately to the proposed concept. The presentation of real sensory stimuli in the qualitative phase was shown to be very important concept exploration. One can point out the fact that a good market research strategy always begins with a qualitative exploration, but the novelty of the present study is to focus on the links between sensory and overall concept, and to have appropriate stimuli to illustrate this concept with real potential fit to consumers' expectation.

Third, the main interest of this approach is to make R&D feel secure in the choice of product parameters. Indeed, marketing individuals usually design R&D briefs based on their own sensibilities and/or qualitative results, but often this is done in a imprecise way, i.e. saying for example that the colour should be gold yellow, without giving direction on the intensity level. The experimental design was particularly useful to reduce the number of combinations for the consumer test. Thus, the conjoint analysis gives powerful clues for the identification of the drivers of liking and their levels. The other originality of this methodology is to introduce in the trade-off multi-sensory product characteristics, in particular in mouth perceived characteristics, which could make consumer assessment tiresome if numerous combinations exist. The experimental design is particularly useful to reduce the number of products for the consumer test. The importance of scores calculation gives information on consumer hierarchy of the tested attributes which could be very useful for selecting where the company should concentrate its development efforts. The utilities calculations help to create the ideal product regarding the combination of several attributes. Conjoint analysis provides a format for presentation of results (utilities and importances) that clearly helps marketing strategies (Carneiro et al., 2005). Indeed, conjoint analysis helps marketing professionals to understand the relative importance of product attributes: this type of information is of great relevance for industrial marketing strategies. It can be very

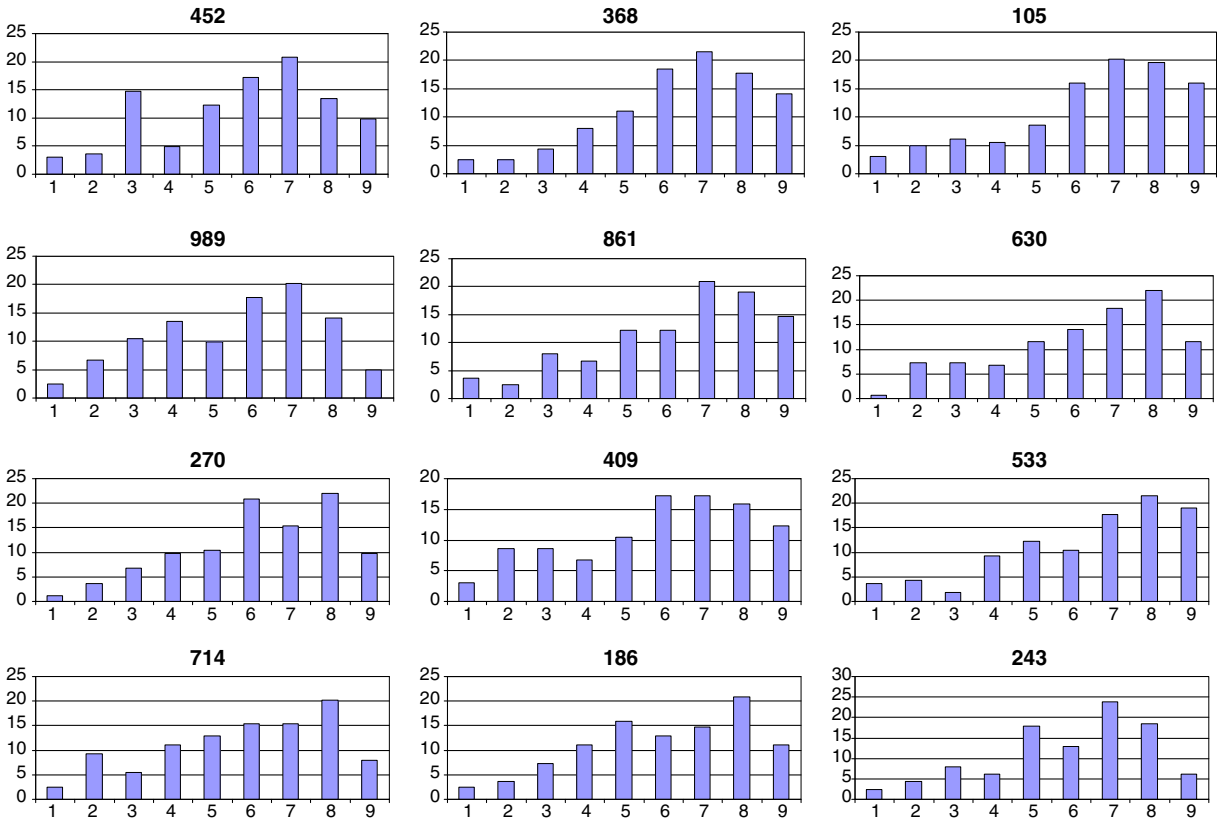

Fig. 8. Overall liking scores distribution of the 12 treatments ($N = 163$).

useful to define changes and adaptations in particular products or services as well as in the process of developing novel products for different consumers (Malhotra, 1998).

However, one of the difficulties of the method is the formulation of the products regarding all the chosen attributes and levels, above all when it includes products and sophisticated packaging. For instance in this study, the consumers' evaluation was split in three sequences, due to the impossibility to obtain prototyped bottled with brand printed labels. We can easily assume that having the label to touch behind a curtain does not introduce the same context to the consumer as having the final bottle with label and product inside. Consequently, the use of this approach needs a good coordination between R&D, packaging designer and manufacturer.

One other limit of this approach could be the number of studied attributes. Indeed the key levers which make up the product success are numerous, but one could further add to the chosen attributes, the price, the bottle shape and size, the name of the product and so on. So with several levels per attribute, the potential combinations could be very important. At the same time, to keep a good reliability of the results, the cut-off number of combination is limited.

We also strongly believe that clustering consumers is a preliminary compulsory step in the statistical sequence. In this case, no clusters were observed but in many cases, it helps to define different product responses to groups with specific preference or expectation in terms of sensory properties and concept fitting. However, let us keep in mind the necessity of large consumer groups when looking for consumers' clusters, in order to have enough consumers in each group to obtain reliable conclusions. This clustering step is crucial in the success of the protocol as heterogeneous targets would lead to average models, without any subgroup being well explained.

In the present work, several sensory attributes are identified from the qualitative phase and product and pack scenarios are formulated by variation of these attributes. A conjoint approach is used to know the hierarchical importance of the different attributes and to calculate the optimum value of each variable. This methodology of a qualitative screening associated to a conjoint analysis on relevant sensory attributes has shown good performances to fit consumers' expectation: it has now to be reproduced, as every brand, concept and product is a unique combination designed for a specific consumer group.

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