STUDY ON COMFORTABLE ELEMENTS OF WET COTTON HAND TOWELS "OSHIBORI"

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ABSTRACT

In the present study, we attempted to clarify the important elements of the feelings of comfort associated with wet cotton hand towels, or oshibori. First, the following adjectives were extracted as words used to evaluate the characteristics of the oshibori: "favorite," "comfortable," "large," "pretty," "high-grade," "shapely," "soft," "thick," "clean," "moist," "luxurious," "heavy," "strong," "safe," "feel-smooth," and "rare." We then conducted a subjective evaluation of 25 kinds of oshibori of various sizes and thicknesses. Thirty-seven males and seven females, ranging in age from their twenties to fifties, participated in the experiment. Each subject evaluated the oshibori by grading them from one to five based on the extracted descriptive characteristics. Factor analysis was conducted on the experimental results and the following three factors were extracted; the first factor defined as "dignity factor." The second factor defined as "preference factor" and the third factor defined as "touch factor." The score for dignity increased as the size of the oshibori increased. The score for preference was high when the size of the oshibori was between 25cm × 25cm and 30cm × 30cm. And the score for touch was high when the size of the oshibori was 30cm × 30cm. These results suggest that subjects felt high-class if the size of the oshibori was greater than 30cm × 30cm, but subjects most preferred oshibori that were between 25cm × 25cm and 30cm × 30cm. No notable trend was found in the analysis of the thickness.

Keywords: oshibori, hand towel, subjective evaluation

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1. INTRODUCTION

Oshibori are given to customers at restaurants before meals so that they can clean their face and hands. Handing out oshibori to customers is one of the long-standing traditions in Japan, and with the growth of the food service industry after the 1960s, the practice of handing out oshibori spread throughout the country. While much research has been conducted on oshibori over the years, most studies have investigated the towels from the perspective of cleaning and sanitation [1]-[5]. Few studies have assessed the qualitative and sensory characteristics associated with oshibori. Thus, in order to qualitatively assess oshibori, we first conducted a subjective evaluation using cotton and paper oshibori [6]. We reported that cotton oshibori were assessed more favorably than paper oshibori in many aspects. The present subjective evaluation was conducted to identify the important elements in determining the feeling of comfort associated with oshibori, including the various sizes and thicknesses of oshibori that people prefer.

2. EXTRACTION OF EVALUATION WORDS

In this section, we describe a method for extracting words to evaluate the characteristics of oshibori. First, a total of 1,189 possible adjectives that could describe oshibori were gathered from past studies on oshibori and an adjective dictionary. Next, ten people were asked to determine whether or not each adjective was appropriate for evaluating oshibori using the following three grades (1: applicable, 2: neutral, and 3: not applicable). Based on the results, we discarded the words whose average scores exceeded 2.5 points. The 1,189 words were narrowed down to 221 adjectives that were deemed applicable. These 221 words were then classified into 60 groups with similar meaning, and the word with the highest score in each group was identified as a representative adjective. Subsequently, 107 people were asked to determine whether or not the 60 words were appropriate for evaluating oshibori using the three grade levels to narrow the list to 27 words. Of these 27 words, ones that were not appropriate for the purpose of the present study, such as words related to smell and convenience, were excluded, and the following 16 words were chosen to evaluate oshibori: favorite, comfortable, large, pretty, high-grade, shapely, soft, thick, clean, moist, luxurious, heavy, strong, safe, feel-smooth, and rare. Along with each of these 16 words, an antonym was chosen to generate a list of 16 pairs of words to evaluate oshibori. The 16 pairs of words are listed in Table 1.

Table 1: Words used to evaluate oshibori

small	⇔	large	dirty	⇔	clean
ugly	⇔	pretty	dry	⇔	moist
uncomfortable	⇔	comfortable	simple	⇔	luxurious
cheap	⇔	high-grade	light	⇔	heavy
unshapely	⇔	shapely	weak	⇔	strong
hard	⇔	soft	unsafe	⇔	safe
unfavorable	⇔	favorite	rough	⇔	feel-smooth
thin	⇔	thick	common	⇔	rare

3. SUBJECTIVE EVALUATION OF OSHIBORI

The semantic differential (SD) method was used for the subjective evaluation and was conducted using the 16 pairs of words.

3.1. Samples

The experiment used a total of 25 different kinds of cotton oshibori with five different sizes and five different thicknesses. All samples were pile-woven and unused. In order to remove dirt and glue that became attached during manufacturing, all samples were washed once; the level of residual chlorine was set at less than 100 ppm. The moisture content of each oshibori was 2.5 times its dry weight, and in order to avoid changes in the moisture content, each sample was wrapped in a film. The size, thickness and weight of each sample type are shown in Table 2. The temperature and humidity of the laboratory was set at 20 ± 2 °C and $60 \pm 2\%$, respectively.

3.2. Procedure

Each sample was packed in a vinyl bag and all samples were prepared for one subject. The subjects were instructed to randomly choose one oshibori at a time from the 25 available and wipe their hands to evaluate it. Subjects then scored the selected oshibori on a scale from 1 to 5 (1: lowest; 5: highest) in the 16 categories. The evaluation sheet used in the experiment is shown in Figure 1. After each evaluation, the subjects were instructed to sufficiently dry their hands using a towel or electric fan to avoid influencing the evaluation of the next sample. The evaluation process was divided into two sessions to avoid fatigue of the subjects, with a break of at least one hour between them. Twelve samples were evaluated during the first part and 13 samples in the second part. One session of the experiment took less than 30 minutes.
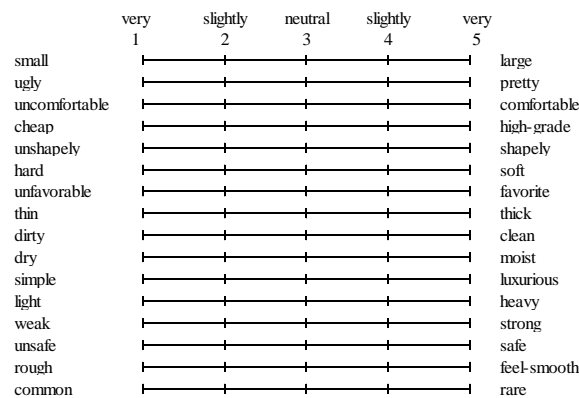
	very 1	slightly 2	neutral 3	slightly 4	very 5	
small						large
ugly						pretty
uncomfortable						comfortable
cheap						high-grade
unshapely						shapely
hard						soft
unfavorable						favorite
thin						thick
dirty						clean
dry						moist
simple						luxurious
light						heavy
weak						strong
unsafe						safe
rough						feel-smooth
common						rare

Figure 1: Evaluation sheet used during the experiment.

3.3. Subjects

Forty-four people (males: 37; females: 7; age range: 20–59 years) participated in the study.

Table 2: Sizes, thicknesses, and weights of cotton oshibori evaluated in the present study

No.	size (cmxcm)	thickness (mm)	weight(g) dry	weight(g) wet	No.	size (cmxcm)	thickness (mm)	weight(g) dry	weight(g) wet
C-1	20x20	1.52	13.0	32.5	C-16	35x35	1.75	41.3	103.3
C-2	20x20	1.84	13.6	34.0	C-17	35x35	1.96	44.3	110.8
C-3	20x20	1.99	15.0	37.5	C-18	35x35	2.16	47.8	119.6
C-4	20x20	2.29	16.0	40.0	C-19	35x35	2.40	51.0	127.5
C-5	20x20	2.44	16.7	41.7	C-20	35x35	2.62	54.2	135.4
C-6	25x25	1.63	20.8	52.1	C-21	40x40	1.79	52.8	132.1
C-7	25x25	1.89	22.3	55.6	C-22	40x40	2.12	60.4	150.9
C-8	25x25	2.02	24.5	61.3	C-23	40x40	2.50	68.5	171.3
C-9	25x25	2.35	25.7	64.2	C-24	40x40	2.58	70.7	176.7
C-10	25x25	2.55	27.8	69.6	C-25	40x40	2.80	76.0	190.0
C-11	30x30	1.69	28.8	72.1					
C-12	30x30	1.89	30.7	76.8					
C-13	30x30	2.10	33.7	84.2					
C-14	30x30	2.34	36.0	90.0					
C-15	30x30	2.65	39.0	97.5					

4. RESULTS

The results for the following words that exhibited characteristic trends for the 25 different oshibori (Table 2: C1 to C25) are shown in Figure 2: "favorite," "comfortable," "shapely," "thick," "strong," "rare," "pretty," "high-grade," "luxurious," "soft," "clean," and "feel-smooth." In Figure 2(a), ○, ● and □ indicate "favorite," "comfortable," and "shapely," respectively. In Figure 2(b), ○, ● and □ indicate "thick," "strong," and "rare," respectively. In Figure 2(c), ○, ● and □ indicate "pretty," "high-grade," and "luxurious," respectively. In Figure 2(d), ○, ● and □ indicate "soft," "clean," and "feel-smooth," respectively. Data suggest that, in terms of "favorite," "comfortable," and "shapely," 25 cm × 25 cm or 30 cm × 30 cm oshibori were evaluated highly. The common size range for oshibori is 28–30 cm square, suggesting that familiar sizes were evaluated favorably. In terms of "thick" and "strong" the tendency was that the thicker or stronger the oshibori, the more favorable the evaluation. With regards to "rare," the subjects tended to view 20 cm × 20 cm and 40 cm × 40 cm oshibori as rare. As to "pretty," the smaller the size of the oshibori, the greater the score. In terms of "high-grade" and "luxurious" the scores for sizes larger than 30 cm × 30 cm were comparable, and as a result, large, 35 cm × 35 cm or 40 cm × 40 cm, oshibori are not necessarily viewed as high-grade or luxurious. The scores for "soft" and "clean" were mostly comparable because all samples were unused, made of identical material, and woven in the same manner; although the score for "feel-smooth" was slightly higher for the 30 cm × 30 cm oshibori.
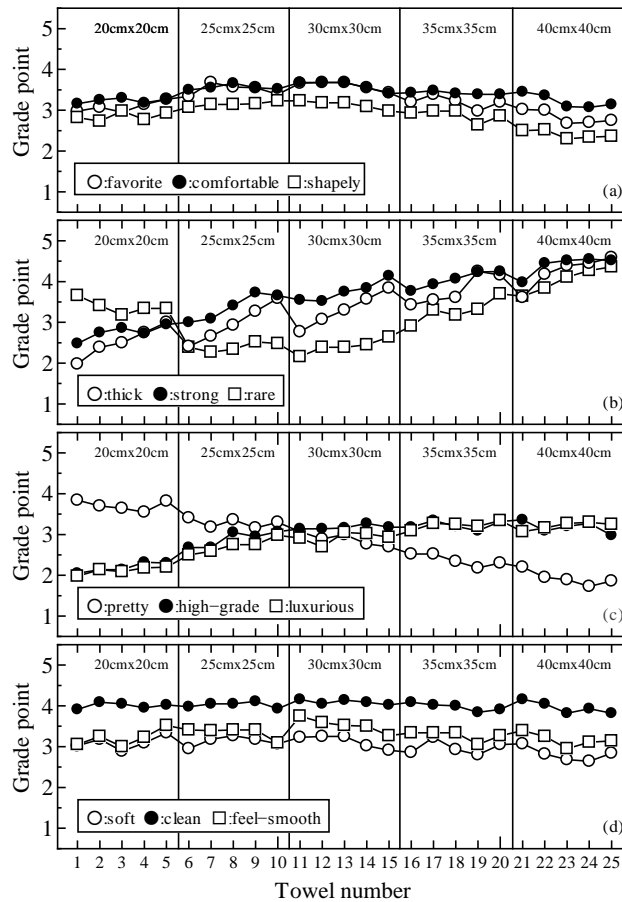

Figure 2: Oshibori evaluation results.

5. DISCUSSION

5.1. Evaluation word correlations

In this section, we discuss the correlation coefficient of each word combination (Table 3). Strong positive correlations with coefficients of more than 0.8 were seen among "favorite," "comfortable," and "shapely." Also, strong positive correlations were seen among "large," "thick," "luxurious," "heavy," and "strong." Furthermore, "high-grade" exhibited a strong positive correlation to "large," "luxurious," "heavy," "strong," and "safe." Therefore, the subjects associated size and thickness with luxuriousness and high-grade. On the other hand, "rare" exhibited a strong negative correlation to "favorite," "comfortable," and "shapely." This suggested that the subjects did not prefer rareness in oshibori. Also, "pretty" exhibited a strong negative correlation to "large," "thick," "luxurious," "heavy," and "strong."

Table 3: Correlation coefficients among all words used to evaluate cotton oshibori

	favorite	comfort-able	large	pretty	high-grade	shapely	soft	thick	clean	moist	luxurios	heavy	strong	safe	feel-smooth	rare
favorite	1.000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
comfortable	**0.901**	1.000	-	-	-	-	-	-	-	-	-	-	-	-	-	-
large	-0.294	-0.057	1.000	-	-	-	-	-	-	-	-	-	-	-	-	-
pretty	0.429	0.210	**-0.978**	1.000	-	-	-	-	-	-	-	-	-	-	-	-
high-grade	0.159	0.371	**0.852**	-0.770	1.000	-	-	-	-	-	-	-	-	-	-	-
shapely	**0.911**	**0.808**	-0.492	0.618	-0.052	1.000	-	-	-	-	-	-	-	-	-	-
soft	0.758	0.616	-0.537	0.644	-0.201	0.695	1.000	-	-	-	-	-	-	-	-	-
thick	-0.409	-0.248	**0.882**	**-0.909**	0.725	-0.564	-0.581	1.000	-	-	-	-	-	-	-	-
clear	0.621	0.641	-0.236	0.319	0.054	0.532	0.566	-0.428	1.000	-	-	-	-	-	-	-
moist	-0.528	-0.425	0.656	-0.740	0.521	-0.595	-0.687	0.747	-0.444	1.000	-	-	-	-	-	-
luxurious	-0.097	0.121	**0.946**	-0.894	**0.934**	-0.273	-0.398	**0.868**	-0.179	0.645	1.000	-	-	-	-	-
heavy	-0.363	-0.145	**0.981**	**-0.982**	0.826	-0.551	-0.580	**0.941**	-0.328	0.739	**0.938**	1.000	-	-	-	-
strong	-0.281	-0.075	**0.947**	**-0.945**	0.845	-0.460	-0.544	**0.958**	-0.271	0.730	**0.943**	**0.979**	1.000	-	-	-
safe	0.469	0.594	0.641	-0.518	**0.892**	0.285	0.044	0.486	0.242	0.271	0.782	0.591	0.647	1.000	-	-
feel-smooth	0.790	0.742	-0.101	0.218	0.232	0.608	0.699	-0.289	0.728	-0.441	-0.004	-0.197	-0.149	0.447	1.000	-
rare	**-0.920**	**-0.869**	0.400	-0.519	-0.050	**-0.923**	-0.594	0.506	-0.580	0.530	0.206	0.468	0.378	-0.341	-0.642	1.000

5.2. Factor analysis

Factor analysis was conducted on the experimental results using SPSS 16.0J. Factors were extracted using the principal factor method, and varimax rotation was used for rotating the factor axis. The factor matrix following rotation is shown in Table 4.

Table 4: Factor matrix

	factor		
	dignity	preference	touch
luxurious	**0.983**	0.031	-0.073
strong	**0.961**	-0.156	-0.149
large	**0.957**	-0.215	-0.041
heavy	**0.954**	-0.256	-0.143
high-grade	**0.947**	0.237	0.104
thick	**0.867**	-0.274	-0.256
safe	**0.790**	0.507	0.205
moist	**0.638**	-0.324	-0.407
pretty	**-0.917**	0.344	0.120
shapely	-0.299	**0.901**	0.236
favorite	-0.088	**0.857**	0.468
comfortable	0.127	**0.824**	0.470
rare	0.203	**-0.899**	-0.268
feel-smooth	0.040	0.461	**0.834**
clean	-0.126	0.403	**0.632**
soft	-0.397	0.472	**0.582**

Factor analysis of the 16 evaluation words identified three factors, and each of these factors was named based on the associated words as follows: 1) "dignity" with high absolute factor loadings for "luxurious," "strong," "large," "heavy," "high-grade," "thick," "safe," "moist," and "pretty"; 2) "preference" with high absolute factor loadings for "shapely," "favorite," "comfortable," and "rare"; and 3) "touch" with high absolute factor loadings for "feel-smooth," "clean," and "soft."A factor score was calculated for the three extracted factors. The relationship between dignity and preference factor scores is shown in Figure 3(a); between dignity and touch factor scores in Figure 3(b); and between preference and touch factor scores in Figure 3(c). In each figure, ◆, ■, ▲, ×, and * represent 20, 25, 30, 35 and 40-cm square oshibori, respectively. As shown in Figures 3(a) and (b), dignity factor scores had positive values when the size of the oshibori was more than 30 cm × 30 cm, suggesting that people believe that oshibori larger than 30 cm × 30 cm are of high dignity. As shown in Figures 3(a) and (c), the preference factor scores were higher for 25 cm × 25 cm or 30 cm × 30 cm oshibori, suggesting that people prefer 25 cm × 25 cm to 30 cm × 30 cm oshibori. In Figures 3(b) and (c), no notable tendency is observed for touch factor scores in relation to oshibori size, but the touch factor score for 30 cm × 30 cm oshibori was slightly higher.
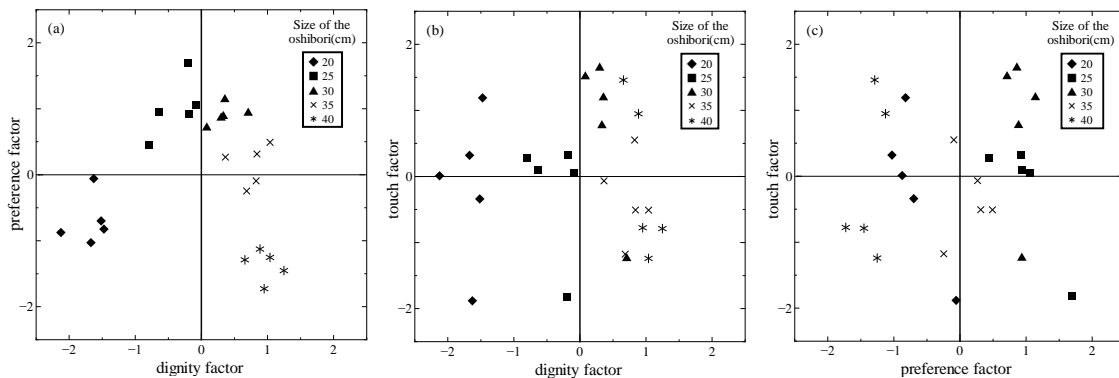

Figure 3: Relationships between "preference," "dignity" and "touch" factors.

6. CONCLUSIONS

In the present study, numerous adjectives suited for evaluating the characteristics of oshibori were selected, and the following 16 words were extracted: "favorite," "comfortable," "large," "pretty," "high-grade," "shapely," "soft," "thick," "clean," "moist," "luxurious," "heavy," "strong," "safe," "feel-smooth," and "rare." Oshibori were then subjectively evaluated using these 16 extracted words. Based on the results of the evaluation, correlation and factor analyses were performed, and the following results were obtained:

- The subjects viewed size and dignity as indicators for high-grade and luxurious oshibori.
- The subjects did not prefer rareness in oshibori.
- The important characteristics of oshibori were classified into preference, dignity and touch factors.
- Dignity factor scores tended to be high for more than 30 cm × 30 cm oshibori.
- Preference factor scores tended to be high for 25 cm × 25 cm to 30 cm × 30 cm oshibori.
- Touch factor scores tended to be slightly higher for 30 cm × 30 cm oshibori.
- No notable trend was found between oshibori thickness and the three factors.

These results suggest that people perceive more than 30 cm × 30 cm oshibori as luxurious and high-grade oshibori, but prefer 25 cm × 25 cm to 30 cm × 30 cm oshibori.

REFERENCES

[1] Y. Mizunoue and M. Aotani, "Studies on cleaning and sanitation of the "oshibori", " Bulletin of the Faculty of Home Economics, Hiroshima Women's University, Vol. 7, pp. 45-51, 1972.

[2] U. Takeuchi, H. Seki, M. Ouko, M. Maki, M. Murase,K. Honda, T. Kanoh, and I. Mizoguchi, "Hygienic study on lease OSHIBORI," Japanese Journal of Public Health, Vol. 32, No. 6, pp. 275-286, 1985.

[3] R. Juichi and T. Tabata, "Antimicrobial effect of "oshibori" containing essential oil," Studies in Humanities and Science, Kobe Women's Junior College, Vol. 11, pp. 61-66, 2000.

[4] T. Hongu, T. Kikutani, M. Takatera, H. Takahashi, N. Naruse, K. Hamada, K. Hara, N. Minemura, "Encyclopedia of Fiber," Maruzen, 2002.

[5] T. Miyakawa and K. Kawamura, "Bacteriological study on the safety use of home-prepared "oshibori", " The journal of Wayo Women's University, Vol. 35, pp. 1-6, 1995.

[6] Y. Soeta, T. Kitamoto, H. Hasegawa, and M. Kasuga: Subjective evaluation of comfortableness of wet cotton and paper hand towels "oshibori", Proc. of International Workshop on Advanced Image Technology 2008 (IWAIT2008), p.154, 2008