News Release

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mandom

Visualizing “scent” impressions, often indescribable in words, using an evaluation approach that uses scene images

—To decipher emotional value based on feelings from multiple perspectives, which cannot be gauged by physiological measurements and psychological tests—

Mandom Corporation (Head office: Osaka City, President Executive Officer: Ken Nishimura, hereinafter referred to as Mandom), as a human-oriented company, pursues “creation of new value” to delight, excite, and bring joy to our consumers. We engage in a variety of sensibility research not only to pursue the functional value of our products but also to enhance their emotional value.

For this research, we attempted a new method for evaluating scent impressions using scene images linked to words. This method made it possible to map the impressions of scents of lay persons not equipped with the expertise of perfumers, based on scores via images, and to visualize the characteristics using scene images.

This will allow us to promote the development of fragrances with a fortified understanding of their emotional value, in addition to their physical effectiveness, which can be evaluated using existing physiological measurements and psychological tests.

The results of this research will be presented at the 19th Spring Conference of the Japan Society of Kansei Engineering, which will be held from March 7th (Thursday) to 8th (Friday), 2024.

Background of the research

Compared to other senses, scent is difficult to accurately express in words, and therefore, it is said to be difficult to understand the impressions and emotions associated with scent. In recent years, in order to objectively understand the effects of scents on the body, it is standard practice to use the method of measuring reactions of the autonomic nervous system,[*1] brain activity, etc., and verifying the results based on physiological responses toward sedation or arousal. However, even with this method, it was not possible to gauge how people felt about scents. Understanding of the emotional aspect of the reaction to scents was lacking.

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Research content

It is said that smelling a scent evokes past experiences, scenes of experiences, and emotions related to them. We assumed that such memories could be represented by similar images and that the emotions associated with such similar images would tell us the impression of the scent. Based on this hypothesis, we attempted to grasp the intuitive impression of scents that people have by using scene images for scents that are difficult to explain in words.

■ Experiment overview
[Subjects] 19 women aged 30-49
[Tested scent] Scent used for skin care products (hereinafter referred to as Fragrance A), lavender essential oil, sweet orange essential oil (all 1% dipropylene glycol solution)
[Evaluation method (Figure 1)]
・21 scene images, 16 emotion words, and 16 impression words are selected in advance.
・Experiment subjects associate selected emotion words and impression words with each scene image in advance.
・Smell each scent from the mouth of the bottle and select one or more images that match the scent. The selected images are weighted and scored based on their degree of compatibility with the scent.
・The image score is replaced with the score of the words associated in advance, and analyzed.

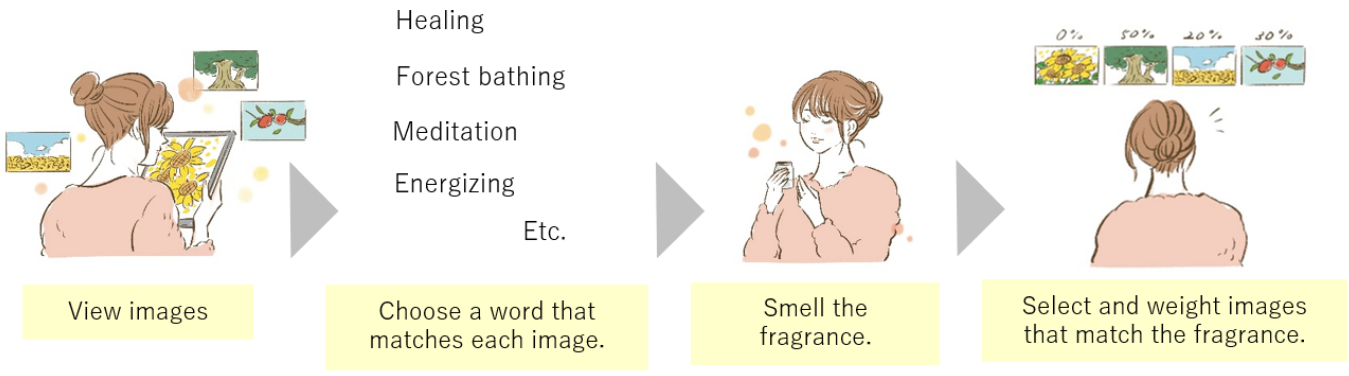

Figure 1. Evaluation method

We conducted correspondence analysis quantification method III) on the scores converted into emotion words and created a map (Figure 2). Words placed near each test scent indicate a strong association with that scent. In this analysis, we derived the strength of the relationship between

each scent and emotion words from numerical data and reflected this onto a two-dimensional map. From this map, lavender essential oil has sedating properties, such as “Calming/soothing” and “Relaxing,” while sweet orange essential oil has arousal properties, such as “Exciting” and “Energizing/invigorating.” It was confirmed that the characteristics of these two types of scents are not different from those conventionally recognized. Sedation and arousal are contradictory characteristics and were in positions of symmetry on the map. Other emotion words were also positioned in a way that is not contradictory, so the reliability of the resulting map was considered to be high, suggesting the effectiveness of this method.

Figure 3 shows the most frequently selected images for each scent and the impression words most often associated with those images. From Figures 2 and 3, it was visualized that Fragrance A used in this test evoked a relieved feeling of “Healing” and positive feelings of “Clarity” and “Bright,” as well as expressing the gorgeous femininity of flowers and fruits.

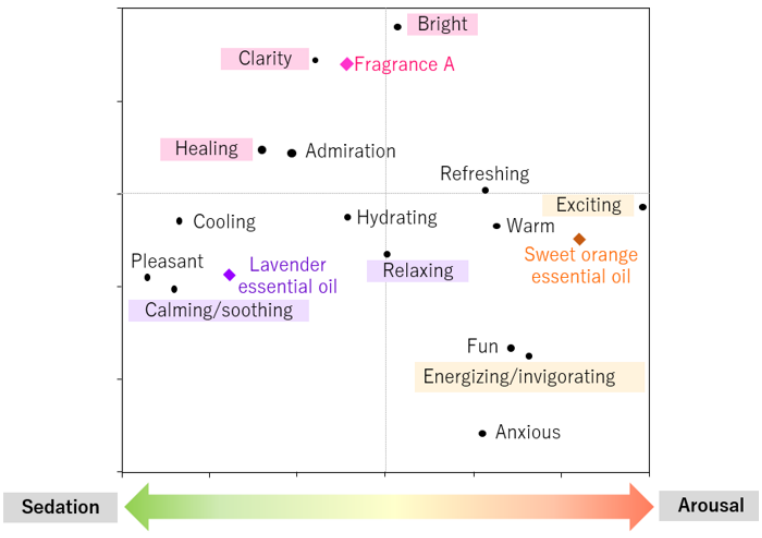

Figure 2. Correspondence analysis map using emotion words

	Images selected from scents (The number in parentheses is the score percentage against the whole.)		
Fragrance A	(19%) 	(9%) 	(8%) 
Impression words	Cute	Lush	Pure
Lavender essential oil	(11%) 	(11%) 	(10%) 
Impression words	Pure	Lush	Meditation
Sweet orange essential oil	(46%) 	(22%) * 	
Impression words	Fresh	Lively	

Figure 3. Images selected from scents with high scores
(The impression words in the bottom row are those most often associated with images.)

To confirm the physiological and psychological effects of this scent on the body, we took physiological measurements and conducted psychological tests using Fragrance A. Compared with smelling air (Control), smelling Fragrance A significantly increased the miosis rate*[2] and peripheral skin temperature*[3], which are indicators of the autonomic nervous system responses*[1], accompanied with that decreased brain activity in the central part of the prefrontal cortex, which is an indicator of the central nervous system*[4] response measured by fNIRS*[5] (Figure 4). Furthermore, in a psychological test using the POMS2 short form,*[6] after smelling Fragrance A,

significant decreases were observed in the subscales of Anger-Hostility, Depression-Dejection, and Fatigue-Inertia. All of these changes in physiological measurements and psychological tests were indicative of a response toward sedation.

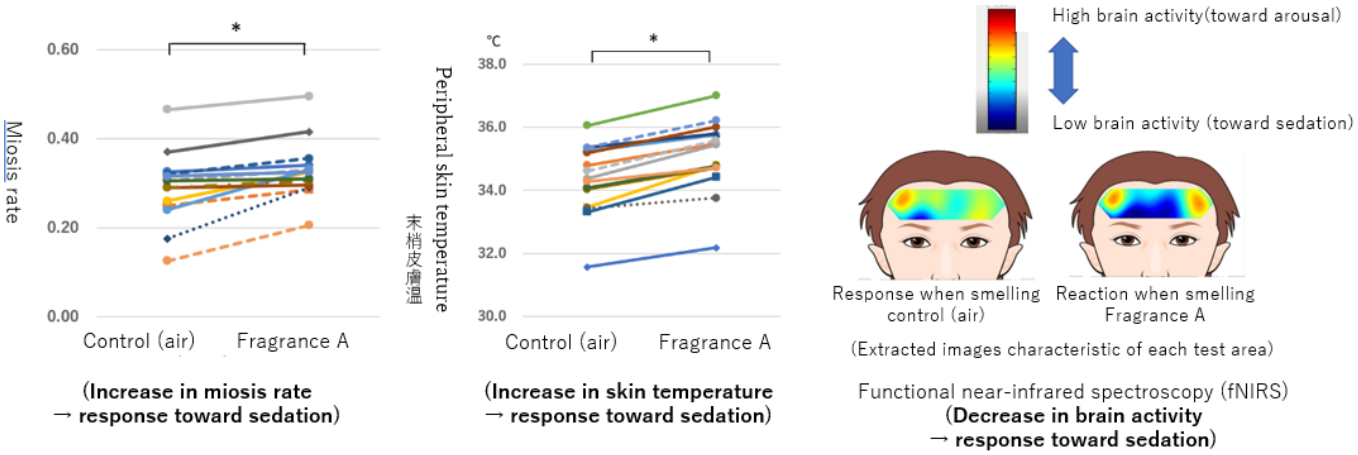

Figure 4. Physiological assessment results

■ Experiment overview

[Subjects] 15 women aged 30-49

[Tested scent] Fragrance A, air (control)

[Test items]

- Miosis rate, peripheral skin temperature (autonomic nervous system response)
- Functional near-infrared spectroscopy (fNIRS) (central nervous system response)
- POMS2 short form (psychological test)

At Mandom, we recognize that “scent” is an extremely important element in the emotional value of cosmetics, including skincare products, and we believe that understanding the true feelings consumers experience when smelling a scent is a key element in product design. We will continue to engage in research and development that focuses on emotional value so that we can provide functionality as well as indicate the mood-elevating effect in a clear manner so that we can provide consumers with useful information upon selecting products.

Notes and glossary

*1 Regulates functions necessary to maintain life within the body, such as blood pressure. The sympathetic nervous system is dominant while concentrating or being nervous, and the parasympathetic nervous system is dominant while sleeping or relaxing.
*2 Represents the constriction rate of pupil diameter in response to light stimulation. The more it constricts, the greater the value.
*3 Changes in skin temperature at the tip of the index finger.
*4 Part of the brain and spinal cord.
*5 A method of estimating blood flow activity near the cerebral cortex by irradiating near-infrared light onto the scalp.
*6 POMS2 short form: Profile of Mood States（questionnaire method）. The mood state in a predetermined time frame is evaluated using seven subscales and the TMD score, which comprehensively represents negative mood states.