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Selection of fragrance for cosmetic cream containing olive oil

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Synopsis

Perceptions of essences for potential use in the development of a line of cosmetic emulsions containing olive oil were studied. Six cream samples prepared with six essences selected in a preliminary study were evaluated for overall liking and intention to purchase by a 63-women sample. A check-all-that-apply (CATA) question consisting of 32 terms was used to gather information about consumer perceptions of fragrance, affective associations, effects on the skin, price, target market, zones of application, and occasions of use. Hierarchical cluster analysis led to the identification of two consumer clusters with different frequency of use of face creams. The two clusters assigned different overall liking scores to the samples and used the CATA terms differently to describe them. A fragrance with jasmine as its principal note was selected for further development of cosmetic creams, as it was awarded the highest overall liking scores by respondents of the two clusters, and was significantly associated with cosmetic features including nourishing, moisturizing, softening, with a delicious and mild smell, and with a natural image, as well as being considered suitable for face and body creams. The use of CATA questions enabled the rapid identification of attributes associated by respondents with a cosmetic cream's fragrance, in addition to contributing relevant information for the definition of marketing and communication strategies.

INTRODUCTION

The term "fragrance" denotes a scent or essence included in a cosmetic formulation for the purpose of prompting a pleasing reaction in the target consumer. A cosmetic product's fragrance is intimately associated with its acceptance by consumers, in a manner related to cultural, affective, socioeconomic, age- and gender-related variables, among others (1,2). A product's fragrance is strongly related to its potential attractiveness and has been attributed a decisive role in selection between otherwise similar products (3,4). Fragrances can be used to emphasize the presence of particular ingredients, but must be compatible with the use of other product constituents and effectively contribute to the overall marketing mix (5,6). A fragrance can be used in a cosmetic product to suggest the

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product's intended use, quality, or target consumer profile (7). Alternatively, some cosmetics rely on the use of scents to mask the disagreeable smell of base formulations.

A previous study (8) showed that female consumers of anti-aging creams assigned higher overall liking scores to samples with a mild, pleasant fragrance than to those perceived to have a disagreeable smell. According to these results, the sensory and hedonic perception of creams was strongly influenced by the product's fragrance. Interestingly, the results of the study suggested that consumers' overall liking and the perceived quality of a product may be strongly affected by the product's fragrance. Thus, the inclusion of a fragrance selection step in the development of anti-aging creams may be key to the success of a marketing strategy.

In further previous work conducted with the aim of selecting suitable scents for incorporation in olive-oil-based cosmetic emulsions for body, face, and hand creams (9), consumers tended to associate olive-oil cosmetic creams with negative attributes, such as "food odor," "disagreeable smell," and "strong smell."

In selecting a cosmetic product's fragrance, it is worth studying the degree of liking or dislike that different fragrances cause in consumers and further details of the attributes with which the fragrances are perceived by consumers.

Check-all-that-apply (CATA) questions can be conveniently employed in market research to reduce response burden (10). Presented with a multiple choice question consisting of a list of attributes, respondents select those that apply to a given sample.

A major advantage of this type of question is that it allows multiple options to be selected, instead of limiting respondents to selecting only one answer or forcing them to focus their attention on evaluating specific attributes (11).

CATA questions can include not only attributes related to the sensory characteristics of samples but also consumption frequency, purchase intention, and affective variables (12).

CATA questions have been used for the sensory characterization of various food and cosmetic products, and have been reported to be a quick, simple, and easy method for assessing consumer perception of the sensory characteristics of several products (8,13–19)

The aim of this study was to use CATA questions to gather information on consumer perceptions of fragrances, with a view to determining the essences worth considering in the development of olive-oil-based cosmetic creams.

MATERIALS AND METHODS

PRELIMINARY STUDY

Choice of fragrances to be incorporated in creams, on the basis of fragrance names. A preliminary study was conducted to select fragrances to be incorporated in cosmetic creams. In view of the sense-exhausting character of fragrances, the preliminary study was done with the mental images evoked by the names of fragrances alone, which reflect consumers' experiences, imagination, and expectations (2,20).

The study was conducted in Montevideo, Uruguay, using convenience (opportunity) sampling. A total of 134 female respondents aged between 18 and 60 were recruited randomly

in shopping areas, universities, and other public places. Respondents were asked to select up to 3 of 28 fragrance names that they considered most appropriate for each of three cream types. The list of fragrance names covered a wide range of notes generally associated with cosmetic creams, such as floral, fruity, citric, herbal, and spicy notes.

The cream types were hand cream, body cream, and facial cream.

The fragrance names were odorless, apple, azalea, blueberry, cherry, coconut, fresh fruit, honey and lemon, jasmine, kiwi, lemon, linden and magnolia, magnolia, melon, olive and sage, orange, orchid, peach, pear, pineapple, pink grapefruit, rose, rose and lemon verbena, strawberry and blackberry, tropical fruit, vanilla, white flowers, and wild strawberry.

Frequency of mention was determined for each note and the six notes mentioned most frequently overall were identified. On the basis of these six fragrances, essences that would contain the notes mentioned were screened. Lariales S.A., a local company, kindly provided the essences used in this study, as well as advice on their selection.

Six essences mentioned in Table I were selected, as containing the most representative notes named by the consumers.

On the basis of these fragrance names selected by consumers in the preliminary study, essences were compounded and incorporated into a cream base, and were then subjected to an olfactory test using women consumers.

OLFACTORY TEST WITH WOMEN CONSUMERS

Samples. A cream base was prepared with acrylate–acrylamide copolymer, Picual extra virgin olive oil, propylene glycol, methyl and propyl paraben, aqua and butylated hydroxytoluene. The fruitiness intensity of the olive oil used was below 3.0 on the IOC scale (IOC/T.20/Doc. no 15/Rev. 4, 2011) (21), according to Gámbaro *et al.* (22). The emulsion was prepared by mixing all the ingredients followed by 5-min stirring (Servodyne Mixer Head Model No. 50003-45, Cole–Palmer Instrument Co., Vernon Hills, IL) at 500 rpm.

Fragrant essences were added to this emulsion to a final concentration ranging from 0.4% to 1%, following the supplier's instructions. The six cream samples were labeled as CE1– CE6, where C indicated the cream type used.

Table I
Essences Selected for This Study

Code	Principal note	Other notes
E1	Vanilla	Lime, sweet orange, bitter orange, cocoa, caramel, coconut, and ambergris
E2	Lemon	Lime, bergamot, orange, jasmine, violet, pineapple, musk, and vanilla
E3	Fresh fruits	Orange, bergamot, peach, green notes, musk, and vanilla
E4	Jasmine	Violet, white flowers, vanilla, and sandalwood
E5	Rose	Silver wattle, violet, vetiver, sandalwood, ambergris, and musk
E6	Linden/magnolia	Herbs, gardenia, musk, and cedar

Consumer test. A total of 63 female consumers of cosmetic creams aged between 21 and 72 were recruited randomly in shopping areas, university facilities, and other public places in Montevideo, Uruguay. Taking into account the areas where the respondents were recruited, the sample was assumed to represent the general Uruguayan middle-income groups. The test was conducted at the site of recruitment, exercising care to avoid odor contamination and to create the conditions for respondents to perform the test in a relaxed atmosphere.

Respondents were presented with 20 g each of the six cream samples in white plastic cups coded with three-digit random numbers. The sequential monadic sample presentation protocol was used, using a different random presentation order for each respondent.

The respondents were asked to remove the cup lids, smell each cream sample, and rate it according to overall liking on a 9-point structured hedonic scale ranging from extreme dislike to extreme liking, and intention to purchase on a 9-point structured hedonic scale ranging from definite unwillingness to definite intention to purchase. No information about the name of the sample fragrance was provided to the respondents.

Finally, the respondents answered a CATA question consisting of a list of 32 terms from which they selected those applicable to each of the six samples they had smelled. The CATA terms could be classified into the following categories:

Odor: delicious, disagreeable, strong, mild

Affective: must-have, glamorous, for pampering oneself, energizing

Effect of cream on the skin: nourishing, moisturizing, softening, beautifying, anti-aging, anti-wrinkle

Price: cheap, expensive

Target market: young women, older women, exclusive, mass market

Zones of application: feet, hands, face, body

Occasions of use: summer, winter, day, night

Other: fresh, healthy, natural, artificial

Respondents also completed a brief survey of sociodemographic data (age, marital status, number of persons in the household, number of children in the household, and highest educational level attained). They were also asked about their consumption frequency of face creams (moisturizing, nourishing, and anti-aging) and body creams (moisturizing, nourishing, anti-aging, slimming, and toning creams) with structured answers (three options): never, sometimes, or always used.

Data analysis. An analysis of variance (ANOVA) was performed on the overall liking and intention to purchase data using sample as the variation factor. Significant differences between means were determined according to the Tukey test ($p \leq 0.05$).

CATA question. For the CATA question, frequency of mention by respondents was counted for each attribute and sample. To detect differences in consumers' perception of the evaluated fragrances, Cochran's Q test was carried out for each of the 32 terms considering sample and consumer as variation factors. Cochran's Q test is a non-parametric statistical test used in the analysis of two-way randomized block designs to determine whether k treatments have identical effects when the response variable is binary.

Cluster analysis. Hierarchical cluster analysis of overall liking data enabled the identification of two consumer groups with different overall attitudes toward the tested products. The formation of clusters was based on Ward's aggregation criterion and the calculation of Euclidean distances between data points. The chi-square statistical test was performed to determine significant differences ($p \leq 0.05$) in the distribution frequency of sociodemographic variables and in cosmetic cream consumption frequency between clusters.

An ANOVA was conducted on overall liking, considering sample, cluster, and a combination of the two, as variation factors. Mean ratings and honestly significant differences were determined based on the Tukey test ($p \leq 0.05$).

For the CATA questions, frequency of mention was determined for each term and cluster, and Cochran's *Q* test was carried out for each term to determine whether the consumers in the two clusters used the terms in significantly different ways.

Finally, correspondence analysis—a descriptive/exploratory technique designed to analyze simple two-way contingence tables showing a certain degree of correspondence between rows and columns—enabled a spatial representation of the data, reflecting the relationship between the stimuli and the elicited concepts (23).

XL-Stat 2012 (Addinsoft, New York, NY) was used to conduct the above analysis.

RESULTS AND DISCUSSION

Table II shows the sociodemographic characteristics of respondents and the frequency of cosmetic cream use among these consumers.

Table II
Sociodemographic Characteristics and Cosmetic Cream Use Frequency (n = 63)

Age (years old)	≤35	28 (44.4%)
	Over 35	35 (55.6%)
Education level	Secondary education completed	18 (28.6%)
	Partial tertiary education	19 (32.2%)
	University graduates	26 (41.2%)
Marital status	Lives with a partner	18 (28.6%)
	Lives alone	45 (71.4%)
Number of persons in the household	1–2	34 (54.0%)
	3 or more	29 (46.0%)
Number of children in the household	0	52 (82.5%)
	1 or more	11 (17.5%)
Face cream use frequency	Occasional use	12 (19.0%)
	Frequent use	39 (62.0%)
	Always uses	12 (19.0%)
Body cream use frequency	Occasional use	17 (27.0%)
	Frequent use	39 (61.9%)
	Always uses	7 (11.1%)

The non-probabilistic sampling method and the recruiting procedure used in this study did not provide a statistically representative sample, thus preventing generalization of these results to the entire female population of Montevideo. However, a wide range of consumers was covered in terms of sociodemographic variables, as shown in Table II. The sample was biased toward more highly educated women, women living without a partner, and women with no children, probably as a result of an overall higher willingness of these individuals to participate in the survey.

Table III shows overall liking and intention to purchase ratings according to sample for the total respondent population, and overall liking according to sample for Clusters 1 and 2.

Significant differences ($p \leq 0.05$) were found between overall liking and intention to purchase scores assigned by the consumers to the samples of this study. Rating scores were lower for intention to purchase than for overall liking, possibly because the respondents were unable to decide on their willingness to purchase on the sole basis of fragrance, but needed to consider other factors.

The cream with fragrance E4 was assigned significantly higher overall liking ratings than creams with fragrances E2, E3, and E5. Taking six on the 9-point scale as the minimum overall liking and quality score for a product to have commercial potential (24), only sample CE4 exceeded the minimum score. The respondents evidently did not like the fragrances of the other cream samples.

Table IV shows the frequency of mention of each term by the total population of consumers.

The most frequently used term for all the samples was "use on body," which was mentioned 167 times, although no significant differences were found between the number of mentions according to sample, which indicates that all six fragrances were considered suitable as body creams. The terms "cheap" (116 mentions), "strong smell" (112), "mild smell" (109), "for older women" (109), and "delicious smell" (103) followed in frequency. Three fragrance-related attributes were among those selected most frequently by respondents, reflecting the importance of fragrance among the attributes readily perceived by consumers. A significant number of respondents perceived samples as "cheap"

Table III
Mean Overall Liking and Intention to Purchase Scores (9-Point Scales)

	Total population (n = 63)		Overall liking	
Sample	Overall liking	Intention to purchase	Cluster 1 n = 22	Cluster 2 n = 41
CE1	$5.2^{a,b}$	4.6^{b}	$5.1^{b\,A}$	$5.3^{a,b\,A}$
CE2	4.9^{b}	4.4^{b}	$6.5^{a,b\,A}$	$4.1^{b,c\,B}$
CE3	5.0^{b}	4.5^{b}	$6.2^{a,b\,A}$	$4.4^{a,b,c\,B}$
CE4	6.2^{a}	5.7^{a}	$7.3^{a\,A}$	$5.6^{a\,B}$
CE5	4.8^{b}	4.4^{b}	$6.2^{a,b\,A}$	$4.0^{c\,B}$
CE6	$5.6^{a,b}$	$4.8^{a,b}$	$5.8^{b\,A}$	$5.4^{a\,A}$

Different lower case letters within columns indicate significant differences between samples according to the Tukey test ($p \leq 0.05$).
Different upper case letters within the same row indicate significant differences between clusters for the same sample according to the Tukey test ($p \leq 0.05$).

Table IV
CATA Results

	Samples					
Attributes	CE1	CE2	CE3	CE4	CE5	CE6
Nourishing*	14.3	14.3	19.1	31.8	22.2	15.9
Moisturizing^{ns}	22.2	23.8	23.8	39.7	20.6	25.4
Softening*	15.9	19.1	22.2	34.9	12.7	28.6
Energizing*	7.9	19.1	15.9	4.8	3.2	11.1
Anti-aging**	6.4	1.6	3.2	9.5	17.5	12.7
Fresh*	12.7	22.2	33.3	28.6	11.1	25.4
For young women*	15.9	14.3	30.2	20.6	7.9	12.7
For older women**	20.6	28.6	17.5	23.8	42.9	28.6
Daytime use**	20.6	38.1	34.9	28.6	17.5	17.5
Night time use^{ns}	19.1	7.9	19.1	17.5	15.9	19.1
Natural*	15.9	6.3	19.1	28.6	15.9	20.6
Artificial*	22.2	33.3	31.7	11.1	28.6	25.4
Cheap*	25.4	31.8	36.5	22.2	42.9	23.8
Delicious smell**	19.1	20.6	28.6	46.0	20.6	28.6
Disagreeable smell^{ns}	15.9	19.1	17.5	9.5	22.2	11.1
Strong smell***	17.5	42.9	49.2	11.1	36.5	20.6
Mild smell***	44.4	14.3	11.1	42.9	17.5	42.9
Mass market***	11.1	30.2	19.1	7.9	27.0	14.3
Summer use***	11.1	28.6	36.5	19.1	14.3	14.3
Winter use^{ns}	12.7	3.2	6.4	14.3	12.7	9.5
Use on feet**	3.2	12.7	14.3	1.6	15.9	15.9
Use on hands^{ns}	27.0	30.2	25.4	23.8	28.6	22.2
Facial use**	7.9	4.7	9.5	25.4	14.3	17.5
Use on body^{ns}	44.4	30.2	50.8	55.6	44.4	39.7

Frequency of mention according to attribute and sample. Only terms used by more than 10% of respondents are shown.
*$p \leq 0.05$, **$p \leq 0.01$, ***$p \leq 0.001$, ns: no significant differences ($p > 0.05$) according to Cochran's Q test.

on the sole basis of fragrance, showing how fragrance influences the instant mental image evoked in consumers' minds.

Significant differences ($p \leq 0.05$) were found between 18 of the 24 terms of the CATA question mentioned by more than 10% of respondents. Cream CE1 was described in terms of "mild smell" and "use on body." Cream CE2 was described in terms of "energizing," "daytime use," "artificial," "strong smell," "mass market," "summer use," "use on feet," and "use on body." Cream CE3 was mainly described as "fresh," "for young women," "daytime use," "artificial," "strong smell," "summer use," "use on feet," and "use on body." Cream CE4 was described mainly in terms of "nourishing," "softening," "natural," "delicious smell," "mild smell," "facial use," and "use on body." Cream CE5 was described as being "for older women," "anti-aging," "artificial," "cheap," "strong smell," "mass market," "use on feet," and "use on body."

All the fragrances were regarded as appropriate for body creams, while only the cream with the E4 fragrance was regarded as appropriate for a facial cream.

The terms "artificial" and "strong smell" were used to describe the three creams with lowest overall liking scores (CE2, CE3, and CE5), suggesting that respondents disliked these fragrances, in contrast with the cream with the highest overall liking (CE4), described in terms of, *inter alia*, "natural" and "mild smell."

CLUSTER ANALYSIS

The data suggested the existence of sub-groups of consumers with different perceptions of the fragrances tested, within the sample of respondents used in this study. Hierarchical cluster analysis was carried out on the overall liking data, leading to the identification of Clusters 1 and 2, composed of 22 and 41 consumers (35% and 65% of the consumer sample), respectively. Mean overall liking scores according to cluster are shown in Table III.

Significant differences ($p = 0.0012$) were found between the overall liking scores assigned by Cluster 1 to the fragrances of the tested creams. Overall liking ratings among respondents in this cluster were significantly higher for cream CE4 than for CE6 and CE1. Samples CE4, CE2, CE3, and CE5 received scores above the minimum threshold for commercial potential.

Highly significant differences ($p < 0.0001$) were found in Cluster 2 between overall liking scores assigned to the samples, with CE6 and CE4 receiving significantly higher scores than CE5 and CE2. Overall liking scores assigned by this cluster to the samples were consistently below the minimum commercial potential threshold, suggesting that Cluster 2 respondents did not like the fragrances tested. It is also possible to assume that Cluster 2 respondents did not regard the fragrance of the creams as an important sensory attribute for a cosmetic cream, as other sensory factors (color, texture) and non-sensory factors (packaging, brand, price) may have greater implications for the overall liking of a fragrance (2,5). This could be the subject of future research.

No significant differences between clusters ($p > 0.05$) were found for any of the socioeconomic variables surveyed. However, a significant difference was found in the frequency of use of face cream ($\chi^2 = 6.643$, $p = 0.036$), with Cluster 1 respondents using face creams more frequently than those of Cluster 2. Whereas in Cluster 1, 32% always used face creams and only 5% used them only occasionally, in Cluster 2, only 12% were frequent users and 27% used them only occasionally. Consumers more accustomed to using face creams assigned higher overall liking scores to the cream samples tested than less frequent users of face creams.

CATA QUESTION

Tables V and VI show, for the two clusters, frequency of mention for each of the CATA terms.

Cluster 1 respondents used 30 terms to describe the samples, while Cluster 2 used 24, considering only those terms mentioned by more than 10% of the respondents in each cluster. The terms used exclusively by Cluster 1 were the majority of the affective terms proposed ("beautifying," "glamorous," "must-have," and "for pampering oneself") as well as "healthy," "expensive," and "winter use." These attributes may be associated with emotional

Table V
CATA Results for Cluster 1

	Sample					
Attribute	CE1	CE2	CE3	CE4	CE5	CE6
Nourishing*	13.6	22.7	31.8	54.5	40.9	31.8
Moisturizing^{ns}	18.2	27.3	31.8	45.5	22.7	36.4
Softening*	9.1	31.8	36.4	50.0	18.2	31.8
Energizing^{ns}	13.6	31.8	13.6	9.1	9.1	27.3
Beautifying^{ns}	4.5	0.0	4.5	13.6	9.1	9.1
Anti-aging^{ns}	13.6	4.5	13.6	18.2	27.3	4.5
Anti- wrinkle^{ns}	4.5	0.0	13.6	13.6	9.1	4.5
Fresh**	9.1	36.4	18.2	40.9	18.2	59.1
Healthy^{ns}	0.0	13.6	9.1	13.6	13.6	9.1
For young women*	18.2	22.7	9.1	27.3	18.2	50.0
For older women*	31.8	22.7	22.7	40.9	54.5	18.2
Daytime use*	13.6	50.0	27.3	40.9	27.3	54.5
Night time use^{ns}	31.8	13.6	22.7	18.2	18.2	27.3
Natural^{ns}	13.6	9.1	27.3	40.9	27.3	31.8
Artificial^{ns}	22.7	22.7	18.2	4.5	18.2	18.2
Cheap^{ns}	31.8	22.7	27.3	18.2	36.4	18.2
Expensive^{ns}	4.5	0.0	13.6	18.2	9.1	13.6
Glamorous^{ns}	9.1	0.0	0.0	13.6	4.5	4.5
Delicious smell**	18.2	45.5	31.8	72.7	45.5	45.5
Strong smell^{ns}	18.2	31.8	27.3	9.1	27.3	45.5
Mild smell*	27.3	22.7	40.9	45.5	22.7	4.5
Popular^{ns}	13.6	22.7	13.6	9.1	31.8	22.7
Summer use**	18.2	18.2	18.2	22.7	18.2	59.1
Winter use^{ns}	18.2	4.5	18.2	27.3	22.7	13.6
Use on feet^{ns}	4.5	0.0	18.2	0.0	13.6	9.1
Use on hands^{ns}	18.2	27.3	31.8	27.3	40.9	18.2
Facial use^{ns}	13.6	13.6	9.1	40.9	22.7	18.2
Use on body^{ns}	36.4	45.5	36.4	63.6	40.9	68.2
Must-have^{ns}	0.0	13.6	13.6	9.1	0.0	4.5
For pampering oneself*	4.5	13.6	0.0	22.7	4.5	0.0

Frequency of mention by attribute and sample. Only terms used by more than 10% of respondents are shown. *$p \leq 0.05$, **$p \leq 0.01$, ns: no significant differences ($p > 0.05$) according to Cochran's Q test.

aspects and cost factors, and may be related to the higher consumption frequency of face creams in this cluster. Cluster 2 used the term "disagreeable smell," which was not used by Cluster 1, confirming that dislike of a cream's fragrance can strongly influence its acceptability (8).

Significant differences ($p \leq 0.05$) were found for 10 of the 30 CATA terms used by Cluster 1. The cream with fragrance E4, which had the highest overall liking score, was described mainly in terms of "nourishing," "softening," "fresh," "for older women," "daytime use,"

Table VI
CATA Results for Cluster 2

	Sample					
Attribute	CE1	CE2	CE3	CE4	CE5	CE6
Nourishing^{ns}	14.6	9.8	7.3	19.5	12.2	12.2
Moisturizing^{ns}	24.4	22.0	22.0	36.6	19.5	17.1
Softening^{ns}	19.5	12.2	24.4	26.8	9.8	17.1
Energizing^{ns}	4.9	12.2	9.8	2.4	0.0	9.8
Anti-aging^{ns}	2.4	0.0	12.2	4.9	12.2	2.4
Anti-wrinkle^{ns}	0.0	2.4	2.4	4.9	9.8	0.0
Fresh^{ns}	14.6	14.6	29.3	22.0	7.3	19.5
For young women^{ns}	14.6	9.8	14.6	17.1	2.4	19.5
For older women*	14.6	31.7	31.7	14.6	36.6	17.1
Daytime use^{ns}	24.4	31.7	12.2	22.0	12.2	24.4
Night time use^{ns}	12.2	4.9	17.1	17.1	14.6	14.6
Natural^{ns}	17.1	4.9	17.1	22.0	9.8	12.2
Artificial^{ns}	22.0	39.0	29.3	14.6	34.1	39.0
Cheap*	24.4	36.6	22.0	24.4	46.3	46.3
Delicious smell*	19.5	7.3	26.8	31.7	7.3	19.5
Disagreeable smell^{ns}	14.6	29.3	17.1	14.6	34.1	26.8
Strong smell***	17.1	48.8	17.1	12.2	41.5	51.2
Mild smell***	53.7	9.8	43.9	41.5	14.6	14.6
Popular**	9.8	34.1	14.6	7.3	24.4	17.1
Summer use*	7.3	34.1	12.2	17.1	12.2	24.4
Use on feet*	2.4	19.5	14.6	2.4	17.1	17.1
Use on hands^{ns}	31.7	31.7	17.1	22.0	22.0	29.3
Facial use**	4.9	0.0	22.0	17.1	9.8	4.9
Use on body^{ns}	48.8	22.0	41.5	51.2	46.3	41.5

Frequency of mention by attribute and sample. Only terms used by more than 10% of respondents are shown. *$p \leq 0.05$, **$p \leq 0.01$, ***$p \leq 0.001$, ns: no significant differences ($p > 0.05$) according to Cochran's Q test.

"delicious smell," "mild smell," and "for pampering oneself." Of the creams with the lowest overall liking scores, CE1 had a low frequency of mention among the CATA terms, while sample CE6 was described mainly in terms of "fresh," "for young women," "daytime use," "delicious smell," and "summer use." Samples CE4 and CE5 were associated with "older women" by Cluster 1 respondents.

Significant differences ($p \leq 0.05$) were found for 9 of the 24 CATA terms used by Cluster 2. As for Cluster 1, cream CE4 was described by Cluster 2 in terms of "delicious smell" and "mild smell," yet its overall liking was rated below the minimum commercial potential threshold. This may support the idea that Cluster 2 respondents did not regard the fragrance of the creams as an important sensory attribute in evaluating their overall liking. Cream CE5, which was assigned the lowest overall liking score by Cluster 2, was described by this group in terms of "for older women," "cheap," and with a "strong smell." The high odor intensity of this cream, together with its perceived cheapness, may explain the low overall liking scores assigned to CE5.

As mentioned above, a correspondence analysis was used to visualize the relationships between products and associations. The resulting perceptual maps are shown for the two clusters in Figures 1 and 2, respectively. The first two dimensions of the correspondence analysis explained 61.2% and 79.2% of the variability of the experimental data for Clusters 1 and 2, respectively.

Cluster 1 respondents differentiated between three groups of samples (Figure 1). On the right are samples CE3 and CE2, with fruit and lemon fragrances, characterized in terms of "summer use," "for young women," "daytime use," "fresh," and "energizing." Below is sample CE4, a complex fragrance with several floral constituents, including jasmine and white flowers, as well as vanilla and sandalwood. CE4 is characterized in terms of "facial use," "expensive," "nourishing," "softening," and "glamorous," consistent with its high overall liking score. On the left are samples CE1, CE5, and CE6, with floral and vanilla fragrances, characterized in terms of "cheap," "use on hands," and "night time use."

Figure 2 shows that Cluster 2 respondents differentiated between two groups of samples, with a lesser degree of discrimination than Cluster 1. On the right of the figure are samples CE2, CE3, and CE5, characterized in terms of "summer use," "for older women," with "disagreeable," and "strong" smells, "artificial," "cheap," "for a mass market," and "use on feet." On the

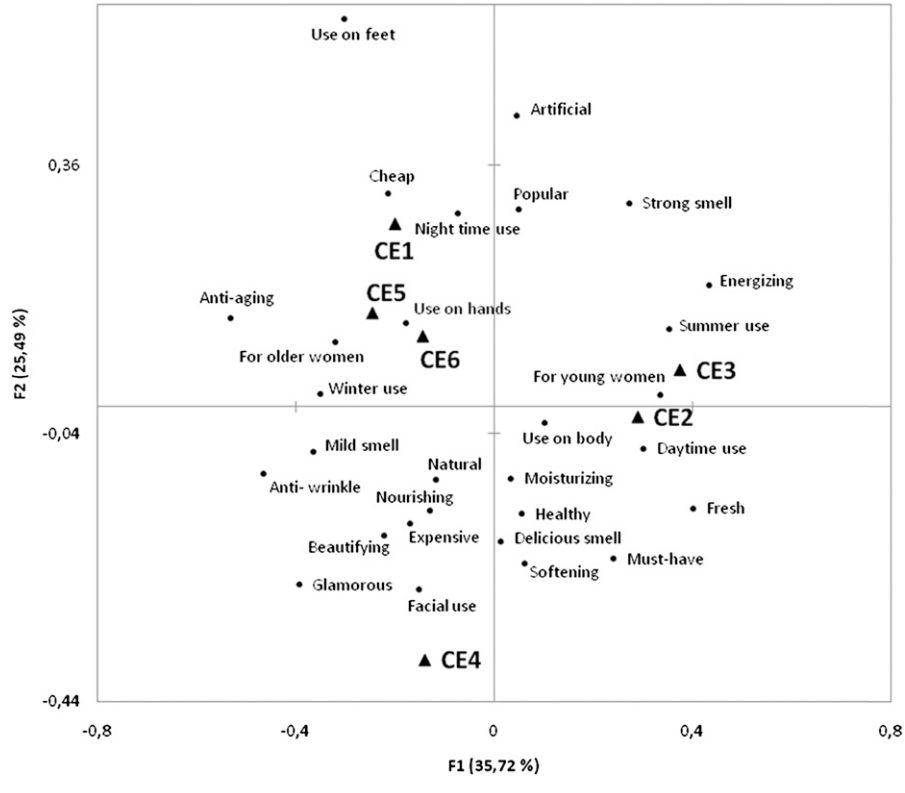

Figure 1. Correspondence analysis plot for CATA terms associated with the different types of fragrance by Cluster 1 respondents.

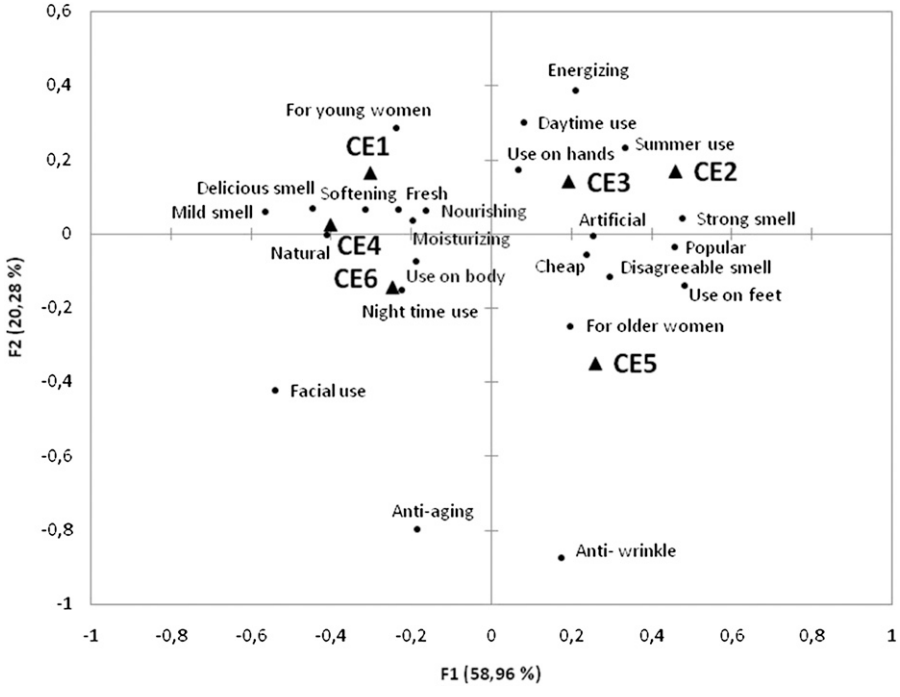

Figure 2. Correspondence analysis plot for CATA terms associated with the different types of fragrance by Cluster 2 respondents.

left are samples CE1, CE4, and CE6, characterized in terms of "nourishing," "softening," "fresh," "moisturizing," "delicious smell," "natural," "use on body," and "night time use."

Fragrance E4 was selected for the further development of a cosmetic cream as it had the highest overall liking scores among respondents of the two clusters and was significantly associated with "nourishing," "moisturizing," "softening," "delicious smell," and "mild smell," as well as considered a suitable fragrance for face and body creams, and associated with a "natural" image.

CONCLUSIONS

Use of "CATA" questions allowed the identification of different perceptions of six fragrances among consumers. The results provided an insight into consumers' perceptions of different aspects of creams associated with their fragrances, including their possible effects on the skin, affective associations, zone of application, and target market.

The selection of a suitable fragrance can contribute to reinforcing product image, and the use of CATA questions enables the rapid identification of associations made by consumers with a cream's fragrance, as well as providing useful insight on possible marketing and communication strategies.

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