Analysis of Impression Evaluation of Fragrances Associated with ‘*Omotenashi*’ in Elderly People using Perfumes

– Including Comparative with Young People –

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Abstract: In this study, we used 6 different fragrances to better understand the tendency of scents to elicit a sense of *omotenashi* (hospitality) in elderly people. To first understand how elderly people perceive scents associated with feelings of *omotenashi* we performed an impression evaluation using SD method of 22 adjective pairs. We then analyzed the results taken from a questionnaire survey we conducted on 51 elderly Japanese men and women using a factor analysis, and extracted the factors that represent sensations of scents which produced a sense of *omotenashi*. Our subsequent examination of the main underlying factors indicated that scents with sensations of freshness, adulthood and pleasure hinted a sense of *omotenashi* in scents for elderly people. We also noted differences in the way the scent was perceived compared to young people.

Keywords: *Elderly, SD method, Fragrances*

1. INTRODUCTION

How much information do we receive and perceive from scents in 24 hours of our daily lives? The information on these scents will differ depending on the *kansei* (sensitivity; emotional response) of the person receiving it. Also, the scent we perceive through our sense of smell is not visible to the eye.

Shoji noted that we usually use our senses to take in information from the outside world. To obtain information from a single object, we usually use not one, but multiple senses at the same time. Moreover, psychological research has shown that when multiple pieces of information are obtained in this way, the discernment of each piece of information is influenced by that received from the other senses [1].

Higuchi said that the olfactory areas in the brain make anatomically unique and direct connections with the neural substrates responsible for emotional information processing. He argues that this has led to speculations that people who interact with fragrance-wearers may experience relatively intense affective responses that result in a positive impression of the fragrance-wearer [2]. *Kansei* is different from person to person, and the way a person perceives a scent depends on his or her age, gender, environment, and lifestyle. Miura said that the psychological and physiological effects of certain smells have also been verified [3]. In a recent paper on the significance of *kansei* engineering and the role it should play against the backdrop of serious social issues in

Japan's super-aged society, Shiizuka proposes a framework for leveraging the 'meta-*kansei* engineering' method. The proposal, based on data from the White Paper on Ageing Society published by the Cabinet Office, provides examples of training the five senses, including the sense of smell and "expressing different fragrances" [4].

Japanese people value the spirit of *omotenashi* (attention to detail in looking after guests; hospitality). The introduction of *omotenashi* as one of the key characteristics of the Japanese spirit became a hot topic at the conference to bid for the Tokyo Olympics in 2020. According to Isao Kumakura, Japanese hospitality is not a one-sided service, but a mutually interactive pleasure [5]. The impact of scent on a person is immeasurable. "Fragrances can be used not only for personal use, but also to create a space in an area or building with fragrance" [6]. The importance of scent is also highlighted by Dzhandzhugazova in the innovative hotel marketing mix named "seven sensual notes" (sight, hearing, smell, taste, touch, intuition, impressions), which offers a new vision for the marketing mix and its correlation with the sensual share of a human being [7]. While previous experiments using three types of fragrances [8] and ten types of fragrances [9] have been conducted, our study used six types of only commercially available fragrances. In another study, Nakagawa used commercially available fragrances with different types of scents, and questionnaire-based experiments to investigate how men and women perceive '*omotenashi*' scents [10], and how they feel the senses of hospitality about those fragrances [11], and how they perceive them depending on the most unpleasant time of the year, the rainy season [12],

and how they perceive them in notes in the fragrances category called ‘notes’[13], and how they perceive them depending on the seasonal perceptions of four seasons [14].

In a similar manner to Nakagawa [14], our study utilized 6 commercially available perfumes and comprised of questionnaire surveys. In our study, however, we questioned 51 elderly people aged 65 years or older to evaluate feelings towards fragrances that elicit a sense of *omotenashi*, and used the SD method to measure the way the elderly people perceived each of the scents that were associated with ‘*omotenashi*’. We then further analyzed the factors in order to extract the factors for the scent that the elderly perceive as ‘*omotenashi*,’ and quantified these scents.

2. METHOD

2.1 Ethical Measures

This study has been approved by the Human Subjects Research Ethics Review Committee of Kyoto Institute of Technology (approval number: 2019-76).

2.2 Characteristics of the Flavors and Fragrances Used in the Experiment

In this study, we used six kinds of perfumes labeled A to F. Among the six kinds of perfumes, A, B, and D had a high sensitivity rating of ‘a sense of *omotenashi*’ in Nakagawa’s study [13].

The details of the perfumes A through to F used in this study, and the characteristics of the notes and their attributes are presented below [15]. “Notes” is the description of scents [16].

- A. Samsara Guerlain: (Woody notes) Eau De Toilette
Luxurious fragrance with plenty of jasmine and birch.
(Woody notes: serene, delicate, mysterious, quiet and calm)
- B. Mitsouko Guerlain: (Chypre note) Eau De Toilette
Classical Chypre type, carrying the smell of flowers, trees and slight fruity notes.
(Chypre note: sophisticated, elegant, chic and mature)
- C. Coco Chanel: (Oriental note) Eau De Toilette
A stylish oriental that suits mature women. Graceful smell that elicits Coco Chanel’s baroque style.
(Oriental note: smooth, sexy and passionate. Sensual, bewitching, and warm for women. Dandy and noble for men.)
- D. Terre D’Hermès Hermès: (Woody notes) Eau De Toilette
Fragrance of trees and forests. Elicits tree imagery among Japanese people.
(Woody notes: serene, delicate, mysterious, quiet and calm)

- E. Chanel No.19 Chanel: (Green note) Eau De Toilette
The refreshing fragrance of Galvanum is loved by both men and women.
(Green note: fresh, clean, natural, gentle and intellectual)
- F. Un Jardin Sur Le Nil Hermès: (Citrus notes) Eau De Toilette
Fresh citrus fragrance which can withstand the Japanese summer heat.
(Citrus notes: fresh, cool feeling, refreshing, cheerful and youthful)

2.3 Experimental Method

Six types of commercially available fragrances were used to evaluate the impressions of the scents using a questionnaire. Six questionnaires were distributed to the participants and they were instructed to evaluate their impressions of each of the six fragrances A to F using a seven-point scale method with the 22-question adjective pairs for appraising fragrances for each of the sheets 1–6. The 22 adjective pairs used in the questionnaire are shown in Table 1. We also instructed them to use the seven-point scale method to evaluate the question, “How do you feel the hospitality?”.

In the questionnaire, the participants were asked to fill out a questionnaire in which they invited others to their homes with the assumption of providing hospitality.

Six fragrances A to F were used as illustrated in Figure 1.

A small amount of the fragrance from the vial as shown in Figure 1 was soaked into the tip of a thin piece of test paper called a *muette*. The participants of the experiment smelled the scent slowly from the tip of the test paper, as shown in Figure 2, and provided their impressions on the questionnaire for the six scents of the fragrances A to F.

Table 1: The Questionnaire Sheet

(Questionnaire)	★ for fragrances of A to F						
1 Like	+3	2	1	0	1	2	-3 Dislike
2 Pleasant	+3	2	1	0	1	2	-3 Unpleasant
3 Comfortable	+3	2	1	0	1	2	-3 Uncomfortable
4 Strong	+3	2	1	0	1	2	-3 Weak
5 Light	+3	2	1	0	1	2	-3 Heavy
6 Masculine	+3	2	1	0	1	2	-3 Feminine
7 Powdery	+3	2	1	0	1	2	-3 Oily
8 Sweet	+3	2	1	0	1	2	-3 Bitter
9 Clear	+3	2	1	0	1	2	-3 Fuzzy
10 Dry	+3	2	1	0	1	2	-3 Moist
11 Refreshing	+3	2	1	0	1	2	-3 Annoying
12 Gentle	+3	2	1	0	1	2	-3 Sharp
13 Clean	+3	2	1	0	1	2	-3 Messy
14 Elegant	+3	2	1	0	1	2	-3 Wild
15 Graceful	+3	2	1	0	1	2	-3 Cheap
16 Adult-like	+3	2	1	0	1	2	-3 Childish
17 Mature	+3	2	1	0	1	2	-3 Immature
18 Young	+3	2	1	0	1	2	-3 Old
19 Calm	+3	2	1	0	1	2	-3 Violent
20 Sensual	+3	2	1	0	1	2	-3 Neat
21 Oriental	+3	2	1	0	1	2	-3 Western
22 Positive	+3	2	1	0	1	2	-3 Negative

Figure 1: Experimental Setup

Figure 2: Method for Sampling a Scent

When all the participants had finished writing the questionnaire evaluation of their impressions of one scent, the *muette* was collected, and another *muette* soaked in the next scent was distributed. The impressions were evaluated sequentially. This process was performed for all six types of scents. In the questionnaire evaluation, as we wanted to measure evaluations of each perfume, we instructed subjects to provide their impressions of the scent of each fragrance individually without comparing the six types of scents. The brand and brand names of the commercially available fragrances used were not disclosed and the experiment was conducted so as to ensure that the fragrance evaluations were genuine impressions not influenced by these factors.

2.4 Experiment Participants

The experiment comprised of 51 participants (12 males and 39 females) aged 65 to 92 years. The average age was 79.1 years.

2.5 Experiment Environment

The experiment was conducted in a room in a private setting. Figure 3 shows the experiment.

Figure 3: Experiment Landscape

2.6 Data Analysis Methods

In this paper, a factor analysis was conducted for 1 to 22 of the adjective pairs shown in Table 1 to extract the factors underlying the scents of the fragrances; and in this case, the fragrance that elicit a sense of *omotenashi* in the elderly.

3. RESULT

3.1 Evaluation of the Fragrances That Gave a Sense of *Omotenashi* among the Elderly

Figure 4 graph shows the average sensory rating for scents that produce a sense of *omotenashi* among the elderly. The vertical axis represents the average of the seven-point rating, and the horizontal axis represents the six types of perfumes. The names of the fragrances are as follows; A: Samsara, B: Mitsouko, C: Coco, D: Terre D'Hermès, E: Chanel No. 19, F: Un Jardin Sur Le Nil. The mean values for each were A = 4.098, B = 5.0, C = 4.156, D = 4.176, E = 4.254, and F = 4.784.

From the bar graph in Figure 4, it can be seen that B was rated the first amongst experimental participants who responded that they felt hospitality among the six fragrances. Fragrance F rated second; E was third; D was fourth, C was fifth, and A was sixth. In addition, a one-way

Figure 4: Evaluation of the Fragrances that Gave a Sense of *Omotenashi*

analysis of the variance was conducted to see if there was a difference in the mean value of the rating of the scent associated with a sense of *omotenashi*. The p-value was 0.09, which was not less than 0.05 which is generally considered to be a significant level. Furthermore, the results of multiple tests using Tukey's 'Honest Significant Difference' (Tukey's HSD) showed that the significance probability p was 0.08 ($F > A$) for Un Jardin Sur Le Nil (F) and Samsara (A). The data from this experiment were analyzed by the function `fa` in R's psych package. The maximum likelihood method (MLE) was used for estimations.

3.2 Determining the Number of Factors

A scree test was conducted to determine the number of factors in the factor analysis. The number of factors determined by the function `fa` in R's psych package was set at 5 by the Scree test.

3.3 Factor Loading and Cumulative Contribution Ratio

The factor loadings with Promax rotation are shown in Table 2. The cumulative contribution ratio of the five factors was 55%.

3.4 Naming of Factors

The factor names obtained from the results of the factor loading matrix by Promax rotation were named 'freshness' for the first factor, 'adulthood' for the second, 'pleasure' for the third, 'elegance' for the fourth, and 'powdery' for the fifth.

Table 2: Factor Loading Matrix

	Factor1	Factor2	Factor3	Factor4	Factor5
Clear	0.891	-0.06	0.046	0.001	-0.113
Refreshing	0.868	-0.067	0.2	-0.083	-0.127
Clean	0.577	0.011	0.052	0.313	-0.043
Dry	0.527	-0.036	-0.078	-0.008	-0.039
Gentle	0.517	-0.136	0.120	0.064	0.263
Light	0.463	-0.119	0.124	-0.009	0.059
Young	0.455	0.190	-0.030	0.211	-0.003
Calm	0.446	0.060	0.021	0.176	0.300
Sweet	0.432	0.089	0.077	0.025	0.065
Mature	-0.238	0.795	0.034	0.166	0.112
Adult-like	-0.186	0.789	0.047	0.336	0.007
Strong	0.012	0.621	0.208	0.031	-0.264
Sensual	0.144	0.580	-0.042	-0.21	0.110
Masculine	0.044	0.212	-0.194	-0.058	0.004
Pleasant	0.179	0.109	0.868	-0.118	0.011
Like	0.194	0.134	0.763	-0.068	0.003
Comfortable	0.220	0.085	0.736	0.009	-0.034
Graceful	0.184	0.072	-0.004	0.717	0.085
Elegant	0.490	0.103	-0.131	0.521	-0.051
Oriental	-0.155	0.014	0.086	-0.013	0.802
Positive	0.166	0.179	0.258	-0.024	0.352
Powdery	0.041	-0.026	-0.059	0.018	0.291

Table 3: The Inter-factor Correlation Matrix of Experiment

	Factor1	Factor2	Factor3	Factor4	Factor5
Factor1	1	0.495	0.608	0.586	0.627
Factor2	0.495	1	0.250	0.382	0.341
Factor3	0.608	0.250	1	0.660	0.382
Factor4	0.586	0.382	0.660	1	0.483
Factor5	0.627	0.341	0.382	0.483	1

3.5 Correlation Matrix between Factors

The inter-factor correlation matrix is presented in Table 3.

3.6 Plot of Factor Scores

Plots of the factor scores are shown in Figures 5 to 7. The factor plot of 'freshness' in the first factor and 'adulthood' in the second factor in Figure 5 shows that

Figure 5: Freshness vs. Adulthood

Figure 6: Freshness vs. Pleasure

Figure 7: Adulthood vs. Pleasure

Mitsouko (B), which had the highest sensory evaluation of the scent of 'omotenashi' among the elderly, exhibited both 'freshness' and 'adulthood' factors. Conversely Un Jardin Sur Le Nil (F) and Chanel No.19 (E) both scored low in both these factors, while Terre D'Hermès (D) showed a combination of both. Coco (C) exhibited some 'freshness' but scored low for 'adulthood' while Samsara (A), scored moderately for 'freshness' and highly for 'adulthood.'

The plot of the factor scores for the first factor 'freshness' and the third factor 'pleasure' in Figure 6 shows that the results for all six fragrance types were closely aligned, with the highest being Terre D'Hermès (D), and the lowest being Un Jardin Sur Le Nil (F).

From the plot of factor scores for the second factor 'adulthood' and the third factor 'pleasure' in Figure 7, it can be seen that Terre D'Hermès (D) exhibited both 'adulthood' and 'pleasure' while neither was observed in Chanel No.19 (E) and Un Jardin Sur Le Nil (F).

The plot of factor scores in Figures 5, 6, and 7 shows that Chanel No.19 (E) and Un Jardin Sur Le Nil (F) fared low in 'freshness', 'adulthood' and 'pleasure.'

4. DISCUSSION

In this experiment, six commercially available fragrances were used to analyze the impressions of fragrances that convey a sense of hospitality to the elderly. Samsara (A), Mitsouko (B), and Terre D'Hermès (D) in Figures 5 to 7 were the fragrances used in the previous study [13] and received high impression ratings from young people for fragrances that elicit a sense of *omotenashi*. The results showed that the younger respondents rated Mitsouko (B), Terre D'Hermès (D), and Samsara (A) in the said order. However, this time, the elderly rated Mitsouko (B), Un Jardin Sur Le Nil (F), and Chanel No.19 (E) in the said order. The results show that there is a difference between young and old people's impressions of the smell of hospitality. According to Ichihara, a comparison of the differences in *kansei* between the elderly and young people was reported on the differences in the perception of color between the elderly and young people [17], and we also found that the perception of smell between young and elderly people was also different.

In the present study, although there was no apparent statistically significant difference, it can be said that there was a stronger tendency for the elderly to feel hospitality in Un Jardin Sur Le Nil (F) than in Samsara (A). In addition, in the report of Nakagawa [13], there was a significant difference in the 'omotenashi' fragrances in the results of young people, but no

significant difference was found in the elderly in the current study. In other words, the older generation seems to have a duller *kansei* to the aromas of 'omotenashi'.

It has been confirmed that human sensory intensity to smell changes with age. Kunieda also stated that sensitivity gradually decreases in the elderly [18]. This report seems to equal ours. A study by Norimatsu reported that since elderly people showed smaller changes in their mean profile concerning plants such as cacti (which do not change morphology) compared to young people changes in the psychological state of the elderly are not considered to be largely influenced by changes in plant morphology [19]. This result can be seen to be consistent with our results, which show a significant difference in the younger age group, but only a tendency in the older age group.

It is no secret that the recent coronavirus outbreaks have changed the way people live their lives. One of the symptoms of COVID-19 patients is olfactory and gustatory disturbances [20]. There was our experimental method of investigating the scent of the mouette (test paper) in this study that using commercially available perfumes for a sniff check for olfactory impairment due to COVID-19 is a safe way to it appears to be a useful method that can be implemented hygienically.

Fragrances can be used not only for the skin but also for space production. In this report, we reported on the scent of 'omotenashi' in the elderly, but in the future, we will continue our research on the influence of scent on people and *kansei*, and to research the design of fragrances, we will raise awareness of scent on a daily basis, and promote "olfactory education" in the sense of smell, which is one of the five senses, and the '*kosuido*' that advocates how to make and use unique fragrances for a wide range of age groups.

5. CONCLUSION

In the present study, we conducted a factor analysis of 22 adjectival pairs of SD data on the impressions of six kinds of fragrances on 51 elderly participants and examined the factors behind the impressions. The results of the experiment suggest that *kansei* (sensibility; emotional response) toward scents that produce a sense of *omotenashi* in the elderly comes from a 'freshness', 'adulthood', and 'pleasure' impression. Also, there were minimal difference in these *kansei* of "omotenashi" fragrances among the elderly compared to the younger ones; suggesting that feelings towards fragrances declines with age.

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