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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

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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.