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Standard Guide for Two Sensory Descriptive Analysis Approaches for Skin Creams and Lotions[1]

This standard is issued under the fixed designation E1490; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 The objective of this guide is to provide procedures for two different descriptive analysis approaches that may be used to qualitatively describe the sensory attributes of skin creams and lotions and quantitatively measure their intensity, similarities, and differences over time. Descriptive analysis can be used to define the sensory experience of skin care products that can then be used to provide direction in product formulation, competitive assessment, ingredient substitutions, research guidance, and advertising claim substantiation.

1.2 Guidelines are provided to assist the reader in determining which approach best meets their research objectives, either the *(1)* technical expert or *(2)* consumer behavior approach to language development and evaluation.

1.3 Guidelines are provided for the selection and training of assessors, defining sensory attributes, measuring intensities on rating scales, developing procedures for the manipulation of the product alone and the product on the skin, product handling, and evaluation of skin condition before testing.

1.4 *Units*—The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E253 Terminology Relating to Sensory Evaluation of Materials and Products

MNL 13 Manual on Descriptive Analysis Testing for Sensory Evaluation

MNL 26 Sensory Testing Methods: Second Edition

3. Terminology

3.1 Terms used in this guide are in accordance with Terminology E253.

3.2 *Definitions:*

3.2.1 *application, n*—process of applying the skin care product.

3.2.2 *delivery, n*—stage during which the product is discharged onto the finger(s) or skin.

3.2.3 *panel leader/moderator, n*—person who is responsible for conducting descriptive panels, protocols, and panel maintenance.

3.2.4 *pick-up, n*—stage during which the product is manipulated between the fingers, as it might be after the product is dispensed onto the finger or lifted from a jar.

3.2.5 *reference anchors, n*—products that are used to define intensities of a specific attribute.

3.2.6 *rub-out, n*—stage during which the product is rubbed onto the skin.

4. Summary of Guide

4.1 *Overview*—This guide describes two approaches to the descriptive analysis of skin care products; technical expert and consumer behavior approaches. The appropriate approaches for identifying, selecting, and training of assessors to evaluate the intensity and duration of sensory characteristics for skin care products are discussed. See Table 1.

4.1.1 *Technical Expert Approach*—The technical expert approach for descriptive analysis is based in the training of assessors on lexicon(s) and intensity references to create a panel that performs as a calibrated human instrument. This method uses a trained panel using descriptors that focus on appearance and tactile qualities of products. Additionally, evaluation of product fragrance can be performed using either the same panel or a separate panel. In both cases, the panel

[1] This guide is under the jurisdiction of ASTM Committee E18 on Sensory Evaluation and is the direct responsibility of Subcommittee E18.07 on Personal Care and Household Evaluation.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

TABLE 1 Overview of Technical Expert and Consumer Behavior Approaches

	Technical Expert Approach	Consumer Behavior Approach
Target panel size	Ten to fifteen assessors	Twelve to fifteen assessors
Pre-recruiting and screening	Up to 60 candidates are recruited from the local community or internal company resources, screened and selected based on sensory acuity, ability to articulate, availability and long term interest (see Figs. 1-16).	Approximately 30 candidates who are likers and users of the product category are recruited, screened, and selected for their sensory acuity and articulation ability, in addition to availability.
Sensory acuity screening	Initial screening will include as many as 10 initial tests and a personal interview (see Figs. 1-16).	Up to 30 trials; repeated measurement; discrimination method, tests represent differences expected in product set and category of interest.
Panel leader/Panel moderator	Qualified panel leader serves as trainer and teaches the attributes, reviews the scales and provides continuous training for the panel.	A trained moderator is the group discussion facilitator. The moderator provides the schedule of activities and works with the panel to help them develop the common vocabulary to describe the products of interest.
Panel training	Three steps: Initial—10 to 20 hours of training in a controlled sensory environment providing an introduction to scaling and sensory evaluation techniques. Secondary—50 to 90 hours practice. Final—Validation on skills for confirmation of performance and readiness for data collection.	8 to 12 hours of group discussions; iterative process; each session builds on previous sessions to develop a comprehensive language; some activities may be in home or extended use. After initial training and pilot testing, remedial training sessions may be scheduled.
Product application	Assessors are presented with standardized lexicon and references for attribute understanding (see Tables 2-5). For skinfeel, assessors' test sites are uniform and controlled to restrict variability and encourage panel consistency.	Evaluation procedures are typical for the category of interest; face lotions and creams will be placed on the face, hand lotions on the hands, body lotions applied more broadly, and so forth. Procedures follow intended consumer usage, most typical for product of interest.
Sensory modalities	Lexicons are used to address the client modalities of interest, focusing on appearance and texture or aroma, or both, of the products and test sites before, during, and post-usage.	Language is developed to capture all sensory modalities that are part of the consumer experience including visual, fragrance, and skinfeel, before, during, and after usage.
Technique	Standardized protocols are provided for the evaluation of products.	Individual procedures are developed by the panel and then standardized. Evaluation procedures are modeled after typical consumer usage behavior for that category.
Language development	Standardized lexicons are used as a core with supplementation if needed to address objectives; typical to have 20+ attributes with multiple evaluations of some attributes across the product use experience.	Comprehensive language, not unusual to have 30 to 40 or more sensory attributes to fully describe perceptions before, during, and after usage.
Data collection	Two replications are typical for skin feel evaluations; fragrance evaluation can be performed using consensus evaluation or with replication.	A minimum of three replications are recommended.
Data analysis	Analysis of Variance	Analysis of Variance
Panel performance measures	Inclusive of data review is assessment of overall panel and individual panelist performance. Statistical analysis allows ongoing monitoring of panel and panelist accuracy (when a blind control is included in the test set), ability to discriminate and consistency/ability to replicate judgments.	This method provides for statistical analysis of panel performance including individual assessor performance by attribute, replication, and overall differences observed relative to the panel as a whole. The analysis then focuses on perceived product differences.
Reporting	Charts, histograms, spider and other plots	Spider or radar plots, charts, and means tables
Usage and application	This approach provides research and product development, operations, quality assurance and marketing personnel with documentation of the product's sensory properties. Study output can be used alone or in conjunction with affective consumer methods. When used alone, data provides product and attribute understanding for single or multiple products and can be directly compared within and across studies (shelf life, development, market comparisons, and competitive category assessment). When used in conjunction with affective responses, correlations and multivariate statistics are used to interpret and extrapolate consumer affective responses and describe the relationship between consumer liking, language, behavior and/or understanding and product attributes. Attributes that influence consumer acceptance of products can be identified and sensory characteristics of ideal products determined.	This approach can be used for a wide variety of purposes, including understanding words consumers use to differentiate products, mapping product similarities and differences, ingredient substitution, new product development, competitive assessments, and advertising claim substantiation, among other uses. When correlated with consumer affective measures, the data can be used to determine key drivers that impact consumer choice behavior and preference segmentation. Developers can use the information to provide products that target specific consumer benefits and needs, and marketing can use the language and sensory properties to help communicate said benefits.

performing the evaluations is trained using fragrance descriptors and references for fragrance evaluation. Participants in these panels have been screened to exclude preexisting conditions or health issues (for tactile evaluations to exclude candidates with eczema, allergies, and hypersensitivity; for fragrance evaluations to exclude candidates with specific anosmias, conditions affecting the sense of smell, allergies, or hypersensitivities to fragrances). The screening process disqualifies assessors with personal habits that would impair or prevent their ability to evaluate a product (for example, activities that could lead to heavy callusing of the fingertips). Screened and selected assessors receive 70 to 100 h of training per sensory modality using intensity references. Intensity reference scales include a wide assortment of products within a category. Products are tested at different stages including before application; during application on specific predetermined sites within specific measured areas; and after application. The intensity of attributes is measured using a predetermined scale (for example, 10, 15, 100 point scales, and so forth). Guidelines (protocols) are provided for all facets of evaluation and include the manipulation of the product alone and on the area on which it is to be tested. Continuous repetition of exposure to scales and evaluation techniques provides understanding of the attributes, scaling for intensities, and use of protocols. Assessor performance is tested through validation exercises before participating in any formal studies. Once the panel is validated, it is ready to evaluate products. The data gathered are analyzed statistically, which allows for differentiation of products both qualitatively (presence of sensory features in some products and not others) and quantitatively (differentiation in level or intensity of attributes). Data gathered provide specific guidelines for those seeking to identify sensory properties perceived in a single product or in a given set of products. The panel is monitored for performance and periodic training and recalibration occur as necessary. Assessors are often trained to evaluate multiple product types.

4.1.2 *Consumer Behavior Approach*—The consumer behavior approach uses the panel as the instrument and acknowledges that there are inherent differences in perception based on behavioral and genetic differences at the receptor level. This approach uses consumers (assessors) who are current users and likers of the product category of interest. Selected assessors are screened for their sensory acuity and articulation ability, along with their willingness to participate on a panel. Twelve of the most sensitive assessors are selected for the descriptive analysis panel. Under the guidance of a qualified panel moderator, selected assessors describe their sensory perceptions of the product(s) of interest using a common everyday descriptive language. Qualitative references are used as necessary to assist with concept alignment and clarification of definitions of terms. Products are evaluated following typical usage behavior expected for that product, for example, hand lotions would be applied to the hands, body lotions applied more broadly, face creams on the face, and so forth. The protocols and evaluation procedures are developed by the panel in conjunction with the qualified panel moderator. Once a common language is agreed upon by the panel as a group, assessors rate their individual perceptions of each product in the array on an unstructured 6 in. (15 cm) graphic rating scale, one at a time, using at least three repeated measures (replications). The data are analyzed statistically to determine reliability and validity of the results. The analysis includes individual assessor performance, performance as a group, and analyses to determine similarities and differences among products for each sensory attribute (before, during, and after usage). This approach requires about four weeks from start to finish to recruit, screen, train, and evaluate an array of products. Subsequent panel and language development time can be reduced once the evaluation techniques are clearly understood and an initial language has been developed.

5. Significance and Use

5.1 The procedures recommended in this guide can be used to assess the sensory characteristics before, during, and after usage of skin care products.

5.2 This guide is applicable to product categories that include skin lotions and creams, facial moisturizers, hand lotions and creams, anti-aging lotions and creams, suntan lotions, personal repellents, and other skin care products.

5.3 Procedures of the type described herein may be used to communicate perceived sensory properties within and between manufacturers and to the consumer through the media. These guidelines are suggested to meet the need for ascertaining the performance of experimental and commercial products.

5.4 These procedures are to be used by assessors who are screened for sensory acuity, trained to use their senses to evaluate products, and in the procedures outlined by the panel method of choice, either technical expert or consumer behavioral approach.

5.5 This guide provides suggested procedures and is not meant to exclude alternate procedures that may be effective in training skinfeel panels and providing sensory evaluation descriptions.

6. Panel Selection and Training

6.1 *Objective*—To select and train a panel of 10 to 15 assessors to evaluate sensory properties before, during, and after usage of skin lotions and creams using descriptive analysis methods that quantify sensory attributes over time.

6.2 *Panel Selection:*

6.2.1 Assessors are recruited from within a company or the local community. The choice to use employees allows a company to have the assessors on site and to keep proprietary information confidential. The use of local community residents provides a smaller risk to assessor attrition both on a daily basis and long term.

6.2.2 A large group of candidates are recruited from the local community by contacting community groups, posting on bulletin boards, websites, placing newspaper ads, or other such ways to communicate. Candidates from within the company are contacted by interoffice memo, e-mail, company newsletter, or notices posted on regular and electronic bulletin boards. Before the prescreening questionnaire, candidates should be informed of the time commitment for training, potential duration of the panel, use of the panel, and expectation of each assessor relative to the responsibilities of the panel. The

prescreening questionnaire is recommended for determining current product usage, skin type, and documentation of potential causes of limited perception, availability, interest, and candidates' ability to articulate perceptions.

6.3 *Skin Types*—Skin types, skin condition, and age may be considered when recruiting assessors for a skincare product panel. This may be important because skin care products are frequently formulated to address the characteristics of a specific skin type, and assessors may generate varying product descriptions of particular attributes based on skin-type differences.

6.4 Since the technical expert and consumer behavior methods have different methods for assessor screening, selection, and language development, the next sections of this guide will outline the technical expert approach and the consumer behavior approach in detail.

TECHNICAL EXPERT APPROACH

7. Project Scope

7.1 Before screening assessors, the scope of the panel evaluations needs to be determined. Based on needs and strategic planning, it is imperative to decide whether the newly developed panel(s) will perform tactile and visual evaluations only, fragrance evaluations only, or both.

8. Equipment

8.1 The following equipment may be used during the evaluation process.

8.1.1 *Template*—Used to outline the 2-in. (51-mm) diameter circles on the forearm. It assures that consistent, measured areas are delineated for product application and evaluation (for example, a flexible plastic material with 2-in. (51-mm) diameter circles cut out for outlining with an appropriate marker).

8.1.2 *Light Source/Viewing Conditions*—A consistent light source for each assessor is recommended for use during the evaluation of shine. The type of light source will depend on the specific nature of the product being evaluated. It is important that all assessors receive the same amount of light on the arms and the same angle of light and that the distance from the test site and light be the same for each assessor (for example, high-intensity desk lamps).

8.1.3 *Skin Thermometer.*[3]

8.1.4 *Stopwatch.*

8.1.5 *Repeater Pipette.*

8.1.6 *Metronome.*

8.1.7 *Syringe.*

8.1.8 *Petri Dishes.*

8.1.9 *Weigh Boats.*

8.1.10 *Hygrometer.*

9. Panel Recruitment and Qualifications

9.1 For a panel of 10 to 15 assessors, up to 60 candidates are initially selected based on a prescreening questionnaire to participate in further screening to include acuity screening, rating/ranking tests, and a personal interview. The prescreening questionnaire intent is to gather personal information including availability, health, perception issues specific to the sensory modality for which the panel is being trained, and preexisting knowledge and articulation for the sensory modality of interest. Fig. 1 and Fig. 2 can be used for prescreening a tactile panel, Figs. 3-5 for prescreening a fragrance panel. Prescreening includes administering a scaling questionnaire to evaluate the candidate's ability to learn scaling.

9.2 *Acuity Screening and Rating/Ranking Tests*—Candidates meeting the prescreening criteria are invited to an onsite session for assessment of sensory abilities. Candidates participate in three or more exercises related to comprehension of sensory properties and scaling. Acuity screening tests aim to demonstrate candidates' ability to detect and describe characteristics present in creams and lotions as well as detect and describe intensity differences in these characteristics among products. Rating/ranking tests aim to assess the candidates' ability to rate products and to record differences.

9.2.1 *Acuity Screening and Rating/Ranking Tests for Appearance and Tactile Evaluation:*

9.2.1.1 Candidates are asked to rate the intensity of skin attributes for samples chosen specifically to represent the range for the attributes tested. It is recommended that one attribute be chosen from each evaluation category: appearance (for example, integrity of shape), pick-up (for example, firmness or stickiness), rub-out (for example, ease to spread or thickness), and afterfeel (for example, greasiness or amount of residue).

9.2.1.2 Test products are delivered in a controlled way on the test site, such as the back of hand, fingertips or 2-in. (51-mm) diameter circles on the volar forearm. For example, for rub-out and afterfeel attributes, the three test products are applied in premeasured amounts to three 2-in. (51-mm) circles on each arm. Candidates can use one arm for the rub-out attribute evaluation and the other arm for the afterfeel attribute evaluation to avoid contamination of test sites. Candidates should have at least two thirds of the total products tested rated properly for three of the four attributes to qualify as having high sensory acuity. Each attribute used should be defined on the screening ballot. (See Fig. 6).

9.2.2 *Acuity Screening and Ranking/Rating Tests for Fragrance Evaluation*—Candidates are first presented with a series of tests that might include 10 to 15 fragrances such as peppermint oil, cassia oil, triplal, and eugenol to which the candidate is asked to describe the fragrance by common name or association. Other tests may include fragrance matching, ranking of a specific stimuli (for example, spruce oil), and describing the fragrance/aroma characteristics of lotions directly from a container or after rubbing on the skin.

9.3 *Personal Interview:*

9.3.1 Each candidate is interviewed by the panel administrator or trainer to determine attitude; interest; ability to learn and work in a group dynamics situation, and availability for orientation, practice, and panel sessions on a routine basis.

9.3.2 Among the candidates screened, 10 to 15 assessors are selected for training based on a series of exercises and criteria (see Figs. 1-9), as follows:

[3] Two telethermometers that would satisfy the guidelines identified in this guide are Telethermometer Model 44TA, marketed by YSI (Yellow Springs Instrument Company, Inc.), Yellow Springs, OH or Digital Thermometer Model No. 5650 from Markson Science, Inc., Del Mar, CA.

Prescreening Questionnaire for a Skinfeel Panel

History
Name:_____
Address: _____
Phone (home and business):_____
From what group or organization did you hear about this program?_____

Time
1. Are you currently employed outside the home?_____
2. Are there any weekdays (M–F) that you will not be available on a regular basis?_____
3. How many days/weeks of vacation or certain holidays do you plan to take?_____

Health
1. Do you have any of the following?
Central nervous system disorder _____
Unusually cold or warm hands _____
Skin rashes_____
Calluses on hands/fingers _____
Hypersensitive skin _____
Tingling in the fingers _____
2. Do you take any medications which affect your senses, especially touch?
_____
3. Have you ever had an allergic or adverse reaction to any lotion, fragrance or cream? _____
If yes, please describe _____.

General
1. Is your sense of touch: (check one)
Worse than average _____
Average _____
Better than average _____
2. Does anyone in your immediate family or someone with whom you have close association work for a skin care product company?_____
3. Does anyone in your immediate family or someone with whom you have close association work for a marketing research or advertising company?_____

Prescreening Questionnaire for a Skinfeel Panel

(Answer Key)

History
Name:_____
Address: _____
Phone (home and business): _____
From what group or organization did you hear about this program?_____

Time
1. Are you currently employed outside the home? *No/Part-Time*
2. Are there any weekdays (M–F) that you will not be available on a regular basis? *Never/Occasionally*
3. How many days/weeks of vacation or certain holidays do you plan to take? *None/2 weeks per year*

Health
1. Do you have any of the following?
Central nervous system disorder *No*
Unusually cold or warm hands *No*
Skin rashes *No*
Calluses on hands/fingers *No*
Hypersensitive skin *No*
Tingling in the fingers *No*
2. Do you take any medications which affect your senses, especially touch?
No
3. Have you ever had an allergic or adverse reaction to any lotion, fragrance or cream? *No/Occasionally*
If yes, please describe *Dependent on product and type of reaction*.

General
1. Is your sense of touch: (check one).
Worse than average _____
Average _____ *Dependent on ability versus capacity*
Better than average _____
2. Does anyone in your immediate family or someone with whom you have close association work for a skin care product company? *No (if conflict of interest exists, position at company will be determined appropriate/inappropriate on an individual basis.)*
3. Does anyone in your immediate family or someone with whom you have close association work for a marketing research or advertising company? *No (if conflict of interest exists, position at company will be determined appropriate/inappropriate on an individual basis.)*

FIG. 1 Prescreening Questionnaire for a Technical Expert Panel

9.3.2.1 Availability for the complete orientation and 80 to 100 % of the practice sessions during training;

9.3.2.2 No health-related problems—skin irritations, central nervous system disorders, or medications that interfere with the central nervous system and could reduce skin and muscle sensitivity. For fragrance evaluations, the candidates should have no chronic colds or sinus infections, no hypersensitivity and allergies to fragrances, lotions, creams, soaps, or other topical products, and no previous history of allergy to lotions, creams, soaps, or other topical products;

9.3.2.3 Correct and comprehensive descriptive answers to 75 % or more of the open-ended tactile or fragrance questions or both in the prescreening questionnaire;

9.3.2.4 Correct ratings of 80 % or more of the scaling exercise in the prescreening questionnaire;

9.3.2.5 Correct ratings for two thirds of the products for three of the four attribute scales for appearance and tactile evaluation and/or correct description of fragrances, fragrance matching, and ranking of fragrance intensities for at least 80 % of the tests; and

9.3.2.6 Demonstration of good verbal skills, a high interest in descriptive and group dynamics tasks, and a cooperative yet confident personality demonstrated in the interview.

10. Panel Training, Orientation, and Practice

10.1 *Panel Orientation and Training:*

10.1.1 To begin training of the 10 to 15 selected assessors, the panel trainer shall orient them first to the general concepts, such as the definition, components, and applications of descriptive analysis testing, focusing on the modalities of interest. This takes up to 2 h. It is recommended that for panel evaluating multiple modalities, training should focus on one modality at a time.

Prescreening Touch Quiz – Technical Expert Panel

PLEASE ANSWER EACH QUESTION IN YOUR OWN WORDS.

1. What tactile characteristics of a lotion would make you think it is rich?
2. What is thicker, an oily or greasy film?
3. When you rub an oily film on your skin, how do your fingers move? Slip_____ or Drag _____(check one)
4. How might the appearance of a hand crème influence your perception of the feel of it?
5. Name some things that are sticky?
6. When your skin feels moist, what other words or properties could describe it?
7. Name some things that are rough:

   What makes them rough?
8. Briefly, how would you define absorbent in a lotion?
9. What properties make a deodorant feel sticky?

Prescreening Touch Quiz – Technical Expert Panel

(Answer Key)

PLEASE ANSWER EACH QUESTION IN YOUR OWN WORDS.

1. What tactile characteristics of a lotion would make you think it is rich? *thick, viscous, creamy, firm, smooth*
2. What is thicker, an oily or greasy film? *greasy film*
3. When you rub an oily film on your skin, how do your fingers move? Slip X or Drag_____ (check one)
4. How might the appearance of a hand crème influence your perception of the feel of it? *thicker lotion = richer, moisturizing; thinner lotion = oily*
5. Name some things that are sticky? *honey, jelly, syrup, Vaseline*
6. When your skin feels moist, what other words or properties could describe it? *dewy, wet, oily, sweaty, clammy, greasy, moisturized*
7. Name some things that are rough: *concrete, emery board, toast*

   What makes them rough? *particles, stiffness, dryness*
8. Briefly, how would you define absorbent in a lotion? *An absorbent lotion in not greasy or oily and goes into the skin quickly.*
9. What properties make a deodorant feel sticky? *sticks to the skin/fingers, too wet, too thick*

FIG. 2 Prescreening Touch Quiz—Technical Expert Panel

10.1.2 Assessors are introduced to the need for strictly controlled procedures for the manipulation and application of samples and the careful definition of each sensory attribute. This takes up to 2 h. (See Table 2 for procedures.)

10.1.3 Discussion and demonstration of each attribute are conducted for each stage: before application (appearance, pick-up, and/or fragrance), during application (rub-out or fragrance or both) and after-feel (skin feel or fragrance or both). This establishes the overall structure of the descriptive analysis of skincare properties. Assessors are encouraged to discuss each term, its definition, the protocol for evaluation, and the corresponding rating scale after they are demonstrated by the panel trainer. This takes 2 to 3 h (see Table 3).

10.1.4 For each attribute, the procedure, definition, and scale are discussed and demonstrated using three to five references (if possible) that represent the full intensity range from none or extremely low to very high. This exercise takes 4 to 5 h (see Tables 2 and 3). Reference values are subject to change if manufacturers change the product or process.

10.2 *Panel Practice:*

10.2.1 Several practice sessions totaling 20 to 24 h per sensory modality are held to review the orientation material. These include the following:

10.2.1.1 Review of the procedure, definition, and rating scale for each attribute.

10.2.1.2 Evaluation of products—these are evaluated independently with the scale references, as needed, and are reviewed with the group.

10.2.2 Five to six pairs of samples, with initial pairs quite different from each other, are evaluated on all attributes for all stages. For appearance/tactile panels, this includes appearance, pick-up, rub-out, and afterfeel. For fragrance panels, this may include product from container, in use, and/or after application at defined time points. This takes 10 to 12 h.

10.3 *Validation*—Any one of the following methods can be used for panel validation.

10.3.1 Choose three to four different products from the same product category (lotions, creams, gels, mousses, and so forth) that demonstrate significant differences on several attributes. When there is an established panel, the panel results from the recently trained panel are compared to the results of the same samples from the established panel. The recently trained panel should provide similar results in 80 % of all attributes.

10.3.2 Choose panel data across three to four different products from the results of the recently trained panel. Compare these data with consumer attribute data for those attributes

Prescreening Questionnaire for a Fragrance Panel

History
Name:_____
Address:_____
Phone (home and business):_____
From what group or organization did you hear about this program?_____

Time
1. Are you currently employed outside the home?_____
2. Are there any weekdays (M–F) that you will not be available on a regular basis?_____
3. How many days/weeks of vacation or certain holidays do you plan to take?_____

Health
1. Do you have any of the following?
Nasal Disease _____
Hypoglycemia _____
Allergies _____
Frequent cold or sinus condition _____

2. Do you take any medications which affect your senses, especially smell?
_____
3. Have you ever had an allergic or adverse reaction to any lotion, fragrance or cream? _____
If yes, please describe _____.

General
1. Is your sense of smell: (check one)
Worse than average _____
Average _____
Better than average _____
2. Does anyone in your immediate family or someone with whom you have close association work for a skin care product company?_____
3. Does anyone in your immediate family or someone with whom you have close association work for a marketing research or advertising company?_____

Prescreening Questionnaire for a Fragrance Panel

(Answer Key)
History
Name:_____
Address:_____
Phone (home and business): _____
From what group or organization did you hear about this program?_____

Time
1. Are you currently employed outside the home? *No/Part-Time*
2. Are there any weekdays (M–F) that you will not be available on a regular basis? *Never/Occasionally*
3. How many days/weeks of vacation or certain holidays do you plan to take? *None/2 weeks per year*

Health
1. Do you have any of the following?
Nasal Disease *No*
Hypoglycemia *No*
Allergies *No*
Frequent cold or sinus conditions *No*

2. Do you take any medications which affect your senses, especially smell?
No
3. Have you ever had an allergic or adverse reaction to any lotion, fragrance or cream? *No/Occasionally*
If yes, please describe *Dependent on product and type of reaction* .

General
1. Is your sense of smell (check one).
Worse than average _____
Average _____ *Dependent on ability versus capacity*
Better than average _____
2. Does anyone in your immediate family or someone with whom you have close association work for a skin care product company? *No (if conflict of interest exists, position at company will be determined appropriate/inappropriate on an individual basis.)*
3. Does anyone in your immediate family or someone with whom you have close association work for a marketing research or advertising company? *No (if conflict of interest exists, position at company will be determined appropriate/inappropriate on an individual basis.)*

FIG. 3 Prescreening Questionnaire for a Technical Expert Panel

for which consumers have demonstrated understanding and an ability to differentiate among products. If the panel data has a high correlation with the previously validated consumer responses for similar attributes, the panel data can be considered valid.

NOTE 1—A lack of correlation may be a function of consumer terms that are not related to the panel attributes or are not understood by the consumers.

10.4 *Panel Monitoring for Skin Feel Evaluation*—Three different factors can be monitored when reviewing data from the panel and assessors.

10.4.1 A measure of the variability within the panel (that is, among panel members) can be determined with three replications of several samples for all attributes and all assessors. The mean value and standard deviation for each sample for each attribute is computed. The assessors and panel leader can then look at the mean value for each sample and attribute versus each assessor's score. This permits the panel leader to determine whether one or more assessors are rating consistently higher or lower than the panel as a whole on one or more attributes. Review of the standard deviations across attributes demonstrates whether some assessors have standard deviations that are higher than most assessors and on which attributes. Large panel standard deviations indicate the need for a review of definitions, evaluation procedures, or reference standards for the attribute in question.

10.4.2 A measure of the repeatability of the panel as a whole can be monitored by analyzing three replications of the panel's evaluation of two or three samples of the same product type. An analysis of variance will determine whether the panel scores are the same for the same sample across the replicates. This analysis should be conducted for each attribute.

10.4.3 Analysis of the data collected from three replicates of different samples (as used in 10.3.2) can provide information on judge-by-treatment interactions in the analysis of variance. A significant F value on any attribute indicates that one or more

Prescreening Fragrance Quiz – Technical Expert Panel

PLEASE ANSWER EACH QUESTION IN YOUR OWN WORDS.

17. If a perfume is "floral" in type, what other words would you use to describe it?
_____
18. What are some products that have an herbal smell?
_____
_____
19. What are some products that have a sweet smell?
_____
20. What types of odors are associated with clean and fresh?
_____
21. How would you define the difference between fruity and lemony? _____
22. Briefly, what words would you use to describe the difference between a feminine fragrance and a masculine fragrance?
_____
23. What are some of the words which would describe the smell of a hamper full of clothes?
_____

Describe some of the noticeable smells in...
A bakery _____
A liquid dish detergent _____
Bar soaps _____
A basement _____
A McDonald's restaurant _____

Prescreening Fragrance Quiz – Technical Expert Panel

(Answer Key)

PLEASE ANSWER EACH QUESTION IN YOUR OWN WORDS.

10. If a perfume is "floral" in type, I what other words would you use to describe it? Flowery, perfumey, sweet, fresh, woody, rose, lavender _____
11. What are some products that have an herbal smell? _Chamomille tea, verbena candle, minty toothpaste _____
12. What are some products that have a sweet smell? _baby powder, vanilla,
_____
13. What types of odors are associated with clean and fresh? Spring-like and flowery, orange and lemony, citrusy,
_____
14. How would you define the difference between fruity and lemony? _fruity is sweeter, lemony is sharper, sour and citrusy
15. Briefly, what words would you use to describe the difference between a feminine fragrance and a masculine fragrance? _feminine is light and fresh, often floral, and sweet,_masculine is strong, rich, spicy and woodsy _____
16. What are some of the words which would describe the smell of a hamper full of clothes? __Sour, mildewed, bad, strong, reminiscent of wet cats or ogs... _____

Describe some of the noticeable smells in...
A bakery __caramelized yeasty warm bread
A liquid dish detergent __Spring-like and floral and soapy Bar soaps__Soapy sharp and perfumey
A basement __musty, dusty, mildewed

FIG. 4 Prescreening Fragrance Quiz—Technical Expert Panel

assessors are evaluating samples differently. Data for these attributes should be plotted to determine the assessors whose values are different from the panel as a whole.

10.4.4 *Ongoing Monitoring*—Every two to six months, repeat procedures (see 10.4).

11. Procedure

11.1 *Sample Preconditioning*—Samples should be reconditioned before conducting the descriptive evaluations. Preconditioning consists of storing the samples in an area with similar temperature and humidity conditions (see 11.5) until the samples equilibrate to those conditions.

11.2 *Skin Preconditioning*—For products evaluated on skin, skin should be preconditioned. The assessors should not apply lotions, creams, or any topical products to the volar forearms for approximately 4 h before an evaluation session. The test sites may be reused within 4 h if the sites are cleansed and dried thoroughly. However, possible product buildup or residual effect or both from prior treatments may affect the rating of subsequent treatments. This is especially true if the skin has been treated with antiperspirants or deodorants.

11.3 *Preparation of Test Sites*—Before product application, the assessors should cleanse and prepare the test areas.

11.3.1 The assessors may wash each forearm at the test facility under supervised conditions before the evaluation session, or they may wash at home before the evaluation session. Immediately following the wash, the arms should be rinsed thoroughly with tepid tap water and pat dried thoroughly with absorbent paper towels (non-fragranced, non-moisturized, and non-softened).

11.3.1.1 A recommended procedure for a supervised cleansing would include a 1-min wash with a mild soap (non-fragranced and non-moisturized) and a 15-min dry-out period.

11.3.2 Approximately 15 min after drying, the test sites (location for product application) should be marked on the forearms of each assessor. Using an appropriate skin marker (that is, eyebrow pencil or skin scribe), mark two 2-in. (51-mm) diameter circles on the inner aspect of the forearm.

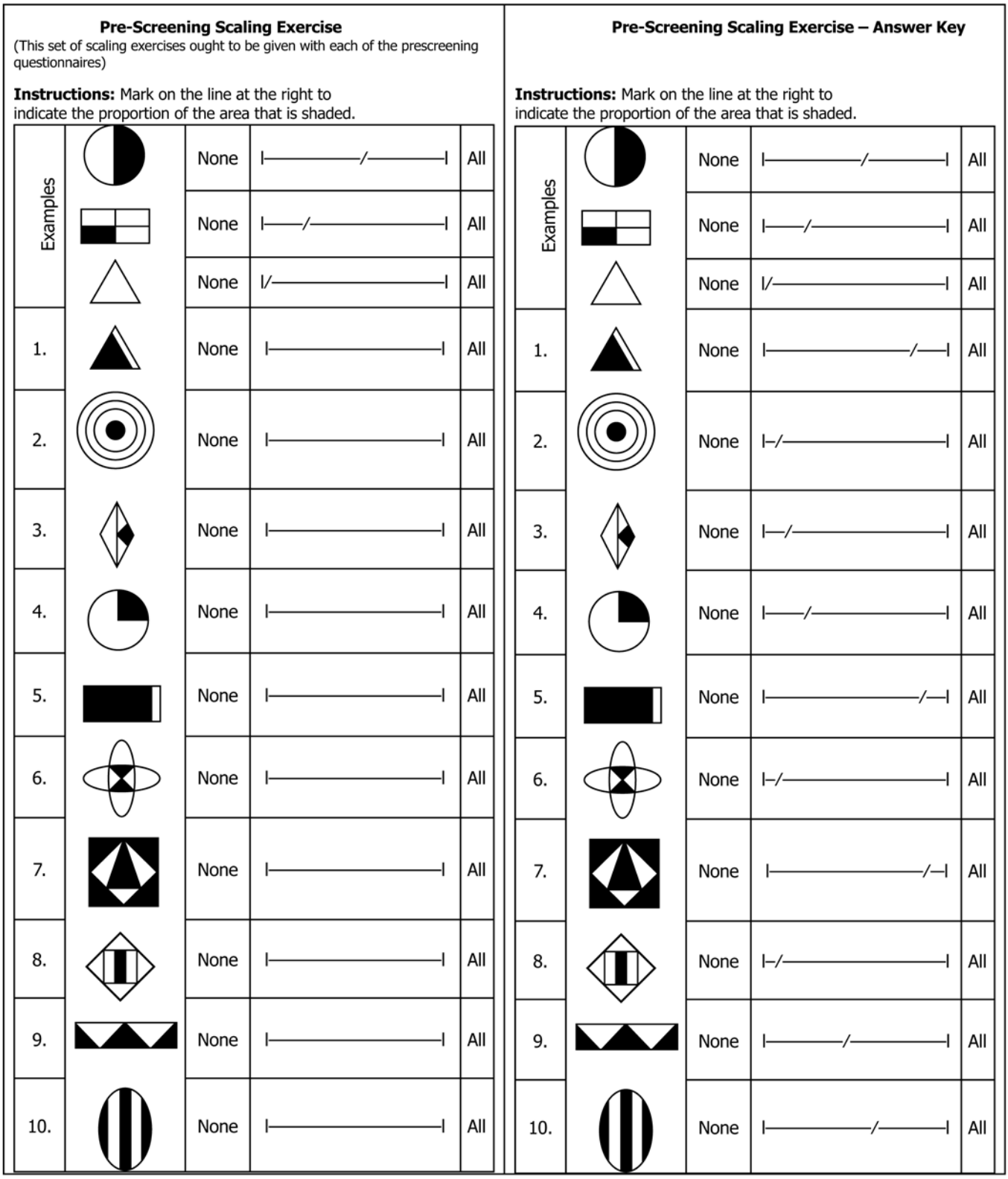


FIG. 5 Pre-Screening Scaling Exercise—Technical Expert Panel

The circles should be located 2-in. (51-mm) above the wrist and 2-in. (51-mm) below the elbow.

11.4 *Skin Temperature Reading*—The skin temperature of the test sites may be measured 15 min after the wash

Acuity Screening Scaling Exercise – Technical Expert Panel

Sample _____ **Code** _____

Ballot _____

Name: _____

Date: _____

Directions:

- Place 1 drop of product_____on forefinger tip of right hand.
- Compress the drop GENTLY between the forefinger and thumb.
- Estimate the AMOUNT of each attribute AS COMPARED TO MOST HAND LOTIONS.

THICKNESS: *force to compress*

|----------|
None Extreme

PEAKING: *amount the sample peaks (when fingers are pulled apart)*

|----------|
None Extreme

WETNESS: *amount of wet/watery feel to the product during compression or rotation of fingers*

|----------|
None Extreme

Acuity Screening Scaling Exercise – Technical Expert Panel

(Answer Key Template)

The answers for the acuity tests depend on the sample chosen.

Sample _____ **Code** _____

Ballot _____

Name: _____

Date: _____

Directions:

- Place 1 drop of product_____on forefinger tip of right hand.
- Compress the drop GENTLY between the forefinger and thumb.
- Estimate the AMOUNT of each attribute AS COMPARED TO MOST HAND LOTIONS.

THICKNESS: *force to compress*

|----------|
None Extreme

PEAKING: *amount the sample peaks (when fingers are pulled apart)*

|----------|
None Extreme

WETNESS: *amount of wet/watery feel to the product during compression or rotation of fingers*

|----------|
None Extreme

FIG. 6 Acuity Screening Scaling Exercise—Technical Expert Panel

procedure. During the 15-min wait, the assessors should be seated in the panel room.

11.4.1 The temperature of each site (2-in. [51-mm] circle) should be measured by placing the skin probe of the thermometer against the skin surface for approximately 1 min. Depending on the instrument used, the length of time per measurement may vary; however, the instrument should be used consistently among the assessors.

11.4.2 A record of the temperature readings should be placed in the study records. A history of skin temperature measurements may be used to correlate the effects of skin temperature with the rate of absorption, the within and between assessor variability, and other variables that may be influenced by skin temperature.

11.5 *Environmental Conditions*—The environmental conditions of the panel room should be controlled as much as possible.

11.5.1 For discussion and training, seating should be provided for the entire panel at a round table or in a table arrangement that facilitates group interaction. The assessors may sit at individual booths during the actual evaluation sessions.

11.5.2 All outside distractions and interruptions should be prohibited while the panel is in session.

11.5.3 The temperature and, if possible, relative humidity of the panel room should be maintained at a constant level. Comfortable levels should be established by the panel leader before the start of the session. The comfort level of the panel members should be taken into consideration.

11.5.3.1 Ambient temperature and humidity readings should be recorded before the start of the session and at approximately every hour interval throughout. A drastic change in room temperature or relative humidity (that is, 5°F (–15°C) or 8 % relative humidity or both) should be considered in the final

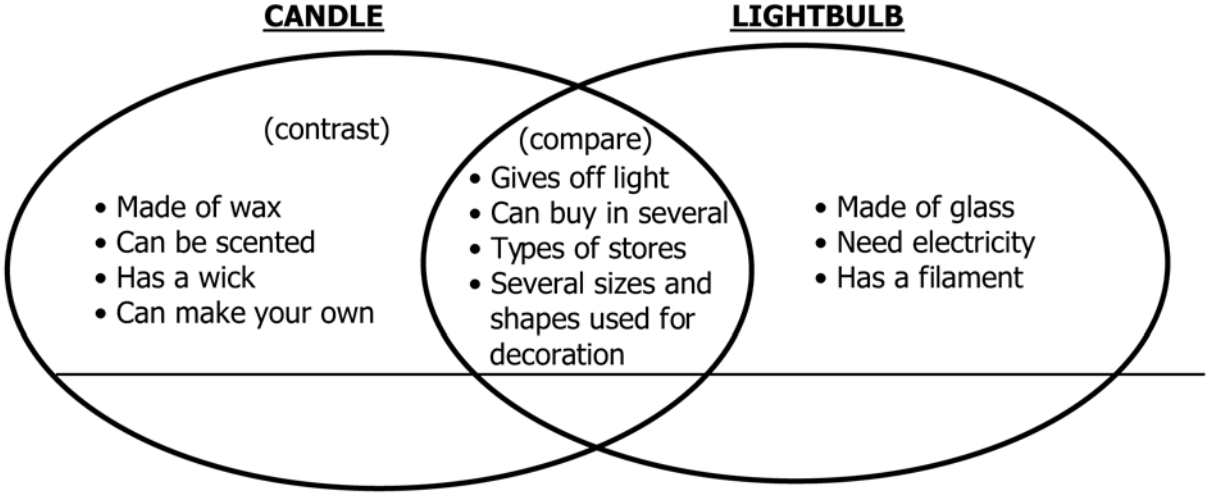
Directions:
As you know, even though objects/products may be in the same category they are not exactly the same. In this exercise, you are going to be comparing the sensory characteristics (look, feel, aroma, etc.) of two related products.

First, see the example below. In this example, you can see how a candle and a light bulb are alike (compare) and different (contrast.)

After reviewing the example, please fill in the worksheet on the next page using the same criteria – what is alike (compare) and what it different (contrast) about the two products.

Compare and Contrast Example

In the areas below, listed are examples of how candles and light bulbs are different (the "contrast" areas) and how they are the same (the "compare" area).



Compare and Contrast Exercise

Please think about **facial moisturizer** and **body lotion**. How are they alike? How are they different? In the outer circles, please describe all the ways **facial moisturizer** and **body cream**/ list the attributes they share. You are not strictly limited to how the products feel on the skin, but please include some of those differences and similarities.

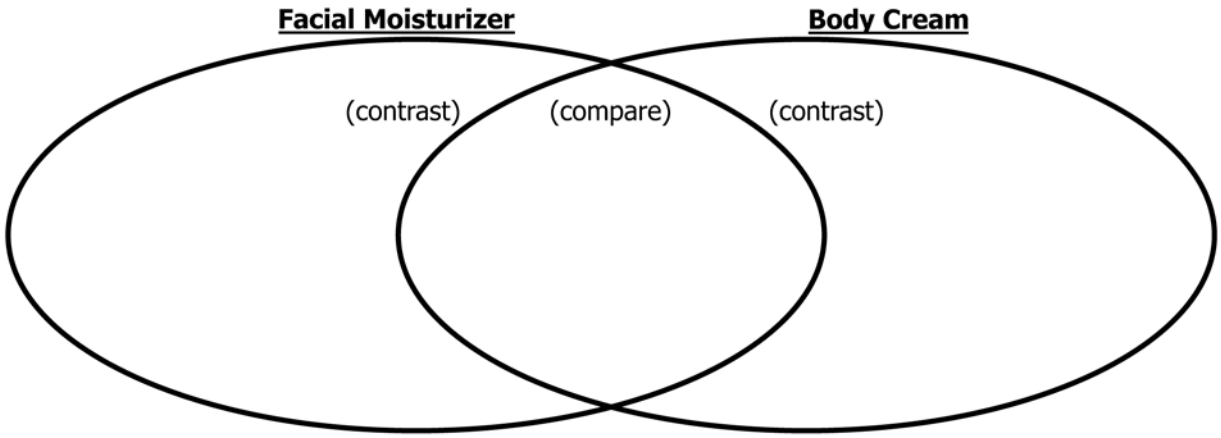


FIG. 7 Acuity Screening—Technical Expert Compare and Contrast Exercise

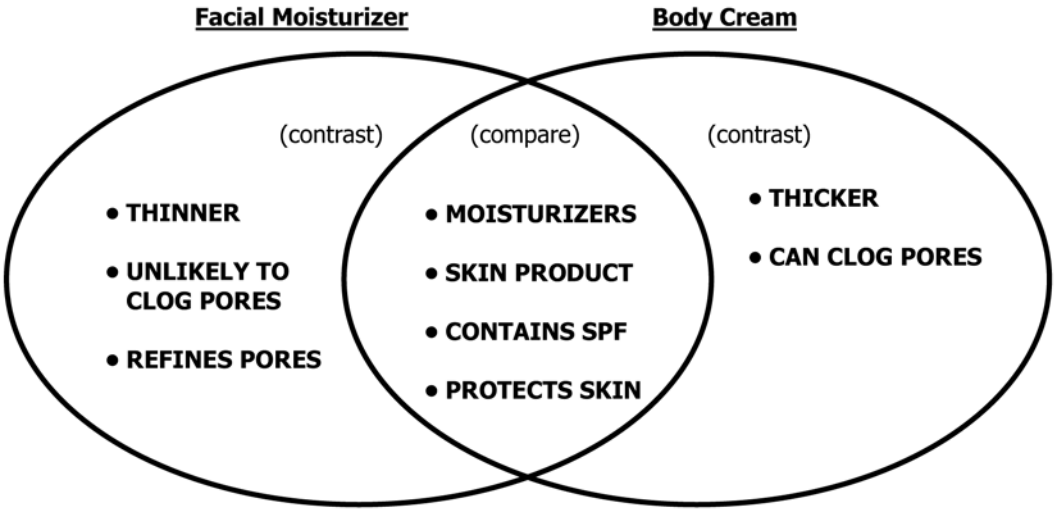


FIG. 8 Acuity Screening—Technical Expert Compare and Contrast Exercise (Answer Key)

Interview Questionnaire - Technical Expert Panel

Name: _____

Date: _____

1. Are you comfortable working in a group situation?
2. How do you feel about voicing your opinion?
3. How do you feel about opinionated people?
4. How do you feel about committing your time to a training program?
5. Are you interested in being an assessor?
6. Do you have any questions for me?

Comments:

Accepted: YES NO

Interview Questionnaire - Technical Expert Panel

(Answer Key Template)

Name: _____

Date: _____

1. Are you comfortable working in a group situation?
   Yes/think so
2. How do you feel about voicing your opinion?
   I comfortable voicing my opinion. I have no problem.
3. How do you feel about opinionated people?
   They do not bother me.
4. How do you feel about committing your time to a training program? *It does not bother me. I am flexible.*
5. Are you interested in being an assessor? *Yes.*
6. Do you have any questions for me?

Comments:

Accepted: YES NO

FIG. 9 Interview Questionnaire—Technical Expert Panel

interpretation of the data and noted in the final report. Immediately following such a drop, skin temperature measurements should be retaken (see 11.4).

11.5.4 Room lighting should be consistent for each panel member and remain standard within a given study. Individual lighting may be used during the appearance and afterfeel

TABLE 2 Terms Used to Describe Skinfeel of Lotions and Creams—Technical Expert Approach

1. Appearance	Definition: The attributes of a product measured by the sense of vision that may include, but not limited to, optical, rheological attributes of a product measured by manipulation between the fingers. In a Petri dish, dispense the product in a spiral shape. Using a nickel-size circle, fill from edge to center.	
	a. Integrity of shape	Degree to which product holds its shape: [Flattens - Retains shape]
	b. Integrity of shape	Degree to which product holds its shape after 10 s: [Flattens - Retains shape]
	c. Gloss	The amount of reflected light from product: [Dull/flat - Shiny/glossy]
2. Pick Up	Definition: The rheological attributes of a product measured by manipulation between the fingers. Using automatic pipette, deliver 0.1 cm^3 of product to tip of thumb or index finger. Compress product slowly between finger and thumb one time.	
	a. Firmness	Force required to fully compress product between thumb and index finger: [No force - High force]
	b. Stickiness	Force required to separate fingertips: [Not sticky - Very sticky]
	c. Cohesiveness	Amount sample strings rather than breaks when fingers are separated: [No strings - High strings]
	d. Amount of peaking	Degree to which product makes stiff peaks on fingertips: [No peaks/flat - Stiff peaks]
3. Rub out	Definition: The physical and rheological attributes of a product on the skin measured by rubbing the product on the skin to the point of product absorbency as well as kinesthetic sensations that may occur. Using automatic pipette, deliver 0.05 cm^3 of product to center of 200 circle on inner forearm. Gently spread product within the circle using index or middle finger, at a rate of two strokes per second. After Three Rubs, Evaluate for:	
	a. Wetness	Amount of water perceived while rubbing: [None - High amount]
	b. Spreadability	Ease of moving product over the skin: [Difficult/drag - Easy/slip]
	After 12 Rubs, Evaluate for:	
	c. Thickness	Amount of product felt between fingertip and skin: [Thin, almost no product - - - - Thick, lots of product]
	After 15–20 Rubs, Evaluate for:	
	d. Oil	Amount of oil perceived in the product during rub-out: [None - Extreme]
	e. Wax	Amount of wax perceived in the product during rubout: [None - Extreme]
	f. Grease	Amount of grease perceived in the product during rubout: [None - Extreme]
	Continue Rubbing and Evaluate for:	
	g. Absorbency	The number of rubs at which the product loses wet, moist feel and a resistance to continue is perceived [upper limit = 120 rubs]
4. Afterfeel (Immediate)	Definition: The physical and kinesthetic attributes of the skin surface after use of a product to include measurement of product residues.	
	a. Gloss	Amount or degree of light reflected off skin: [Dull - Shiny]
	b. Sticky	Degree to which fingers adhere to product: [Not sticky - Very sticky]
	c. Slipperiness	Ease of moving fingers across skin: [Difficult/drag - Easy/slip]
	d. Amount of residue	Amount of product on skin: [None - Large amount]
	e. Type of residue	Naming of all residues present on the skin to include, but not limited to oily, waxy, greasy, silicone (dry/slick), powdery, and chalky
5. Afterfeel (Additional time points)	Definition: The physical and kinesthetic attributes of the skin surface after use of a product to include measurement of product residues.	
	a. Gloss	Amount or degree of light reflected off skin: [Dull - Shiny]
	b. Sticky	Degree to which fingers adhere to product: [Not sticky - Very sticky]
	c. Slipperiness	Ease of moving fingers across skin: [Difficult/drag - Easy/slip]
	d. Amount of residue	Amount of product on skin: [None - Large amount]
	e. Type of residue	Naming of all residues present on the skin to include, but not limited to oily, waxy, greasy, silicone (dry/slick), powdery, and chalky

TABLE 3 Example of Scale Values (0–100) for Skinfeel Texture Attributes

Scale Value	Product	Manufacturer
	1. Integrity of Shape (Immediate)	
7	Baby Oil	Johnson & Johnson
40	Keri Lotion, Original	Novartis Consumer Health
85	Vaseline Intensive Care	Unilever
92	Lanacane	Combe Inc.
	2. Integrity of Shape (After 10 sec)	
3	Baby Oil	Johnson & Johnson
30	Keri Lotion, Original	Novartis Consumer Health
80	Vaseline Intensive Care	Unilever
92	Lanacane	Combe Inc.
	3. Gloss	
5	Gillette Foamy Reg. Shave Cream	Gillette Co.
72	Neutrogena Hand Cream	Johnson & Johnson
78	Vaseline Intensive Care	Unilever
98	Baby Oil	Johnson & Johnson
	4. Firmness	
0	Baby Oil	Johnson & Johnson
32	Vaseline Intensive Care	Unilever
55	Ponds Cold Cream	Unilever
84	Petrolatum	Generic
98	Lanolin AAA	Amerchol
	5. Stickiness	
1	Baby Oil	Johnson & Johnson
26	Vaseline Intensive Care	Unilever
43	Jergens	Kao Brands
84	Petrolatum	Generic
99	Lanolin AAA	Amerchol
	6. Cohesiveness	
5	Noxema Skin Care	Procter and Gamble
10	Vaseline Intensive Care	Unilever
50	Jergens	Kao Brands
82	Petrolatum	Generic
90	Zinc Oxide	Generic
	7. Peaking	
0	Baby Oil	Johnson & Johnson
36	Vaseline Intensive Care	Unilever
40	Curel	Kao Brands
77	Zinc oxide	Generic
96	Petrolatum	Generic
	8. Wetness	
0	Talc	Whitaker, Clark & Daniels, Inc.
22	Petrolatum	Generic
35	Baby Oil	Johnson & Johnson
60	Vaseline Intensive Care	Unilever
70	Aloe Vera Gel	Nature's Family
100	Water	—
	9. Spreadability	
2	Lanolin AAA	Amerchol
29	Petrolatum	Generic
60	Vaseline Intensive Care	Unilever
97	Baby Oil	Johnson & Johnson
	10. Thickness	
5	Isopropyl alcohol	Generic
30	Vaseline Intensive Care	Generic
65	Petrolatum	Unilever
87	Neutrogena Hand Cream	Johnson & Johnson
	11. Amount of Residue	
0	Untreated skin	—
15	Vaseline Intensive Care	Unilever
48	Therapeutic Keri Lotion	Novartis Consumer Health
65	Petrolatum	Generic

TABLE 4 Terms Used to Describe Fragrance of Lotions and Creams

Terms	Definitions
FLORAL	Total aroma associated with flowers.
White Flower	White flowers such as gardenias and jasmine.
Ylang Ylang	Floral, sweet, white flower, thymol, piney, resinous, tropical, animal
Jasmine	White flower, jasmine, green, sweet, animal-urine, hormonal, tropical fruit
Rose	Roses, floral, dried woody, musty
Muguet	Class that includes lily of valley and Muguet 41.315
Lily of the valley	Lily, green, sweet, floral, hyacinth, white flower
Muguet 41.315	Lily of the valley; citrus
Violet	Violet, floral, earthy
Floral/Other	Other flowers not mentioned above including hyacinth and carnation
Hyacinth	Viney, bell peppers, green beans, woody, earthy, white flowers, stemmy
CITRUS	Citrus aromatic impact that includes the raw and cooked notes and the distilled and expressed oil notes
Lime	Lime oil, lime juice
Orange	Orange candy, orange oil, fresh oranges, and orange juice
Bergamot	Citrusy, resinous, sweet, woody, orange
Lemon	Lemon oil, freshly squeezed lemon juice
Grapefruit	Freshly squeezed grapefruit oil, grapefruit juice
Tangerine	Freshly squeezed tangerine juice
Mandarin	Tangerine strings, albedo, sweet, mandarin orange, woody
Citral	Lemon, piney, maltol-vanillin, sweet, caramelized, Pledge
ALDEHYDIC	Nasal pungency, sweaty, fatty, soapy
Aldehyde C-8	Green, citrus, animal fat, ferns, spring
Aldehyde C-12	Green, cilantro, animal fat, ozonic
FRUITY	Total aroma associated with fruit.
Peach	Peaches, peach pits, processed peaches, sweet, fruity, fleshy
Grape/DMA	Grape character related to artificial concord grape drinks and gums [dimethyl anthranilate]
Green Apple	Overall impact of apples, cooked apples, raw apples, jolly rancher apple
Berry	Raspberry, cherry, strawberry blueberry
Red berry	Fruity, raspberry, cherry, strawberry
Melon	Melon flesh, rinds
Cantaloupe	Fermented melon rinds
Melon Ollifac	Green melon rind, artificial watermelon, Jolly Rancher, perfume-y overripe cantaloupe, peachy, slightly grape
Watermelon	Specific melon character related to watermelon fruit or green watermelon rind
Tropical	Tropical fruits including pineapple, guava, mango, passion fruit
Banana	Banana, banana flavored candy, amyl acetate
Papaya/mango	Fragrant ethereal tropical character of mango and papaya, often with some terpene character
FOUGERE	Dominant sweet note combined with a mossy, lavender note, with citrus character.
Lavender	Lavender, sweet, herbaceous, floral, woody undertones.
Mossy	Moss, earth, reminiscent of damp forest floor
PINE	Terpene found in pine and pine cleaners.
Spruce	Spruce, pine, lime, wood sap, resinous, sweet, Christmas tree
Alpha Pinene	Black pepper, musty, piney, brown spice, eucalyptol
Turpineol	Limey, piney, terpeney, Mr. Clean
SPICE	General category of brown and black spices.
Black	Ground black pepper, spicy
Pepper	Ground white pepper, ground black pepper.
Anise	Sweet; licorice, anise, cool, anethole, nasal cooling
Brown	Brown spices (specifically cinnamon, clove, nutmeg, etc.).
Clove Bud Oil	Clove, sweet, brown-spice, medicinal, eugenol
Clove Leaf Oil	Clove, sweet, spicy
Cinnamon Bark Oil	Sweet, woody, spicy, ground cinnamon bark
SWEET	Class if aromas that include honey, anise, maple syrup, brown sugar, vanilla, ethyl butyrate, benzaldehyde
Amber	Sweet sap, [related somewhat to woody, resinous, and powdery.
Caramelized	Heated/browned sugars and/or carbohydrates
Vanillin	Vanillin crystals, marshmallows.
POWDERY	Combination of vanillin and floral [usually rose] notes
CAMPHOR	Ethereal class of character notes including Eucalyptus, thymol, rosemary, cedar leaf, menthol, pine
HERBACEOUS	Green herbs such as oregano, thyme, basil, parsley, sage, rosemary, etc.
WOODY	General category of woody
Sandalwood	Specific sweet wood character of the sandalwood tree

TABLE 4 *Continued*

Terms	Definitions
RESINOUS	Medicinal, woody, tree sap, tar, balsamic
Olibanum	White pepper, sap, resinous, piney
Terpene	Piney, limey
GREEN	General class that includes stems, grass, leaves and the green of green herbs
Triplal	Cut grass
Green Leaves	Fresh leaves (not dried)
Stems	Fresh plant stems (not dried), such as those found in freshly cut flowers
Fermented Green	Fermented grass, stems, leaves, and vegetable matter
MOSS / CHYPRE	Moss, earth, and wet wood reminiscent of damp forest floor
Oakmoss	Woodsy, compost, chopped up leaves, musty, sweet, smoky
OZONIC / MARINE	Ozone, melon rinds, pre and post rain smells, and ocean or bay breezes
ANIMAL	Farm animals, stalls and barns
Leather	Animal origins, animal secretions, leather, and fat
Musk	Hormone, sweat, animal urine, [e.g., musk ketone, galaxolide, ethylene brassylate]
BASE	Unfragranced lotion or cream base
Soapy	Unfragranced soap, animal fat
Chalk	chalk
Petroleum	Petroleum

TABLE 5 Scale Intensity Values (0–15) for Fragrance Attributes: Integrated Product Scale

Scale Value	Reference
2.3	Diethyl pthallate DEP
8.3	Carnation
10.5	Citronellol
15.0	Benzaldehyde

evaluations. If colored lighting is used to mask color differences in samples, note it in the study records.

11.6 *Sample Delivery*—A uniform amount of the sample should be dispensed from a syringe or repeater pipette by the panel leader or panel technician.

11.6.1 The recommended amount for most lotions and creams is 0.25 in^3 (0.63 cm^3). Product amounts should not vary among judges or within a sample during an evaluation session. Syringes or pipettes should be loaded immediately before their use.

11.6.2 Weight boats may be used to dispense products too thick to be pulled up into a repeater pipette or a syringe. The product may be placed in (or onto the back of) the weight boat using a spatula. The product and weight boat should be weighed to ensure that a standard amount of the test product is dispensed. The assessor should be instructed to scoop the product out of the weight boat with a specified finger and place it on the forearm for evaluation.

11.7 *Sample Application:*

11.7.1 The sample is dispensed in the approximate center of the 2-in. (51-mm) circle. Immediately after the product is dispensed, the assessor uses a clean index or second finger to rotate the product in a circular manner within the test site. The direction of the circular rotations should remain constant.

11.7.2 A metronome may be used to ensure a consistent rate of product rotation among the assessors. It should be set at an established number of counts per minute so that the circular rub-in motion can be followed to the beat of the metronome by all assessors. A rate of two rubs per second is recommended for the application of 0.25 $in.^3$ (0.63 cm^3) of product spread in a 2-in. (51-mm) circle.

11.7.3 The samples may be dispensed to the same test site for each assessor so that each assessor evaluates the same test site at approximately the same time, or the samples may be balanced and randomized by location. The test site application pattern should be established by the panel leader before the start of the session.

11.7.4 The choice of which finger to use for spreading the sample should be determined before the start of the session. If the assessors decide to use the same finger for all applications, the finger should be cleaned and dried between uses.

11.7.5 The test sites and application fingers may be reused after 4 h if each is cleansed and dried thoroughly. However, possible product buildup or residual effect or both from prior treatments may affect the rating of subsequent treatments.

11.8 *Rating Scales*—Refer to ASTM MNL 26 for the type of rating scale to use to quantify the panel data.

11.9 *Test Design*—Refer to ASTM MNL 26 for the various designs that may be used.

11.10 *Orientation Session*—Conducting an orientation session depends on how often the panel is used and the uniqueness of the test samples. If the panel does not meet frequently, it may be necessary to conduct an orientation session with mock samples to reintroduce the panel to the procedures and attributes.

11.10.1 A test sample(s) that has unique or unusual properties should be introduced to the panel during an orientation session since it may be necessary to modify the established procedure or develop a new attribute or both.

11.10.2 The panel leader should make the final decision to conduct an orientation session. This requires that the panel leader be very familiar with the procedures and references used

by the panel. In addition, the panel leader should routinely evaluate the tactile properties of the test sample(s) on his/her own skin.

12. Report

12.1 It is recommended that a final report be issued to the project leader or requester. Include the following elements in the report:

12.1.1 *Summary*—Brief statement of test objectives, procedures, results, and conclusions.

12.1.2 *Objective*—Overview of the project or test objectives as agreed upon before the start of the experiment.

12.1.3 *Results*—Presentation and summary of the relevant collected data and statistical analysis.

12.1.4 *Discussion*—Interpretation of the theoretical and practical significance of the results and any relationships to previous knowledge.

CONSUMER BEHAVIOR APPROACH

13. Project Scope

13.1 Needs and strategic planning will help determine unique aspects of the project that may impact language development. Before starting any language development process, the panel moderator shall meet with the research team, which may include members of marketing and technical groups, and be organized to ensure efficient use of panel time. During this meeting, sensory acuity screening tests may be selected along with the array of products to be evaluated during language development. The panel moderator also may select a subset of products for use in the pilot test. This pre-planning helps ensure that the language is comprehensive, developed based on business objectives, and designed to capture similarities and differences of the category/products of interest.

13.2 Panels can be specific for a product (for example, hand lotions) or a category (for example, lotions, both hand and body) and so forth depending on the business needs of the organization. The process for screening, language development, and data collection remain the same; however, the products used in the language development process will change depending on the research objectives. The language created is dependent on the products used in its development. If the products are thoughtfully selected by the team, the language will be robust and is flexible for a variety of business objectives. In addition, as new technology is developed, if there is increased competition, the introduction of global products, or any new attributes that are observed, these changes can easily be incorporated into the existing language. The consumer behavioral language is dynamic, flexible, and can be readily adapted to the business issue of interest.

14. Equipment

14.1 Equipment necessary for the consumer behavior product evaluations requires best sensory practices regarding controlled environments. This includes appropriate temperate and lighting as these may impact individual assessor evaluations.

14.2 *Light Source/Viewing Conditions*—A consistent light source for each assessor is recommended for use during the evaluation of appearance. The type of light source will depend on the specific nature of the product being evaluated. It is important that all assessors receive the same amount of light on the arms and the same angle of light and that the distance from the test site and light be the same for each assessor (for example, high-intensity desk lamps).

15. Panel Recruitment and Qualifications

15.1 Potential assessors are pre-recruited following a specific script (usually via telephone or web based) that begins with appropriate category usage qualification (see Fig. 10). The interview includes assessment of availability, articulation, interest, and comfort with participating in a group activity. Once qualified in the pre-interview, about 30 consumers report to a central location testing facility and are given a series of up to 20 discrimination tests over the course of several days (see Fig. 11 and Fig. 12). These tests are designed to cover the range of products in the category(ies) of interest and cover each modality that will be evaluated by the panel including differences before, during, and after usage. The discrimination tests range from easy to moderate to difficult and are based on the product set(s) of interest. Discrimination tests may include appearance (for example, color, holds shape), during application (for example, thickness, ease of spreading), and after usage (smoothness, oiliness).

15.2 Assessors scoring significantly above and beyond chance in the series of screening tests (for example, ≥70 % correct duo-trio testing) qualify as having appropriate sensory acuity.

15.3 Select 12 to 14 assessors based on their sensory acuity and other qualifying measures as included in the prescreening process, including:

15.3.1 Articulation, long-term availability to participate in language development, results from the pilot testing, and subsequent data collection for the projects of interest and

15.3.2 *No Health-Related Problems*—Skin irritations, central nervous system disorders, or medications that interfere with the central nervous system and could reduce skin and muscle sensitivity and no previous history of allergy to lotions, creams, soaps, or other topical products.

16. Panel Training, Orientation, and Practice

16.1 To begin the language development process, an individual and group orientation is provided for the 12 to 14 selected assessors. During the orientation, the panel leader facilitates introductions and orients the assessors to the general concepts of language development, describing their sensations and perceptions of the product category. This orientation takes no longer than 30 min.

16.1.1 *Comprehensive Language Development*—Immediately following the orientation, the language development process begins as a group activity. Panel members are provided with an appropriate amount of product for evaluation and should be provided with more than they will actually use. The first product given to each assessor should be the one most "typical" for the category (for example, a gold standard, control), along with a category sheet (see Fig. 13). Each panel member is asked to write down their perceptions into

HAND AND BODY LOTIONS SCREENER

☐ (n = 30)	☐ Q7 100% 4 or more times/week	☐ Q8 100% 4 or more times/week

Name_____ Household #____# people living in house?_____

Address_____ State_____ Zip Code_____

City_____ Work Phone: (____)_____-_____

Home Phone: (____)_____-_____ Interviewer_____

Email Address_____ Date Interviewed_____

Hello, this is _____calling from _____ in _____. Today we are talking to different people in your area about various products they purchase, and we would like to include your opinions in our research. We will not try to sell you anything, nor will your name be given to anyone for the purpose of trying to sell you something. We think that you will find our questions interesting.

1. May I please speak to the female head of the household?

Female head of household	☐	**CONTINUE**
FHOH not available	☐	SCHEDULE CALLBACK

2. I would like to make sure I am including people of all ages, so can you please tell me your exact age?_____ years old (**RECORD EXACT AGE**)

Under 21	☐	TERMINATE
21 – 29	☐	
30 – 39	☐	**CONTINUE**
40 – 49	☐	
50 – 55	☐	**NO MORE THAN 10%**
Over 55	☐	TERMINATE

3. We are interested in talking with people who work in various industries. Do you, or any members of your family, or close friends work in the following industries? (READ ENTIRE LIST)

FIG. 10 Hand and Body Lotions Screener—Consumer Behavior Approach

categories/modalities such as “before usage” (visual, aroma, and so forth), “during usage” (hand feel, skin feel, application, and so forth), and “after usage.” Once each panel member has written down their individual perceptions, the panel leader calls on each assessor to state what they have written, and the panel leader tracks each response on the board. This process is repeated for three or four products that best represent the range of products in the research, at which time typically 90 % of the words needed to describe the product category will have been generated. Products shall be thoughtfully selected by the panel leader to ensure the range of variability within the product array of interest has been provided to the panel. Each panel session is about 90 min in length, and it may require more than one session to describe three or four products because of the physical nature of the category. The language development process is iterative, that is, the words that are generated in the first few sessions to cover the product category are reviewed, discussed, defined, and then consumers practice scoring products using an unstructured graphic rating scale (see Fig. 14). The panel develops a comprehensive list of words to describe the product array and the specific procedures for their evaluation that is most typical for the category of interest. In addition, the assessors decide upon appropriate anchor words for each scale (such as “weak” to “strong” or “slightly” to “very”). The panel leader creates definitions for each attribute scored based on input from the panel so that the final definitions (see Fig. 15) represent a true group consensus. The definitions are always present in the data collection sessions so that assessors can be reminded of the meaning of each attribute. This panel method is designed to provide direct consumer feedback to the technical developers and marketing teams on how these products are similar and different based on their sensory properties,

An advertising agency or public relations firm	☐	
A marketing research agency or marketing agency	☐	**TERMINATE IF YES TO ANY**
A radio or TV station, newspaper or magazine	☐	
A company that manufacturers or distributes beauty and/or personal care products	☐	

4. Have you ever participated in a market research study?

Yes	☐	**READ QUESTION 5**
No	☐	**SKIP TO QUESTION 6**

5. When was the last time you participated in a market research study?

Within the past 3 months	☐	TERMINATE
3 months ago or longer	☐	**CONTINUE**

6. Today we are interested in talking to people about various products they may or may not personally use. Which, if any, of the following products have you purchased and used in the past month? (READ LIST)

Skin Moisturizer	☐	
Hand Lotion	☐	**MUST MENTION TO CONTINUE**
Body Lotion	☐	**MUST MENTION TO CONTINUE**
Anti-Aging or Anti-Wrinkle Cream	☐	
Toner	☐	
Sunscreen or Sunblock	☐	
Skin Cleansers and Washes	☐	

7. You mentioned hand lotion. How often do you use hand lotion in a typical week? (CHECK ONE)

Less than once a week	☐	
Once a week	☐	
2-3 times a week	☐	
4 or more times a week	☐	**MUST MENTION TO CONTINUE**

8. You also mentioned body lotion. How often do you use body lotion in a typical week? (CHECK ONE)

Less than once a week	☐	
Once a week	☐	

FIG. 10 Hand and Body Lotions Screener—Consumer Behavior Approach *(continued)*

absent of brand and imagery. Measures from this consumer-based descriptive analysis method correlate well with consumer affective measures. The consumer-based language development process requires between 8 and 12 h of group discussions over five or six sessions (90 min each). In addition, some take-home activities may be incorporated to capture extended-use perceptions.

2-3 times a week	☐	
4 or more times a week	☐	**MUST MENTION TO CONTINUE**

9. How willing are you to trying different hand and body lotions?

Extremely Willing	☐	
Very Willing	☐	**MUST MENTION TO CONTINUE**
Somewhat Willing	☐	
Not Very Willing	☐	TERMINATE

10. How would you describe your skin type? (READ LIST)

Very Dry	☐	TERMINATE
Normal/Dry	☐	**20%**
Normal	☐	**60%**
Normal/Oily	☐	**20%**
Very Oily		TERMINATE

11. Are you allergic to any soaps or dyes or have any skin allergies, conditions, or sensitivities?

Yes	☐	TERMINATE
No	☐	**CONTINUE**

12. Now, I have a different question for you. Can you please describe your idea of the perfect salad? Tell me what ingredients you would use, what they would look like in the bowl, and why you've chosen this combination. (**CAPTURE RESPONDENTS EXACT WORDS. REFER TO ARTICULATION EXAMPLES BELOW TO DETERMINE LEVEL OF EXPRESSIVENESS. ONLY INVITE THOSE WHO ARE "ARTICULATE" AND "EXPRESSIVE"**.)

Inarticulate: TERMINATE
"A Caesar salad with romaine lettuce, parmesan, and croutons – because it tastes good."

Articulate: INVITE
"It would have organic lettuce, cherry tomatoes, cucumbers, sliced mushrooms, diced red onions, croutons and Italian dressing, because I love salads with a little bit of everything in them."

FIG. 10 Hand and Body Lotions Screener—Consumer Behavior Approach *(continued)*

Expressive: INVITE

"My idea of the perfect salad has a bunch of different ingredients in it. It would consist of a mixture of iceberg and romaine lettuces, diced avocado and tomato, fresh-cut corn kernels, and croutons or tortilla strips with a slightly spicy and creamy dressing. It would be really colorful, like a Mexican fiesta, and all the pieces would be perfectly bite-sized. I love the combination of all those different flavors and textures – like the contrast of the silkiness of the avocado with the crunch of the tortilla strips."

13. Please rate yourself on each of the following statements using a scale of 1 to 5, where 1 means you think the statement does not describe you at all, and 5 means you think the statement describes you very well.

I would feel comfortable giving my opinion in a group of my peers. _____ Terminate if 1 or 2.

I usually have an opinion on any given subject, and I express my opinion freely. _____ Terminate if 1 or 2

I enjoy meeting new people and getting to know them. _____ Terminate if 1 or 2

I prefer letting other people do the talking. _____ Terminate if 4 or 5

14. Just to be sure we include people of all backgrounds, which of the following best describes your education?

Some High School	☐	TERMINATE
Completed High School/GED/Trade School	☐	CONTINUE
Some College	☐	CONTINUE
College Graduate	☐	CONTINUE
Advanced College Degree (MBA, PhD, etc.)	☐	CONTINUE

INVITATION

The reason I have been asking you these questions is that we are inviting a select group of consumers in this area to become testers for various SKINCARE products at our facility. If you are selected, this would require your participation on an ONGOING BASIS, meaning we would continue to call you to see if you are available to come in and test various SKINCARE products. This is strictly a research project; you would never be asked to purchase anything. As a new participant in this research, you would become a new product tester, and your opinions would help bring new products to the marketplace. We have various session times available.

15. Would you like to know more about this project?

Yes	☐	Continue
No	☐	Thank & End Call

FIG. 10 Hand and Body Lotions Screener—Consumer Behavior Approach *(continued)*

16. Are you available to test in the morning hours (between 9:00-11:30)?

Yes	☐	Continue
No	☐	Thank & End Call

17. Are you interested in participating in this project?

Yes	☐	Continue
No	☐	Thank & End Call

"The first phase of this research will require you to come to our facility in XX on XX and the test will last 1- hour to sample various SKINCARE products. You will receive a total of XX **for completing the test**. The times we have available for the test are either.

9:00 am	10:30 am

18. Will you be able to join us at one of those sessions?

Yes	☐	CONTINUE
No	☐	**THANK AND END CALL**

If you qualify for the second phase of this research, it would require you to come to our facility again for 5 days from XX – XX for 90 minutes each day. **And you will also need to attend the third phase, which would require you to come to our facility for 5 more days, on** XX - XX. The third phase of the test will last 90 minutes each day. **You will be compensated at a rate of XX** and will be paid after completing the second and third phase.

19. If you were selected would you be able to join us on those dates at those times?

Yes	☐	CONTINUE
No	☐	**THANK AND END CALL**

THEY MUST BRING IN A PHOTO ID TO QUALIFY FOR TESTING

RECORD APPOINTMENT DAY AND TIME ON FIRST PAGE OF SCREENER

FIG. 10 Hand and Body Lotions Screener—Consumer Behavior Approach *(continued)*

17. Pilot Test and Validation

17.1 Once the sensory language has been developed for the product category of interest, a pilot test is initiated. This test is designed to evaluate individual assessor performance and determine if the panel, as a whole, is using the sensory attributes in the same or similar ways. Before the pilot test, the panel leader reviews the procedures, definitions, and rating scales for each attribute. Four products may be selected from the category that represents a broad sensory range. Then, these products are evaluated by each assessor, on a blind basis, in the individual testing booths and, if necessary, in an extended usage situation. For the pilot test, four replications are recommended. In this case only, the products are evaluated in the same order for each assessor. The reasoning behind this is that the pilot test data are analyzed to determine individual panel performance and attribute agreement, not product differences. The data should be analyzed thoroughly with one- and two-way analysis of variance (ANOVA) for each sensory attribute to determine whether the panel, as a whole, scored products different from one another. Multiple range tests (such as Duncan's Mean Range) are calculated after the ANOVA to identify statistically significant differences among products for

EXAMPLE OF ABBREVIATED SET OF HAND LOTION SCREENING TESTS

Screening samples may be selected from the marketplace to represent the category of interest. To begin the selection of products appropriate for sensory acuity screening, consult marketing and research and development for ideas and prototypes if possible. In addition, sensory staff should procure products of interest from different types of stores in the marketplace *(e.g., department stores, mass drug, warehouse, grocery, etc.)* to cover the intended category.

SAMPLE A	SAMPLE B	TEST TYPE *(Estimated Difficulty)*
Jergens	Nivea	Visual *(Medium/Hard)*
Neutrogena	Olay	Visual *(Easy/Medium)*
Nivea	Keri	Aroma *(Medium/Hard)*
Vaseline	St. Ives	Aroma *(Medium)*
Vaseline	Johnsons	Handfeel *(Easy/Medium)*
Olay	Lubriderm	Handfeel *(Medium)*
Dove	Nivea	Paired (Viscosity)
Neutrogena	Longs Brand	Paired (Greasy)

Day 1

	TEST TYPE	SAMPLE A	SAMPLE B
1	**Aroma** *(M/H)*	Nivea	Keri
2	**Handfeel** *(E/M)*	Vaseline	Johnsons
3	**Visual** *(E/M)*	Neutrogena	Olay
4	**Paired (Viscosity)**	Dove	Nivea

Day 2

	TEST TYPE	SAMPLE A	SAMPLE B
5	**Aroma** *(M)*	Vaseline	St. Ives
6	**Handfeel** *(M)*	Olay	Lubriderm
7	**Visual** *(M/H)*	Jergens	Nivea
8	**Paired (Greasy)**	Neutrogena	Longs Brand

Day 3

May include tests for extended usage activities, at home usage, and full hand coverage, etc.

FIG. 11 Example of Abbreviated Set of Hand Lotion Screening Tests—Consumer Behavior Approach

EXAMPLE HAND LOTION SCREENING SCORECARD

NAME: _____

Testing Procedure:
Apply Product A onto the back of your right hand. Then apply Product B onto the back of your left hand.

Please circle which product feels the *MOST GREASY*. Please write any related comments on the bottom half of the page.

_____ _____

A **B**

Note: *Screening test instructions must be modified such that they are relevant to the assigned sensory acuity task. Evaluation order balanced such that each product is evaluated in each position a relatively equal number of times.*

FIG. 12 Example Hand Lotion Screening Scorecard—Consumer Behavior Approach

each sensory attribute. Calculations include product means, standard deviations, and ranking of each product by attribute. Data are best presented in spider plots of product means created for each modality (and before, during, and after usage).

17.2 This pilot test data is only for the sensory department to make decisions on areas for remedial panel training.

17.2.1 *Remedial Panel Training*—Based on results of the pilot test, the panel is reconvened to discuss attributes and products in which the panel leader wishes to provide clarification of the definitions or evaluation methods or both.

18. Procedure

18.1 *Sample Preconditioning*—Samples should be reconditioned before conducting the descriptive panel. Preconditioning consists of storing the samples in an area with similar temperature and humidity conditions until the samples equilibrate to those conditions.

18.2 *Skin Preconditioning*—The assessors should not apply lotions, creams, or any topical products for approximately 4 h before an evaluation session. The test sites may be reused within 4 h if the sites are cleansed and dried thoroughly. However, possible product buildup or residual effect or both from prior treatments may affect the rating of subsequent treatments.

18.3 *Preparation of Skins*—Before product application, the assessors should cleanse and prepare the test areas.

18.4 *Environmental Conditions*—If the products will be evaluated in a central location facility, the environmental conditions of the panel and evaluation rooms should be controlled as much as possible.

18.4.1 For discussion and training, seating should be provided for the entire panel at a round table or in a table arrangement that facilitates group interaction. The assessors may sit in individual booths during the actual evaluation sessions.

18.4.2 All outside distractions and interruptions should be prohibited while the panel is in session.

18.4.3 The temperature and, if possible, relative humidity of the panel room should be maintained at a constant level. Comfortable levels should be established by the panel leader before the start of the session. The comfort level of the panel members should be taken into consideration.

18.4.4 Room lighting should be consistent for each panel member and remain standard within a given study. Individual lighting may be used during the appearance and afterfeel evaluations. Colored lighting to mask visual differences is not recommended for consumer-based methods unless it is for basic research; results on products obtained under masked

EXAMPLE OF CONSUMER BASED DESCRIPTIVE ANALYSIS
CATEGORY SHEET

Name:_____ Date:_____ Code:_____

Please write down what you notice before, during, and after usage.

APPEARANCE

AROMA

HANDFEEL

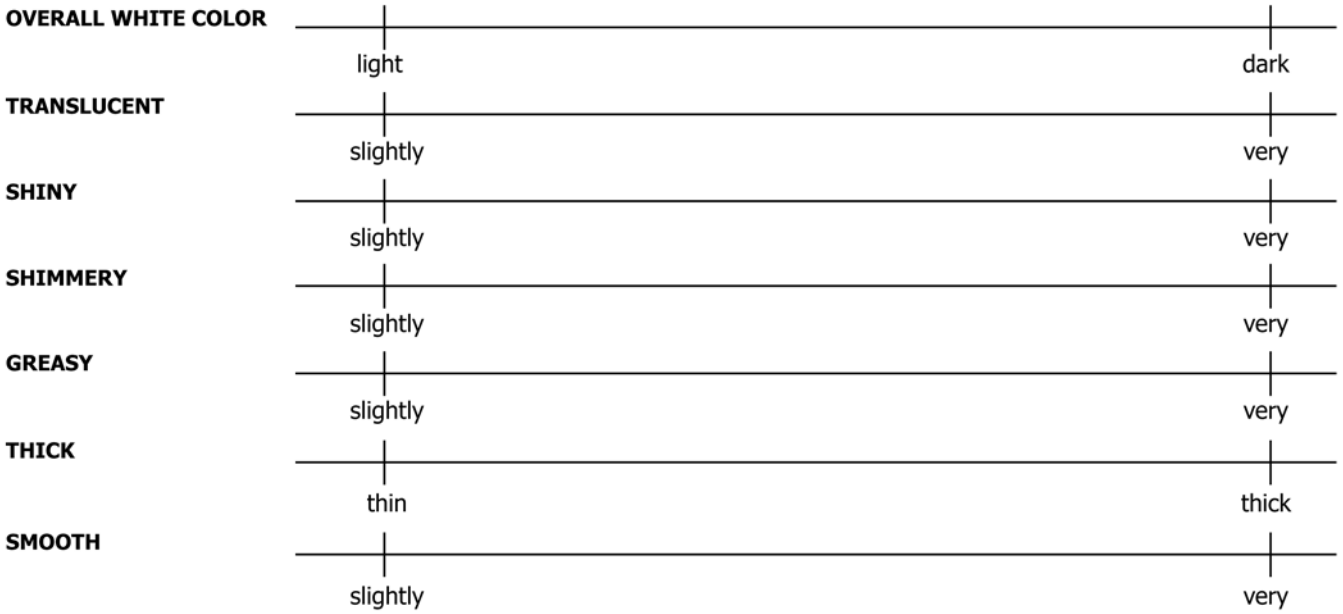
AFTEREFFECTS

FIG. 13 Example of Consumer Based Descriptive Analysis Category Sheet—Consumer Behavior Approach

CONSUMER BEHAVIOR SCORECARD EXAMPLE

APPEARANCE

- Look at the lotion before it is placed on the skin to evaluate:



AROMA

- Smell the product in the sample cup before it is placed on the skin:

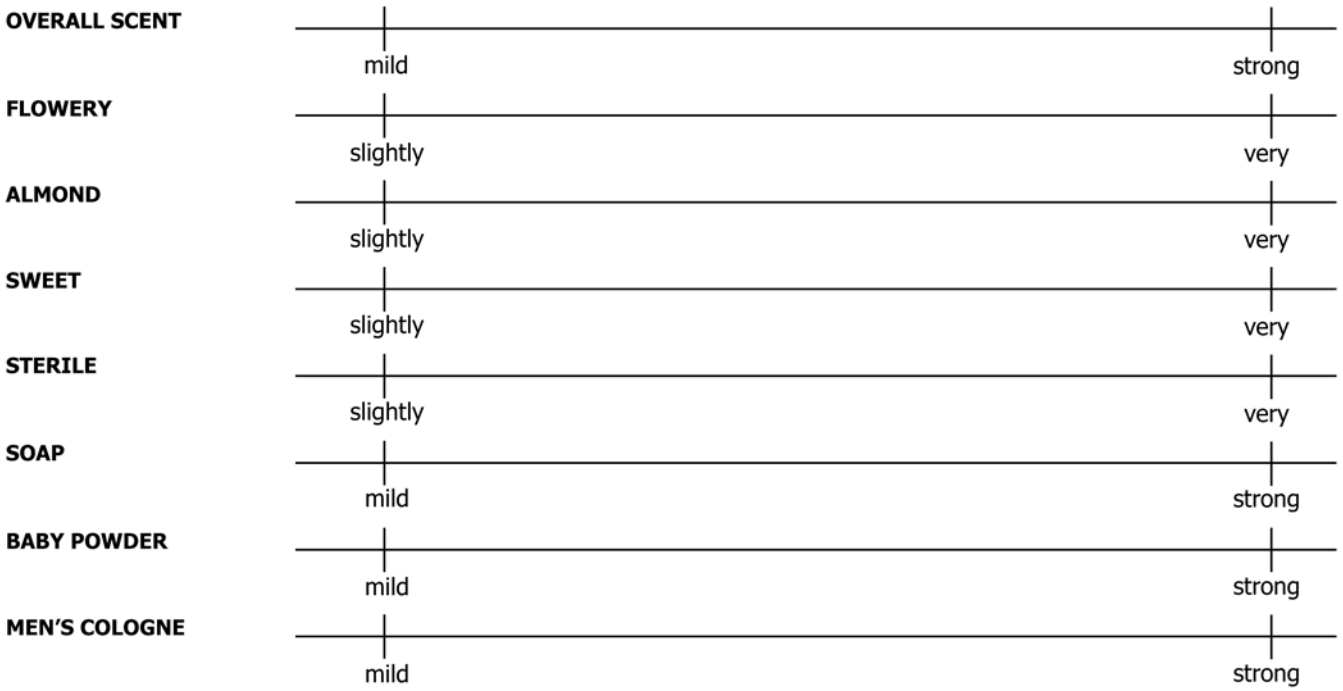


FIG. 14 Consumer Behavior Scorecard Example

CONSUMER BEHAVIOR DESCRIPTIVE ANALYSIS
HAND LOTION DEFINITIONS EXAMPLE

APPEARANCE

- Look at the lotion before it is placed on the skin to evaluate:

OVERALL WHITE COLOR (light-dark)	Measure of the color of the lotion from light like bright white or eggshell to dark like ivory or beige.
TRANSLUCENT (slightly-very)	Measure of how translucent the lotion looks. A lotion that is "slightly translucent" would look more opaque and might have an appearance similar to a pearl and a lotion that is "very translucent" would look more iridescent and would reflect an array of colors.
SHINY (slightly-very)	Measure of how shiny (glossy, wet) the lotion appears.
SHIMMERY (slightly-very)	Measure of a shimmery appearance where the lotion seems to have a glistening luster similar to glitter or sparkles.
GREASY (slightly-very)	Measure of how greasy (like ointment) the lotion appears.
THICK (thin-thick)	Measure of how solid the lotion looks ranging from thin like oil to thick like ointment.
SMOOTH (slightly-very)	Measure of how smooth the lotion looks from slightly smooth like milk to very smooth like cream.

AROMA

- Smell the product in the sample cup before it is placed on the skin:

OVERALL SCENT (mild-strong)	Measure of the intensity of any aroma perceived ranging from mild, subtle to strong, potent.
FLORAL (slightly-very)	Measure of floral aroma similar to roses, freesias, lavender, jasmine or any other fresh cut floral aroma.
ALMOND (slightly-very)	Measure of almond aroma similar to almond butter.
SWEET (slightly-very)	Measure of sweet aroma similar to strawberries, vanilla, or brown sugar.
STERILE (slightly-very)	Measure of sterile aroma similar to a medicinal or hospital aroma.
SOAP (mild-strong)	Measure of soap aroma ranging from mild like liquid hand soap to strong like bar soap.
BABY POWDER (mild-strong)	Measure of baby powder aroma or similar to talc.
MEN'S COLOGNE (mild-strong)	Measure of aroma of men's cologne that is to herbal, earthy, or musky.

FIG. 15 Consumer Behavior Descriptive Analysis Hand Lotion Definitions Example

HANDFEEL

THICKNESS (thin-thick)	Measure of how thick or solid the lotion feels when rubbing it in, ranging from very thin like oil to very thick like grease or ointment.
COATING (thin-thick)	Degree to which the lotion coats the skin as you are rubbing it in, ranging from a thin coating like oil to a thick coating like grease.
SMOOTH (slightly-very)	Degree to which the lotion feels smooth, silky, or creamy as it is rubbed into the skin.
SOFT (slightly-very)	Degree to which the lotion feels soft and velvety when rubbing it in.
STICKY (slightly-very)	Degree to which the lotion feels sticky or tacky when rubbing it in.
ABSORBENT (easy-difficult)	Measure of how easily the lotion is absorbed into the skin.

AFTER AROMA/AFTEREFFECT

ABSORBENT (slightly-very)	Measure of how absorbent the lotion is; a "slightly absorbent" lotion would be difficult to rub in and WOULD NOT be completely absorbed; a "very absorbent" lotion would be easy to rub in and WOULD be completely absorbed.
COATING (thin-thick)	Degree to which the lotion coats the skin as you are rubbing it in, ranging from a thin coating like oil to a thick coating like grease.
STICKY (slightly-very)	Measure of how sticky or tacky the skin feels.
SMOOTH (slightly-very)	Degree to which the lotion leaves the hands feeling smooth, soft, or silky after it has been rubbed into the skin.
WET (slightly-very)	Measure of how wet the lotion leaves the skin feeling, like there is a DAMP layer coating the hand.
SLICK (slightly-very)	Measure of how slick skin feels after lotion has been absorbed into the skin.
LASTING AROMA (weak-strong)	Measure of aroma perceived ranging from mild, subtle to strong, potent.
LASTING FEEL (short-long)	Measure of how long any feelings last on the hands; this does NOT include remaining aromas.
SHIMMER (slightly-very)	Measure of any shimmery appearance remaining on the skin, where the lotion seems to have left a glistening luster similar to glitter or sparkles.

FIG. 15 Consumer Behavior Descriptive Analysis Hand Lotion Definitions Example *(continued)*

lighting conditions may be misleading and may not correlate well with consumer behavior.

18.5 The assessors may wash at the test facility under supervised conditions before the evaluation session or they may wash at home with supplies provided by panel leader before the evaluation session. Immediately following the wash, the skin should be rinsed thoroughly with tepid tap water and dried thoroughly with absorbent paper towels (non-fragranced, non-moisturized, and non-softened).

18.5.1 A recommended procedure for a supervised cleansing would include a 1-min wash with a mild soap and a 15-min dry-out period.

18.6 *Sample Application*—Subjects are instructed to apply the product as they typically would in real-world conditions selecting different parts of arms, hands, or legs for application.

18.7 *Rating Scales*—Refer to ASTM MNL 26 or MNL 13 or both for the type of rating scale to use to quantify panel data. This consumer-based method uses a 6-in. (15-cm) unstructured graphic rating scale, anchored ½ in. (1.3 cm) from both ends with word anchors (weak/strong; slightly/very, and so forth. No numbers are presented on this scale.

18.8 *Test Design*—Refer to ASTM MNL 26 for the various designs that may be used. Balanced complete block designs with replication are recommended.

18.9 *Orientation Session*—The use of orientation sessions depends on how often the panel is used and the uniqueness of the test samples. However, a panel warm-up session or two are always recommended and, if the panel does not meet frequently, it may be necessary to conduct a longer, more in-depth language session to reintroduce the panel to the procedures and attributes.

18.9.1 A test sample(s) that has unique or unusual properties should be introduced to the panel during an orientation session since it may be necessary to modify the established procedure or perhaps develop a new attribute or both.

18.9.2 The panel leader should make the final decision on the length of the language warm-up sessions. This requires that the panel leader be very familiar with the procedures and products used by the panel.

19. Report

19.1 A final report or presentation or both should be issued to the project team. Include the following elements:

19.1.1 *Management Summary*—Background and objectives, brief methodology, conclusions, and recommendations.

19.1.2 *Research Objectives*—Overview of project background and objectives.

19.1.3 *Key Findings*—Presentation and summary of key results and their significance relative to objectives.

19.1.4 *Detailed Discussion*—Interpretation of business implications of results.

19.1.5 *Methodology*—Subject qualifications, product list, and language developed (may be moved to Appendix).

20. Keywords

20.1 aroma; assessors; consumer; cream; descriptive analysis; fragrance; lotion; personal care; quantitative descriptive analysis; sensory; skin care products; tactile

APPENDIXES

(Nonmandatory Information)

X1. CASE STUDY ON HAND AND BODY LOTIONS—TECHNICAL EXPERT APPROACH

X1.1 A case study was funded by Sensory Spectrum specifically for the purposes of this guide. In this case study, ten products were evaluated using a technical expert panel. The process and subsequent results are presented here.

X1.2 *Method*—The assessors used for this study consisted of two separate panels with assessor selection and training based on procedures outlined in the body of the guide. See Figs. 1-9 for examples of screening tools used before panel training.

X1.2.1 Appearance, texture, and skin feel evaluations were performed by a panel trained and validated in the technical descriptive evaluation of these sensory modalities for creams and lotions. The panel consisted of ten assessors with two to ten years of experience evaluating visual and tactile properties of personal care products. Products were evaluated using terms, definitions, and evaluation techniques provided in Table 2 and references provided in Table 3. Before evaluations, the panel went through a 2-hour orientation session in which all terms, definitions, techniques, and references were reviewed using the products to be evaluated in the test. Product references were also used as requested by the assessors. The panel evaluated product appearance, texture during manipulation (pick-up attributes), tactile properties in application (rub-out attributes), and skin feel and appearance immediately and 20 min after product absorbency. Data were collected using individual data with two replications. Analysis of variance (ANOVA) was performed on the data collected to identify products similarities and differences at an attribute level. Additionally, principal component analysis was performed and perceptual maps were generated.

X1.2.2 Fragrance evaluation was performed by a panel trained and validated in the technical descriptive evaluation of fragrances and fragranced products. This panel consisted of six assessors with five to twenty years of experience evaluating fragrances and fragranced products. Products were evaluated using terms, definitions, and evaluation techniques provided in Table 4 and references provided in Table 5. Before the evaluations, the panel went through a 2-hour orientation session in which all terms, definitions, techniques, and references were reviewed using the products to be evaluated in the

test. Product references were also used as requested by the assessors. For the purpose of this study, the panel evaluated product fragrance neat (product in a primary container with no product manipulation) only, although fragrance can be evaluated at multiple time points during and after application. Product references were also used as requested by assessors. For the purpose of this study, product fragrance neat (products presented in 3-oz. (89-mL) glass jars with no product manipulation) using consensus evaluations. Alternately, based on project objectives, fragrance intensity and description can be performed at multiple time points before, during, and after application. Additionally, based on project objectives, data can be collected using replicated individual data and analysis of variance can be performed on the data. These data were collected using consensus data. Principal component analysis was performed and perceptual maps generated to summarize the information collected and identify product similarities and differences.

X1.3 *Results*—Results are provided by attribute in Table X1.1 for product appearance and texture before, during, and after application and in Table X1.2 for fragrance properties. Table X1.1 includes ANOVA results for the study, and perceptual map results are provided in Figs. X1.1-X1.3. Results indicate that the products differ widely in their sensory characteristics.

X1.3.1 From an appearance and feel standpoint before, during, and after application, Sample E differs significantly from all other samples; in application, it is thicker, greasier, and waxier and less wet and spreadable than all other products. After application, it leaves the skin stickier, glossier, more coated (higher amount of residue), and more greasy than all other products. Such differences are still observed at 20 min after application. In contrast, Samples I and D are more similar; although the two products differ in rheological properties (Sample I has a much lower integrity of shape, less peaking, and higher cohesiveness than Sample D), the two products behave similarly during rub-out with the exception of Sample D taking longer to absorb into the skin. After absorbency, Sample D displays more silicone feel, while Sample I leaves the skin more greasy.

X1.3.2 With regard to fragrance evaluation, many differences are noted among the products. Total fragrance intensity varies widely from quite weak and mostly characterized by base notes (Sample E) or plastic vinyl notes (Sample I) or both

TABLE X1.1 Case Study Means and ANOVA Table of Skin Feel Evaluation of Hand and Body Lotions

Attribute	Sample A	Sample B	Sample C	Sample D	Sample E	Sample F	Sample G	Sample H	Sample I	Sample J	P-VALUE	LSD	sig
Product Pick-Up													
Firmness	34.0 CD	58.0 B	29.8 E	31.5 DE	80.6 A	31.8 DE	31.5 DE	37.3 C	33.4 D	33.6 D	<0.001	3.47	**
Stickiness	30.8 C	38.5 B	26.0 E	29.7 CD	81.9 A	25.9 E	25.8 E	28.8 D	30.2 C	29.9 CD	<0.001	1.28	**
Cohesiveness	12.9 C	10.6 CD	10.1 CD	10.7 CD	76.1 A	10.7 CD	9.5 D	11.0 CD	16.0 B	17.5 B	<0.001	2.91	**
Peaking	38.6 C	37.5 C	36.0 C	32.4 DE	88.3 A	36.3 C	29.9 EF	42.5 B	28.5 F	35.8 CD	<0.001	3.54	**
Product Appearance													
Integrity of Shape	86.7 BC	89.9 A	86.2 BCD	84.5 DE	90.8 A	84.0 E	84.7 DE	87.4 B	64.5 F	85.2 CDE	<0.001	1.95	**
Integrity of Shape (10 sec.)	86.1 B	89.7 A	85.3 BC	83.3 CD	90.8 A	80.5 E	82.1 DE	86.6 B	57.0 F	84.4 BCD	<0.001	2.54	**
Gloss	73.1 D	57.8 F	76.5 C	79.3 A	62.2 E	78.3 B	77.2 C	76.9 C	79.8 A	78.2 B	<0.001	0.9	**
Rubout													
Wetness	56.6 CD	44.9 E	62.2 A	60.1 AB	23.1 F	61.8 A	57.2 CD	55.2 D	58.5 BC	57.3 CD	<0.001	2.21	**
Spreadability	62.3 E	49.1 G	67.5 A	65.0 BC	25.4 H	66.6 AB	61.3 EF	60.3 F	64.5 CD	62.7 DE	<0.001	1.81	**
Thickness	31.2 DE	40.3 B	27.7 F	28.6 EF	57.4 A	30.2 EF	34.5 C	33.7 CD	31.0 DE	31.1 DE	<0.001	2.87	**
Oil	25.1 CD	24.9 CD	31.2 A	29.1 AB	18.1 E	31.6 A	31.0 A	27.3 BC	26.5 BC	21.9 D	<0.001	3.68	**
Wax	6.2 CD	8.4 B	7.1 BC	4.6 D	13.7 A	5.7 CD	5.2 CD	6.7 BC	6.1 CD	6.6 BCD	<0.001	2.16	**
Grease	28.6 DE	42.3 B	30.6 D	25.8 F	55.3 A	40.6 BC	39.3 C	42.4 B	29.1 DE	27.1 EF	<0.001	2.7	**
Number of Rubs to Absorbency	65.9 B	51.3 D	39.8 E	76.7 A	72.3 AB	64.4 BC	64.5 BC	54.8 D	65.0 BC	56.8 CD	<0.001	9	**
Afterfeel – Immediate													
Gloss	12.2 E	22.0 B	15.3 D	12.4 E	52.0 A	16.8 CD	22.5 B	19.1 C	14.8 DE	12.1 E	<0.001	2.84	**
Stickiness	10.8 DEF	13.0 BC	11.7 CDE	11.8 CD	24.9 A	14.1 B	10.2 EF	11.5 CDE	11.7 CDE	9.9 F	<0.001	1.55	**
Slipperiness	65.2 CD	65.2 CD	62.8 EF	65.8 C	61.2 F	63.9 DE	75.6 A	69.6 B	65.1 CD	66.4 C	<0.001	1.77	**
Thickness of Residue	12.5 CDE	18.3 B	13.5 CD	11.7 DE	35.5 A	13.2 CD	14.7 C	14.3 C	13.1 CD	10.6 E	<0.001	2.27	**
Amount of Residue	13.5 DEF	20.2 B	15.4 CD	12.7 EF	42.8 A	13.9 DEF	17.0 C	15.6 CD	14.6 DE	11.7 F	<0.001	2.39	**
Oil	2.3 F	12.9 B	8.5 DE	2.4 F	10.0 CD	7.3 E	16.9 A	11.6 BC	3.9 F	2.2 F	<0.001	2.17	**
Wax	82.6 A	45.4 D	62.8 C	81.8 A	36.2 E	71.1 B	29.4 F	42.2 D	75.2 B	81.0 A	<0.001	5.45	**
Grease	13.1 F	39.5 B	26.0 CD	7.5 F	53.9 A	20.6 DE	27.8 C	42.8 B	19.8 E	12.2 F	<0.001	5.81	**
Silicone	2.0 CD	2.3 CD	2.8 CD	8.2 B	0.0 D	1.0 CD	25.8 A	3.4 CD	1.2 CD	4.8 BC	<0.001	4.44	**
Afterfeel – 20 Minutes													
Gloss	10.5 DEF	14.3 B	10.4 EF	10.3 EF	26.3 A	11.1 DEF	12.8 C	11.5 D	11.4 DE	10.1 F	<0.001	1.19	**
Stickiness	2.8 DE	5.0 B	4.5 BC	1.7 E	13.6 A	3.2 CDE	5.2 B	4.0 BCD	1.9 E	2.3 E	<0.001	1.59	**
Slipperiness	75.3 C	73.8 D	75.8 BC	77.4 A	68.5 E	76.8 AB	77.9 A	76.0 BC	75.8 BC	77.3 A	<0.001	1.37	**
Thickness of Residue	5.9 CD	9.2 B	6.4 C	4.6 DE	19.6 A	5.2 CDE	6.7 C	6.8 C	6.2 C	3.9 E	<0.001	1.54	**
Amount of Residue	6.0 CD	10.4 B	7.1 C	4.9 DE	21.6 A	4.9 DE	7.3 C	6.6 C	6.8 C	4.1 E	<0.001	1.5	**
Oil	0.7 E	7.5 A	2.9 D	0.5 E	5.8 B	3.9 C	6.5 B	5.8 B	1.1 E	0.7 E	<0.001	0.96	**
Wax	85.3 A	56.3 E	67.3 D	76.0 BC	45.2 F	70.0 CD	45.9 F	63.8 D	81.8 AB	74.5 C	<0.001	6.6	**
Grease	7.7 DE	31.1 B	22.0 C	1.2 E	49.1 A	17.7 C	16.9 C	21.8 C	9.3 D	7.7 DE	<0.001	7.23	**
Silicone	3.0 CD	5.2 CD	7.9 C	15.7 B	0.0 D	8.4 C	30.8 A	8.6 C	7.8 C	7.2 C	<0.001	6.25	**

Means that share a common letter are not significantly different at the 95% Confidence Level if upper case / 90% confidence level if lower case
** = Significantly different at 95% confidence level
* = Significantly different at 90% confidence level
LSD = Least Significant Difference reported either at 95% if alpha <0.05 or at 90% if alpha <0.1

TABLE X1.2 Case Study Table for Fragrance Evaluation of Hand and Body Lotions

NOTE 1—For the purpose of this study, fragrance evaluation was performed before application using consensus data. Alternately, based on project objectives, individual panelists can rate fragrance separately and ANOVA can be run on the data. Additionally, fragrance intensity and description can be performed at various timepoints before, during and after product application.

Attributes	Sample A	Sample B	Sample C	Sample D	Sample E	Sample F	Sample G	Sample H	Sample I	Sample J
Total Intensity	5.5	8.5	6.5	6.0	2.8	7.0	3.5	7.5	3.5	6.5
Floral	0.0	5.5	1.5	2.0	0.0	0.0	1.0	3.0	0.0	0.0
Rose	0.0	3.5	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
Violet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
White Flower	0.0	2.0	1.5	2.0	0.0	0.0	0.0	1.0	0.0	0.0
Spicy (Carnation)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
Citrus/Terpene/Piney	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
Fruity	0.0	0.0	1.5	0.0	0.0	4.0	0.0	2.5	0.0	3.0
Stone	0.0	0.0	0.0	0.0	0.0	2.0 (Apple)	0.0	2.5	0.0	0.0
Melon	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
Berry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0
Sweet	4.0	1.5	3.0	1.0	1.0	0.0	1.0	1.5	0.0	3.0
Powdery	1.5	1.5	3.0	1.0	0.0	0.0	0.0	1.5	0.0	0.0
Benzaldehyde	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0
Green (Stems)	0.0	0.0	0.0	1.0	0.0	1.0	0.0	1.5	0.0	0.0
Spice (Brown/Cinnamon/ Clove)	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Herbaceous/Lavender	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ozonic/Marine	0.0	0.0	0.0	0.0	0.0	2.2	0.0	0.0	0.0	0.0
Solvent	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0
Plastic/Vinyl	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0
Base (Type)	2.2	1.0	1.5	3.5 (Soapy/Animal)	2.0 (Petroleum)	2.0	1.0	0.0	2.0	1.5 (Petroleum/Starch)
Balance/Blend	7.5	8.5	7.5	6.0	5.0	8.0	3.0	9.0	3.0	5.0

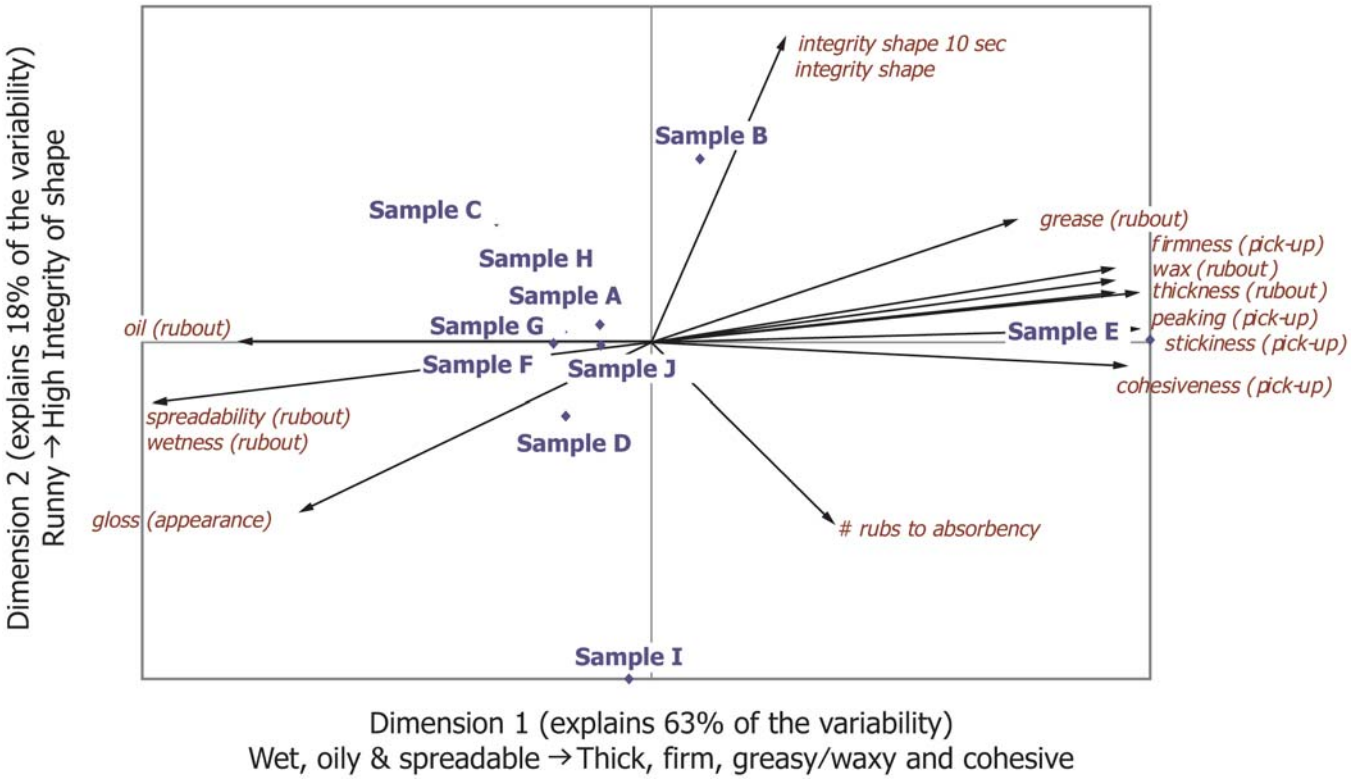


FIG. X1.1 Case Study: Perceptual Map of Skinfeel Texture Attributes of Hand and Body Lotions: Rubout and Appearance

to quite fragrant (for example, Samples B, H, and F). Among those more intensely fragrant products, fragrance characters differ, for example, Samples H and F are similar in intensity, but Sample F is mostly fruity (apple/melon) with green and ozonic undertones and the presence of a low-intensity base note. In contrast, Sample H is slightly more balanced and

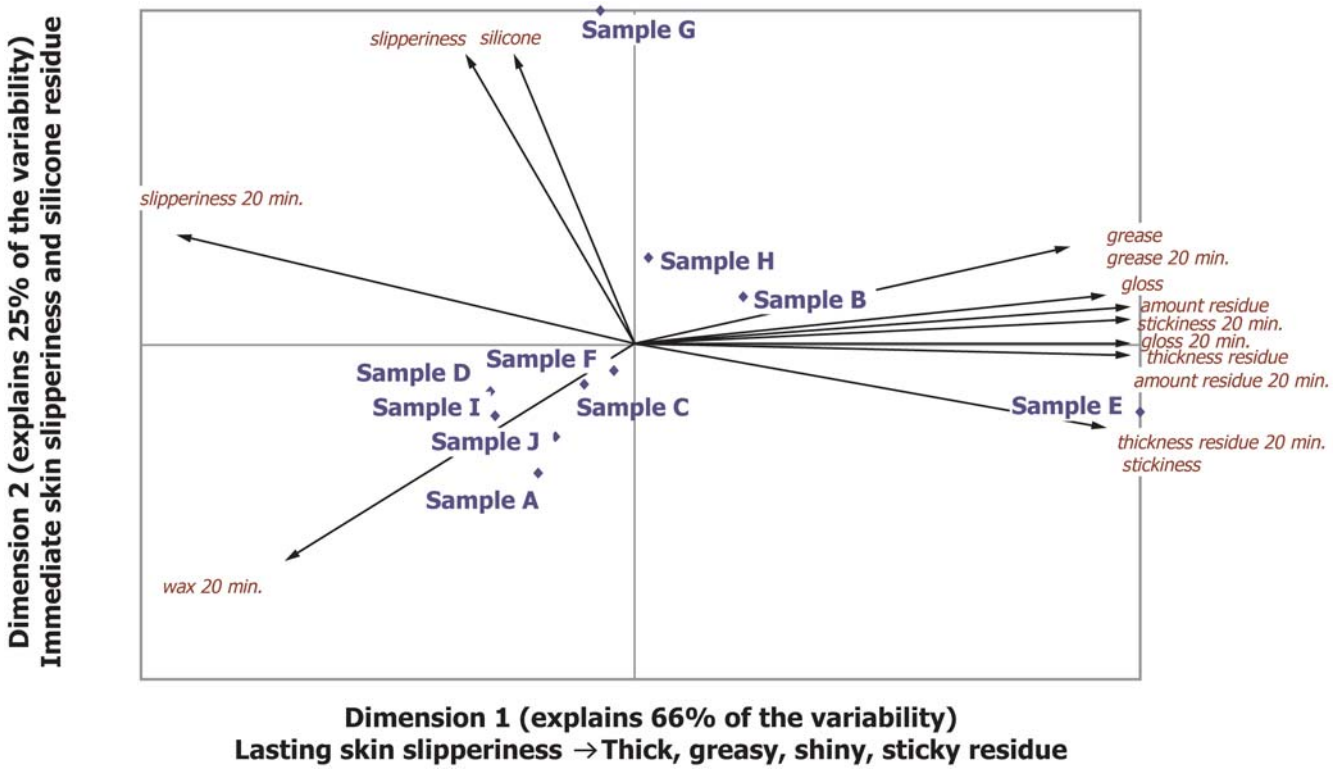


FIG. X1.2 Case Study: Perceptual Map of Skinfeel Texture Attributes of Hand and Body Lotions: Afterfeel

blended; base notes are fully covered by a complex floral arrangement complemented by fruity, sweet/powdery, and green/stemmy notes.

X1.4 *Conclusions*:

X1.4.1 The technical expert method used in this case study provides detailed information about each individual product sample included in the study. Data for each sample can be compared and contrasted with product profiles generated for another product or group of products within the study. This method provides objective and technical understanding of individual product properties with little risk for attribute misinterpretation and without the influence of personal preference or marketing information. Presentation of results can be tailored depending on project objectives. Such results provide invaluable information for product developers and marketers to use in supporting their efforts to improve or position existing products, learn about competitors' products, and identify areas of opportunities in which no product currently exists or they can differentiate themselves from their competitors. Use of the technical expert method alone can often provide the detailed information required for decision making without the need for consumer affective testing, thus representing a cost-effective and time-efficient way to collect large amounts of developer-actionable data. Data collected using the technical expert method can also be correlated with instrumental and quantitative consumer testing for the most robust understanding of products.

X1.4.2 Technical expert method results for appearance and texture evaluations consisted of ten assessors with two replications. The fragrance evaluation was conducted by a separate panel of six assessors using consensus data.

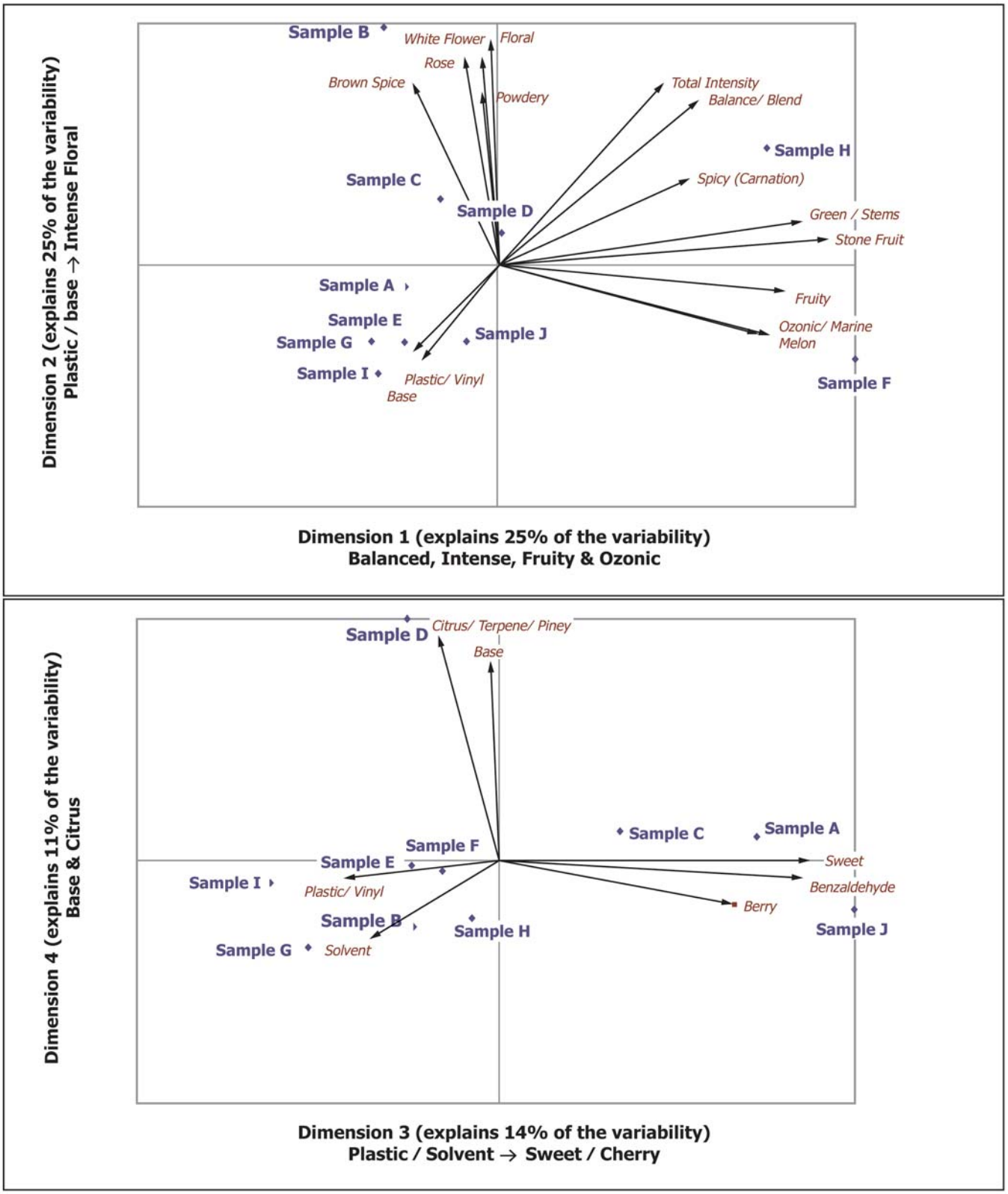


FIG. X1.3 Case Study: Perceptual Maps of Fragrance Attributes of Hand and Body Lotions: Neat Evaluation from Container

X2. CASE STUDY ON HAND LOTIONS—CONSUMER BEHAVIOR APPROACH

X2.1 A case study was funded by Tragon Corporation specifically for the purposes of this guide. In this case study, six products were evaluated using the consumer behavior approach. The process and subsequent results are presented here.

X2.2 *Panel Recruitment and Screening*—Potential assessors were recruited from the San Francisco Bay area based on standard consumer recruiting criteria of age, gender, and product category usage (see Fig. 10). For this particular study, they were required to have "normal" skin—not dry or oily. After prescreening, 28 consumers were recruited and invited to participate in sensory acuity screening tests. During this process, 16 discrimination trials were conducted using a broad array of hand lotions (see Fig. 11 and Fig. 12). In a typical consumer behavior panel, up to 30 trials may be used to screen potential assessors.

X2.3 *Panel Selection*—To create the panel, twelve assessors successfully completed the discrimination screening and participated in the language development sessions.

X2.4 *Language Development*—Five 2-hour sessions were held at a central location facility in which assessors developed a comprehensive descriptive language and definitions for the hand lotions of interest (see Fig. 13 and Fig. 15). The panel also developed an evaluation procedure and the scorecard on which to evaluate the product array to ensure all assessors followed the same procedures. Assessors were instructed to provide extended-use language and evaluations more typical of the consumer's experience. From these language sessions, 29 sensory attributes were identified—7 appearance, 8 aroma, 6 hand feel, and 8 after aroma/aftereffects.

X2.5 *Data Collection*—After assessors developed the language, they evaluated all six products individually on repeated occasions (see Fig. 14). Each product was evaluated by each assessors six times; three replications were done in the booths and three replications were conducted at home to provide an extended usage occasion.

X2.6 *Data Analysis*—For purposes of computation, assessors' responses on the line scales were converted to numbers from 0 to 60. These values were then entered into a computer program especially designed to analyze consumer-based method responses. The analyses consisted of:

X2.6.1 One-way analysis of variance (ANOVA) for each sensory attribute to measure subject consistency and contribution to identifying product differences;

X2.6.2 Two-way ANOVA (treatment by subject, with repeated measures, mixed model) for each sensory attribute to determine whether the panel, as a whole, scored the products as different from one another;

X2.6.3 Duncan multiple-range test for use after the ANOVA to identify statistically significant differences among products for each sensory attribute;

X2.6.4 Product means, standard deviations, and subject ranking of each product for each sensory attribute; and

X2.6.5 Mean values are then plotted to represent visually product similarities and differences.

X2.7 *Results and Discussion* —For illustration purposes, mean values for each product and each attribute are provided in Table X2.1. The results clearly indicate that significant differences were found for 14 of the 15 appearance and aroma attributes (all except almond aroma). Product 2 was most white, thick, and greasy with the least overall scent and had the least flowery, sweet, soapy, baby powder aromas but the most sterile aroma. Based on the spider plots for appearance and aroma, as shown in Fig. X2.1, Product 1 has more men's cologne and soap aroma than Products 2 and 3, whereas Product 3 was rated higher on floral and sweet aroma and was least thick, least greasy, and least white among these three products. Fig. X2.2 illustrates the spider plot for hand feel and aftereffects. Large and significant differences were observed between products and three are plotted for comparison. Table X2.2 illustrates principal component analysis for the 29 sensory attributes. In this study, 5 factors were found that accounted for 100 % of the product variance. This indicates that the sensory language created by the panel and the observed differences accounted for the product differences very well. Fig. X2.3 is a perceptual map that illustrates similarities and differences among the product array as viewed by the panel. Product 4 has more almond and baby powder aroma, a more shimmery appearance, and is more absorbent and shimmery in the after feel. Product 2 has a thick, greasy, white, and translucent appearance, a more sterile aroma, a more coating and sticky hand feel, and a sticky after feel. Product 1 has more men's cologne and soapy aromas.

X2.8 *Conclusions*—The consumer-based descriptive method provides a scientific approach to understanding consumer perceptions. Consumers can clearly differentiate among products that they regularly use and, with known sensory acuity and language development sessions, are able to describe and rate similarities and differences among products accurately. When data are analyzed from this panel method, statistical comparisons of products and perceptual space can be calculated and analyzed with other data sources such as analytical and consumer research. Differences observed by this panel method are highly correlated to consumer behavior and best-capture differences they observe in the marketplace that may influence their repeat purchase and usage.

X2.8.1 The consumer behavior approach provides a complete "picture" of an array of products.

X2.8.2 When combined with attitudinal and imagery measures, it has important business implications.

X2.8.3 A descriptive panel records what is perceived; it cannot provide an unbiased preference judgment.

X2.8.4 A descriptive panel measures what is perceived using all attributes, but all attributes are not equally important

TABLE X2.1 Means for Consumer Perceived Descriptive Attributes[A]

	White Appear		Translucent Appear
Product 2	29.65 a	Product 2	26.92 a
Product 4	25.53 a	Product 5	23.02 a
Product 1	25.15 a	Product 1	22.69 a
Product 6	17.15 b	Product 6	22.02 ab
Product 5	15.46 b	Product 3	17.79 bc
Product 3	9.35 c	Product 4	16.65 c
	Shiny Appear		Shimmery Appear
Product 1	32.35 a	Product 1	33.00 a
Product 5	30.92 a	Product 4	15.81 b
Product 3	30.54 a	Product 3	15.65 b
Product 6	28.65 ab	Product 2	14.06 b
Product 4	28.46 ab	Product 6	13.31 b
Product 2	25.50 b	Product 5	11.71 b
	Greasy Appear		Thick Appear
Product 2	31.29 a	Product 2	38.62 a
Product 5	29.58 ab	Product 5	35.38 ab
Product 4	23.88 bc	Product 4	33.01 bc
Product 1	22.35 c	Product 1	31.29 bcd
Product 3	19.88 c	Product 6	29.15 cd
Product 6	19.79 c	Product 3	26.15 d
	Smooth Ap		Overall Scent Ar
Product 1	38.42 a	Product 3	34.90 a
Product 4	38.15 ab	Product 1	31.02 a
Product 3	36.50 abc	Product 4	30.58 a
Product 6	36.08 abc	Product 5	19.40 b
Product 5	34.25 bc	Product 6	18.73 b
Product 2	32.71 c	Product 2	10.04 c
	Flowery Ar		Almond Ar
Product 3	31.02 a	Product 1	10.62
Product 1	19.79 b	Product 3	7.58
Product 4	15.71 b	Product 5	7.38
Product 5	15.40 b	Product 6	7.27
Product 6	12.67 b	Product 2	6.94
Product 2	5.21 c	Product 4	6.04
	Sweet Ar		Sterile Ar
Product 3	21.02 a	Product 2	17.35 a
Product 1	19.31 a	Product 6	15.17 a
Product 5	12.92 b	Product 5	12.44 ab
Product 4	12.38 b	Product 4	8.92 ab
Product 6	12.29 b	Product 1	5.56 b
Product 2	5.69 c	Product 3	5.48 b
	Soap Ar		Baby Powder Ar
Product 4	24.81 a	Product 1	20.04 a
Product 5	16.04 b	Product 5	9.52 b
Product 6	15.48 b	Product 3	6.81 bc
Product 3	13.48 b	Product 4	6.73 bc
Product 1	11.19 b	Product 6	5.98 bc
Product 2	8.62 b	Product 2	3.50 c
	Men's Cologne Ar		Thickness Hndfl
Product 4	19.19 a	Product 2	31.94 a
Product 3	7.31 b	Product 5	29.06 ab
Product 2	4.04 b	Product 6	28.19 ab
Product 6	3.65 b	Product 4	26.42 bc
Product 5	3.52 b	Product 1	22.88 cd
Product 1	3.42 b	Product 3	19.67 d
	Coating Hndfl		Smooth Hndfl
Product 5	28.52	Product 3	36.48 a
Product 2	28.19	Product 1	34.46 ab
Product 6	24.88	Product 4	33.98 ab
Product 4	23.67	Product 6	31.94 b
Product 3	21.96	Product 5	30.77 b
Product 1	20.85	Product 2	30.75 b
	Soft Hndfl		Sticky Hndfl
Product 3	35.87	Product 5	23.15 a
Product 1	34.31	Product 2	22.52 a
Product 4	33.46	Product 6	18.44 ab
Product 6	31.62	Product 4	16.92 ab
Product 2	30.79	Product 3	16.54 ab
Product 5	29.56	Product 1	12.50 b
	Absorbent Hndfl		Absorbent Afd
Product 6	30.81 a	Product 1	39.56 a
Product 2	30.50 a	Product 6	34.98 ab
Product 3	29.88 a	Product 4	33.27 b
Product 5	29.38 a	Product 2	32.94 b
Product 4	29.29 a	Product 3	31.96 b

Product 1	21.08 b	Product 5	30.17 b
	Coating Aft		Sticky Aft
Product 4	26.65 a	Product 5	19.71 a
Product 2	25.96 a	Product 2	18.42 a
Product 6	25.02 a	Product 4	16.94 ab
Product 5	23.88 a	Product 6	16.29 ab
Product 3	23.79 a	Product 3	12.94 bc
Product 1	16.38 b	Product 1	9.38 c
	Smooth Aft		Wet Aft
Product 3	35.31 a	Product 3	15.10
Product 1	35.27 a	Product 2	13.31
Product 6	32.64 a	Product 5	12.50
Product 4	31.54 ab	Product 4	11.90
Product 5	26.19 bc	Product 6	11.71
Product 2	23.35 c	Product 1	9.79
	Lasting Aft		Lasting Feel Aft
Product 3	37.38 a	Product 3	38.98 a
Product 4	36.69 a	Product 4	38.73 a
Product 1	35.06 a	Product 1	34.62 b
Product 5	25.88 b	Product 6	34.06 b
Product 6	21.74 b	Product 2	33.21 b
Product 2	12.31 c	Product 5	32.94 b
	Shimmer Aft		
Product 1	22.00 a		
Product 3	14.73 b		
Product 6	11.00 bc		
Product 4	10.73 bc		
Product 2	7.48 bc		
Product 5	4.90 c		

[A] Means with different letters are significantly different at the 95 % confidence level.

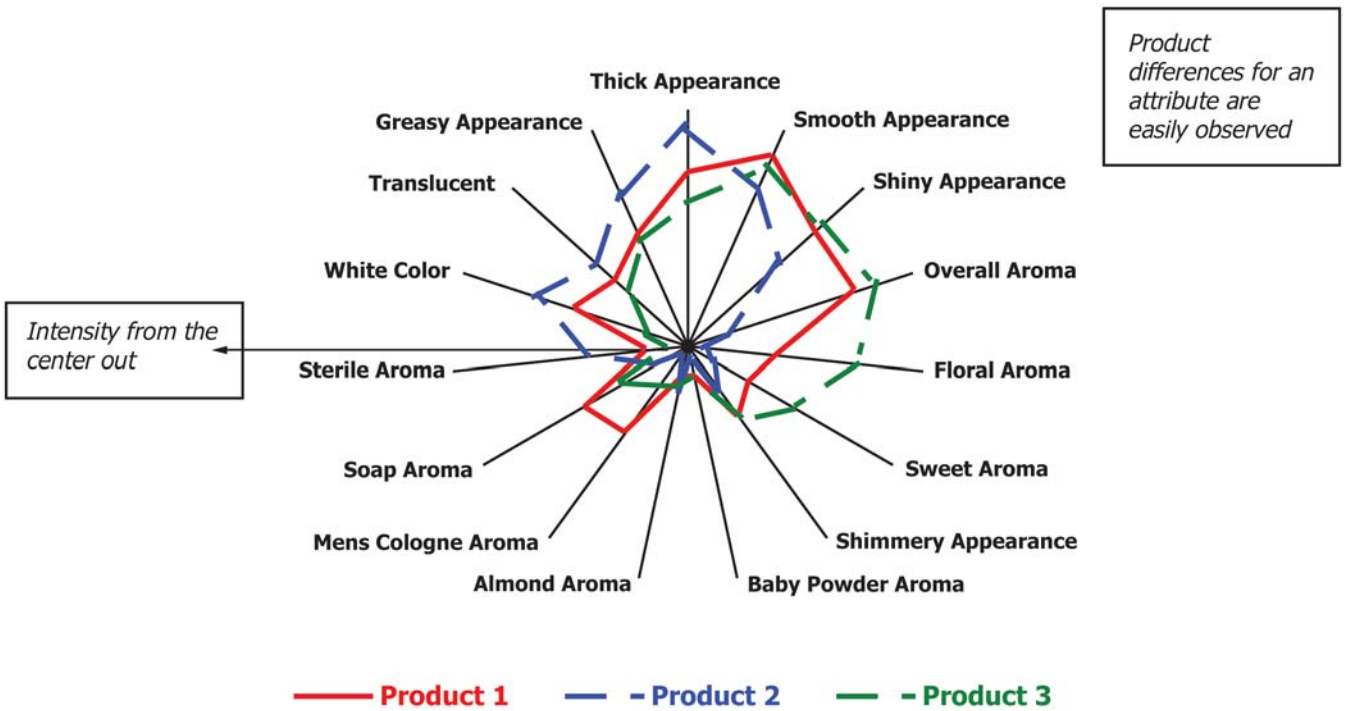


FIG. X2.1 Spider Plot of Appearance and Aroma Attributes for Three Hand Lotions

in the eyes of the consumer.

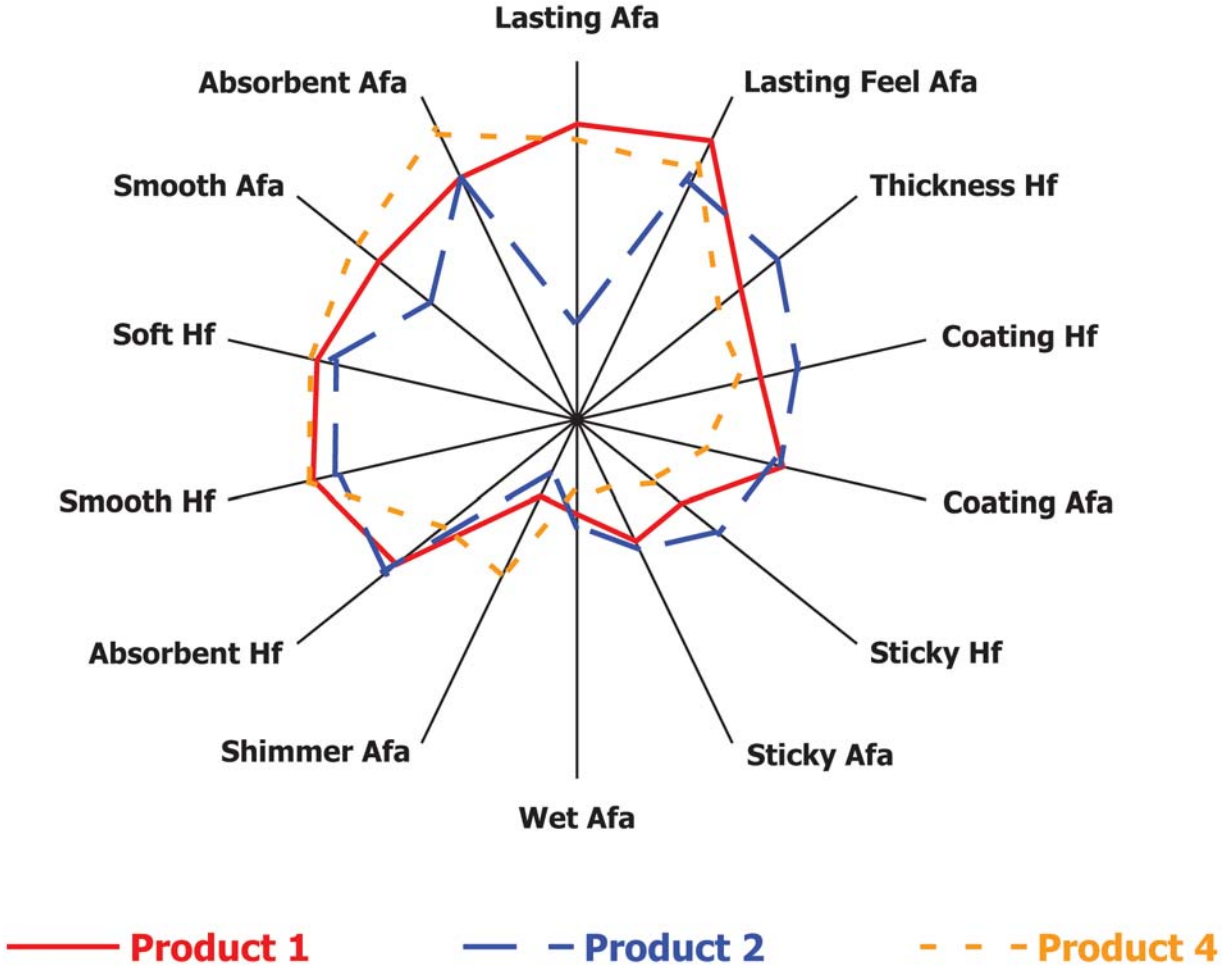


FIG. X2.2 Spider Plot of Handfeel and Aftereffect Attributes for Three Hand Lotions

TABLE X2.2 Principal Component Analysis for Consumer Perceived Descriptive Analysis

Rotated Component Matrix	Component					
	1	2	3	4	5	
Smooth Hf	0.952					
Soft Hf	0.943					
Lasting Feel Afa	0.855					
Flowery Ar	0.823			0.554		
Overall Scent Ar	0.820					
Lasting Afa	0.730		0.501			
Sweet Ar	0.711			0.557		
Smooth Afa	0.657				-0.578	
Coating Hf	-0.756					
Sterile Ar	-0.802					
Thickness Hf	-0.874					
Baby Powder Ar		0.952				
Shimmery Ap		0.937				
Almond Ar		0.882				
Absorbent Afa		0.850				
Shimmer Afa	0.586	0.733				
Sticky Hf	-0.624	-0.647				
Sticky Afa	-0.635	-0.684				
Wet Afa		-0.837				
Coating Afa		-0.911				
Absorbent Hf		-0.975				
Soap Ar			0.969			
Men s Cologne Ar			0.837			
Smooth Ap	0.521	0.531	0.552			
Translucent Ap	-0.655		-0.667			
Shiny Ap		0.594		0.737		
White Ap				-0.825		
Greasy Ap	-0.540				0.790	
Thick Ap	-0.632				0.656	
Percent Variance Explained	36.46	31.70	12.26	10.52	9.06	Total 100.00

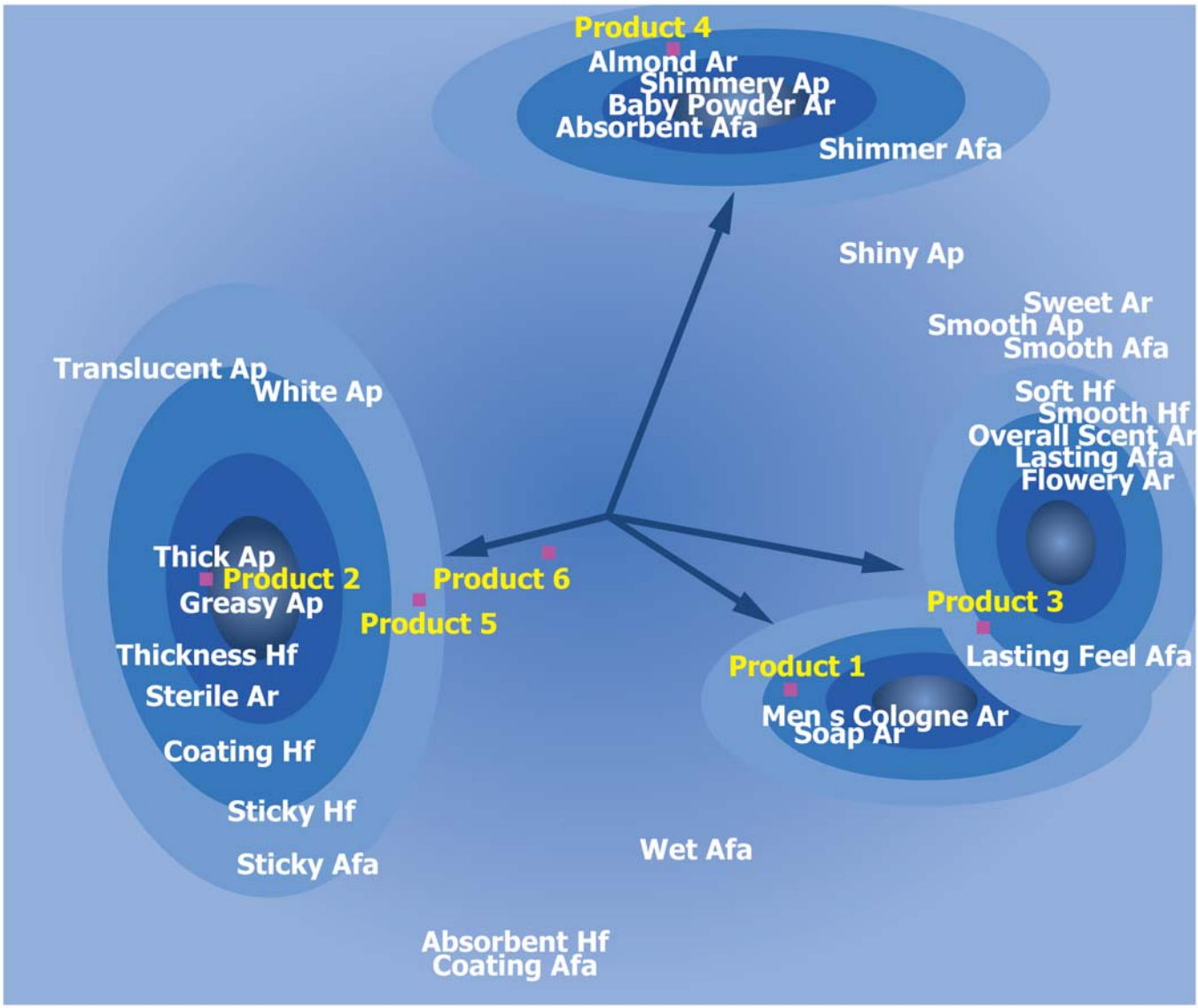


FIG. X2.3 Sensory Perceptual Map of Consumer Perceived Attributes and Products

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