Statistical Analysis for Skin Care Sensory Panel and Panelist Performance Evaluation

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Introduction:

Sensory evaluation is a scientific discipline that is used to evoke, measure, analyze, and interpret the reactions to those products as they are perceived by the senses of sight, smell, touch, taste, and hearing . At first, it was mainly used in the food field. In recent years, it has become an important analytical technique in the cosmetics industry. Among them, Quantitative Descriptive Analysis (QDA), is a commonly used descriptive analysis method. The QDA method is used to evaluate some sensory quality indicators of products, and the sensory evaluators need to undergo professional consistency training. After the training, their results need to be assessed to determine the evaluation ability of the sensory panel and panelist. It mainly tests the Distinguish ability, Stability and Consistency of the evaluation sensory panel and panelist.

This article uses PanelCheck, SPSS, Excel data analysis software to discuss and explain how to test the evaluation performance of the skin care product sensory evaluation panel and panelists, and determine the direction of next training for the panel and panelists, so as to improve the rational management and reliability of evaluation results of the sensory evaluation panel.

Materials & Methods:

Materials	Methods
Gilson pipette (0-250μL) Medicine spoon Mirror Four skincare products 15 ml clear glass vials 12 evaluators	**Selection and training of evaluators**：requiring the evaluators to be free from any perceived defects, to be unbiased in the products tested, to be interested in and have some knowledge of the sensory evaluation of skin care products, and to be non-pregnant or lactating, with normal sensitivity.
	Evaluation procedure：The 12 evaluators were trained twice a week, and the assessment was conducted after 3 months. Test two products in the same session, and repeat the test after testing 4 products.
	Statistical analysis：Excel 2016, SPSS and PanelCheck were used to analyze the data of 33 sensory descriptors and the performance of the whole sensory panel and individual.

Results & Discussion:

Table 1. Discriminatory ability results of panel

Attributes	Product effect（P Value）
Shiny	0.000
Product transparency	0.000
Fluidity	0.000
Product thickness	0.000
Watery sensation	0.000
Oily sensation	0.000
Slippery sensation	0.002
Penetration	0.000
Skin reflection	0.000
Skin stickiness	0.000
Skin smoothness	0.193
Skin wetness	0.001
Skin moisture	0.000

Table 2. Stability results of panel

Attributes	Product-Session（P Value）
Shiny	0.540
Product transparency	0.565
Fluidity	0.276
Product thickness	0.000
Watery sensation	0.688
Oily sensation	0.844
Slippery sensation	0.716
Penetration	0.663
Skin reflection	0.995
Skin stickiness	0.295
Skin smoothness	0.273
Skin wetness	0.363
Skin moisture	0.788

Table 3. Discriminatory ability results of panelists

Attributes	A	B	C	D	E	F	G	H	I	J	K	L
Shiny	0.02	0.01	0.26	0.69	0.02	0.01	0.06	0.01	0.02	0.08	0.00	0.12
Transparency	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.48
Fluidity	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
Product thickness	0.01	0.02	0.00	0.00	0.22	0.11	0.23	0.09	0.01	0.02	0.00	0.00
Watery sensation	0.00	0.02	0.00	0.05	0.00	0.13	0.28	0.00	0.02	0.00	0.15	0.05
Oily sensation	0.01	0.00	0.00	0.04	0.00	0.17	0.01	0.00	0.00	0.03	0.09	0.59
Slippery sensation	0.00	0.05	0.03	0.03	0.04	0.38	0.01	0.55	0.01	0.00	0.68	0.03
Penetration	0.67	0.06	0.00	0.06	0.00	0.00	0.30	0.31	0.01	0.04	0.92	0.00
Skin reflection	0.09	0.38	0.00	0.28	0.00	0.15	0.75	0.45	0.23	0.00	0.01	0.07
Skin stickiness	0.15	0.02	0.18	0.04	0.02	0.00	0.00	0.76	0.63	0.00	0.16	0.33
Skin smoothness	0.76	0.58	0.56	0.71	0.61	0.95	0.40	0.07	0.60	0.17	0.60	0.49
Skin wetness	0.34	0.50	0.23	0.11	0.00	0.56	0.26	0.91	0.22	0.27	0.43	0.35
Skin moisture	0.00	0.00	0.01	0.16	0.00	0.03	0.18	1.00	0.01	0.02	0.01	0.65

In this paper, we found the panel performed well in discrimination ability and stability, but the scores on some attributes were discrete in consistency, especially on the attributes assessed on the face, this may be inconsistent with the evaluator's skin type and the evaluator's understanding of the attributes' definitions and requires further training. When evaluating the performance of the sensory evaluation panel and panelist, the criteria for passing can be set according to the actual situation.

Conclusions:

In this paper, a 12-member sensory evaluation panel was used to carry out a descriptive analysis of 33 evaluation descriptors for 4 skincare products. Use PanelCheck, Excel, SPSS to analyze descriptive data, to test the evaluation panel and panelists in three aspects of evaluation capacity. A mixed ANOVA model was used to test panel performance, in which the Product effect can be used to test the panel's discrimination ability and the product-session interaction can be used to test the stability of the panel. The panel consistency was evaluated using the mean standard deviation of four product ratings combined with the Tucker-1 plots. Panelist performance was evaluated using one-way ANOVA to evaluate individual discrimination ability, using MSE to evaluate individual stability, using correlation Plots combined with Tucker-1 Plots to evaluate the individual consistency.

This paper uses different data analysis methods to evaluate the performance of the panel and panelist, and determines the direction of retraining for the sensory evaluation panel and panelist, so as to realize the rational management of the sensory evaluators and improve the reliability of the evaluation data.

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