Investigation of Appearance and Tactile Sensation Scales for Evaluating Clothes in Online Shopping

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Abstract: The purpose of this study was to develop scales to evaluate the appearance and tactile sensation of clothes in online shopping. First, 170 descriptive words were extracted from the existing literature on these areas. Then three groups of participants evaluated these words in terms of their appropriateness in describing the appearance and tactile sensation of clothes. These groups consisted of thirteen male students majoring in engineering (EMS), thirteen female students majoring in fashion design (FFS), and thirteen female students majoring in subjects other than fashion design (OFFS), respectively. Sixty-six appearance words and seventy-six tactile sensation words were selected by comparing the results of the three groups. We then carried out a cluster analysis based on the Kawakita Jiro (KJ) method, using appearance and tactile sensation words for the EMS, the FFS and the OFFS groups. Approximately about ten appearance-representative words and about ten tactile sensation-representative words were obtained for each group. The results of the appearance- and tactile sensation-representative words obtained from the EMS, the FFS, and the OFFS groups were compared, and common evaluation scales for the appearance and tactile nature of clothes were explored. Thus, eight common words indicating appearance, and nine indicating tactile sensation, were obtained as common evaluation scales.

Keywords: Evaluation Scale, Clothes, Online Shopping, Appearance, Tactile sensation.

1. INTRODUCTION

In recent years, online shopping of clothes has grown in popularity (Office for National Statistics, Statistical Bulletin, n.d.). However, because most of the retailers offer only visual information such

as pictures of clothes, there is a discrepancy between an item's visual impression and its physical comfort and appearance. In order to resolve this problem, visual and tactile measures capable of assessing the differences between impressions of clothes in pictures, and impressions of the actual items, are required.

In a previous study (Tomoharu et al. 2011), we carried out an experiment to identify the visual information of seeing the photograph of clothes and the tactile sense information of touching the actual cloth, evaluated by several observers. Observers were asked to look at an image fabric on display and select an actual fabric by blind touch. Two types of photographs were used as the fabric images, those with drapes and those without drapes. The results indicated that the existence or nonexistence of a fabric drape is a key visual factor that influences textures recognition. In another previous study (Tomoharu, Kou, Kazuya, Hiroko, & Miyoshi, 2013), we conducted a fabric identification experiment focused on the window size, to explore the effect of visual field size on the observation of drape fabrics. The results indicated that the window size during the observation of draped fabrics greatly influences the recognition of fabric textures. However, when the visual information and the tactile sense information could be not identified using the method of these fabric identification experiments, the judgment accuracy of fabric textures cannot be clarified. In order to solve this issue, it is necessary to compare the degree of Kansei impression received from the cloth image and the actual cloth.

Therefore, the purpose of the present study was to identify evaluation scales that can accurately express the appearance and tactile sensation of clothes, which apply to a wide range of people who participate in online shopping. Specifically, assessment words relevant to the appearance and tactile sensation of clothes were collected, and the appropriateness of these words for the degree of evaluating clothes was examined. These words were then clustered using various observer groups. Finally, the common-evaluation-words for appearance and the common-evaluation-words for tactile sensation were identified by investigating the similarity of these obtained words across the groups.

2. DETERMINING THE PROCESS OF EVALUATING SCALES FOR CLOTHES

The process of determining the evaluation scales that accurately express the appearance and tactile sensation of clothes in online shopping has been shown in Figure 1. The process of evaluating clothes' scales consisted of three steps, collection, evaluation, and clustering. In the first step, the assessment words which were used for evaluating the appearance and tactile sensation of clothes were identified from the several dozens of research papers (Mutumi, 2008; Mika & Akira, 2008, Kazuya, 2008, Zhebin, 2012, Shogo, 2013), and 170 assessment words were identified. The second step involved examination of the degree of appropriateness of the 170 assessment words for evaluating the appearance and tactile sensation of clothes in online shopping. This was determined by three kinds of observer groups to extract words representative of a wider range of online shoppers. The three groups consisted of thirteen male students majoring in engineering (EMS), thirteen female students majoring in fashion design (FFS), and thirteen female students majoring in subjects other than fashion design (OFFS), respectively. The degree of appropriateness of the words in evaluating the clothes' appearance and tactile sensation was evaluated using five grade scales (Figure 2) which are compliant with ITU-R quality (Recommendation ITU-R BT.500-13, 2012). Their ratings were then analyzed within each observer group and between the three observer groups. As a result, 66 appearance evaluation words and 76 tactile sensation evaluation words were obtained. In the third step, these appearance and tactile

sensation evaluation words were clustered in each observer group using the KJ method (Raymond, 1997), and about ten appearance representative words and ten tactile sensation representative words were obtained in EMS, FFS and OFFS. Eventually, eight common-evaluation-words were identified for appearance and nine were identified for tactile sensation. This was done by investigating the similarity in the appearance and the tactile sensation representative words that were clustered for each observer group, and by comparing the relationship between the obtained representative words and the results of other previous studies (Helen, 1966; Kimie, 2006).
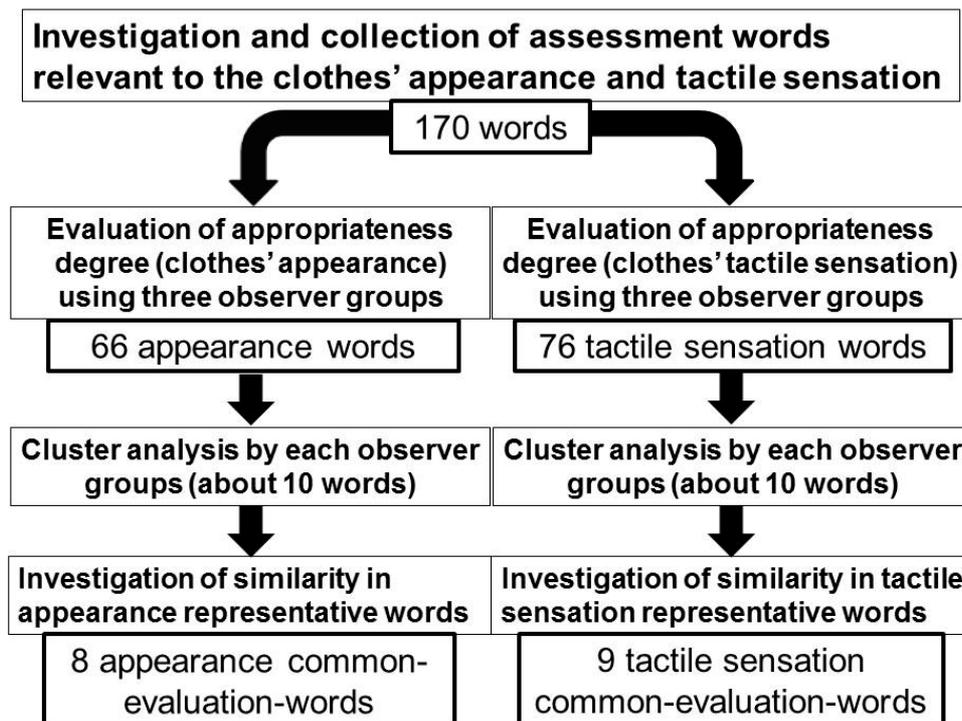

Figure 1: Process of determining evaluation scales for clothes

Figure 2: Five grade evaluation scales for the degree of appropriateness of the evaluation words

3. THE DEGREE OF APPROPRIATENESS FOR ASSESSMENT WORDS

The 170 assessment words identified from previous studies were evaluated by each of the three observer groups in terms of their degree of appropriateness, by using five grade evaluation scales. The occurrence rate for each observer group in terms of their evaluation of the degree of appropriateness of the evaluation words has been shown in Figure 3 and Figure 4, respectively.
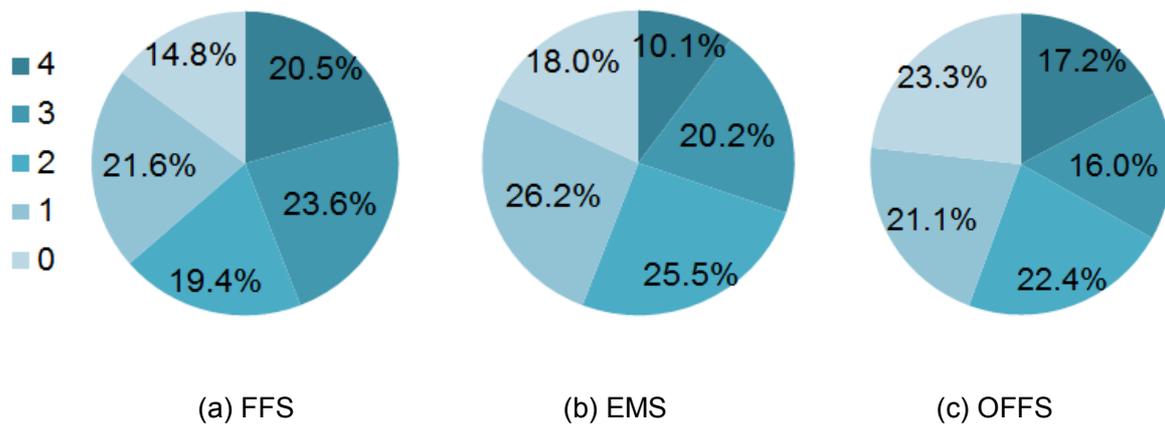

(a) FFS   (b) EMS   (c) OFFS

Figure 3: Occurrence rate for the degree of appropriateness of the words for appearance of clothes

Figure 3(a) shows that the FFS group had an equal distribution of words evaluated across the five grades of the degree of appropriateness. On the other hand, Figure 3(b) shows that the EMS group had a higher occurrence rate for the evaluations of "1: Poor appropriateness" and "2: Fair appropriateness," and these rates occupied the half of their evaluations. Figure 3(a) and 3(b) indicate that the occurrence rate for "4: Excellent appropriateness" for the EMS group was about half of that of the FFS group. This indicates that the FFS group had a tendency to select a higher degree of appropriateness than did the EMS group. Figure 3(c) indicates that the OFFS group had a tendency to select a lower degree of appropriateness, as it had the highest occurrence rate for "0: No appropriateness" across the five grades. However, their occurrence rate for "4: Excellent appropriateness" was more than that for the EMS group, and less than that for the FFS group. The average value of the degree of appropriateness for the appearance evaluation words was about 2.1 in the FFS group, about 1.8 in the EMS group, and about 1.8 in the OFFS group. In order to reflect the judgment of the degree of appropriateness in each of the observer groups, the appearance evaluation words were extracted based on conditions that led to a more than average value for degree of appropriateness across the three observer groups. As a result, 66 appearance evaluation words were obtained.

With reference to tactile sensation, Figure 4(a) shows that the FFS group had a tendency to select a higher degree of appropriateness. Especially in terms of the cumulative occurrence rates for "4: Excellent appropriateness" and "3: Good appropriateness," they account for 50% of all the evaluations. On the other hand, Figure 4(b) shows that the EMS group had a tendency to select the lower degree of appropriateness. Figure 4(a) and 4(b) indicate that the occurrence rate for "4: Excellent appropriateness" by the EMS group was about one third of that of the FFS group. Similar to the findings for the appearance evaluation words, this indicates that the FFS group had a

tendency to select a higher degree of appropriateness as compared to the EMS group, in the tactile sensation evaluation words. From Figure 4(c), it is evident that the OFFS group and the EMS group had a higher occurrence rate for "0: No appropriateness" in five grade scales. However, similar to the trend observed for the appearance evaluation, the occurrence rate for "4: Excellent appropriateness" was higher for the OFFS group than that for the EMS group, and less than that for the FFS group for the evaluation of tactile sensation. The average value for the degree of appropriateness of the tactile sensation evaluation words was about 2.4 in the FFS group, about 1.7 in the EMS group, and about 1.8 in the OFFS group. In order to reflect the judgment of the degree of appropriateness of the tactile sensation evaluation words in each of the observer groups, words were extracted based on the conditions led to a more than average value for degree of appropriateness across the three observer groups. As a result, 76 tactile sensation evaluation words were obtained.
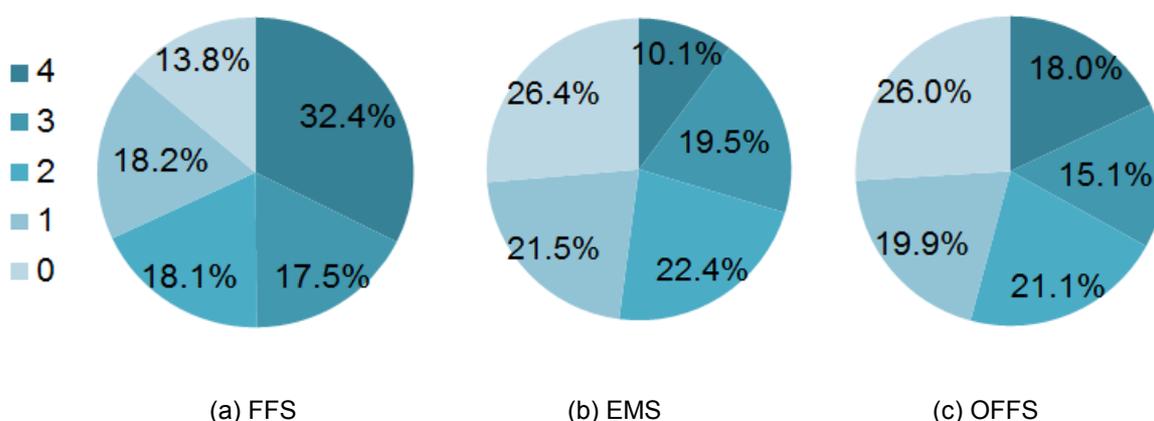

(a) FFS   (b) EMS   (c) OFFS

Figure 4: Occurrence rate for the degree of appropriateness of the words for tactile sensation of clothes

4. CLUSTERING APPEARANCE AND TACTILE SENSATION WORDS AND INVESTIGATING COMMON EVALUATION SCALES

The 66 appearance and 76 tactile sensation evaluation words which were judged as suitable for evaluation of the appearance and tactile sensation of clothes respectively, were summarized as a representative evaluation word using the clustering method (KJ method), by each of the observer groups that consisted of 13 participants. The clustering method of summarizing the appearance and tactile sensation evaluation word was performed in two steps. In the first step, some evaluation words with very high similarity were clustered. In the second step, these evaluation words were further summarized to about ten words for appearance and tactile sensation evaluation, respectively. As a result, the appearance representative evaluation words were identified for the FFS group (nine words), the EMS group (ten words) and the OFFS group (nine words). Similarly, the tactile sensation representative evaluation words were identified for the three groups, specifically, ten words for the FFS group, eleven words for the EMS group and eight words for the OFFS group. These representative evaluation words for appearance and tactile sensation, which were clustered in each of the observer groups, have been presented Table 1.

Table 1: Appearance representative evaluation words and tactile sensation representative evaluations clustered for each observer group

Observer groups	Appearance representative evaluation word	Tactile sensation representative evaluation word
FFS	"Suitable in winter," "Suitable in summer," "Casual," "Premium," "Classic," "Dislike," "Soft," "Unique," "Like," "Youthful"	"Warm," "Thin," "Smooth," "Rough," "Crisp," "Comfortable," "Stretchy," "Ductile," "Moist," "Uncomfortable"
EMS	"Thin/thick feeling," "Casual," "Formal," "Fancy," "Elegant," "Soft/hard feeling," "Brilliant," "Likable," "Slack"	"Thin/thick feeling," "Weightiness," "Rough/smooth feeling," "Comfortable," "Springy," "Soft/hard feeling," "Stretchy," "Flexible," "Dry/wet feeling," "Billowing," "Premium"
OFFS	"Suitable in winter," "Suitable in summer," "Casual," "Formal," "Good impression," "Bad impression," "Soft," "Vivid," "Murky"	"Winter," "Summer," "Smooth," "Uncomfortable," "Crisp," "Soft," "Comfortable," "Premium"

From Table 1, it is clear that the appearance representative evaluation words of the FFS group are similar to that of the OFFS group, while the EMS group exhibited a tendency to summarize the word of an opposite meaning. On the other hand, three observer groups showed different tendencies for the tactile sensation representative evaluation words. Therefore, similarities between the appearance and the tactile sensation representative evaluation words for each of the observer groups were investigated. In particular, results of the first step of the clustering method revealed a representative evaluation word with high similarity by comparing the similarity of the representative evaluation words for appearance and tactile sensation for each observer group. The common representative evaluation words were then examined by comparing the representative evaluation words across the three groups. As a result, eight appearance common-evaluation-words were identified: "Thin," "Thick," "Casual," "Formal," "Good impression," "Bad impression," "Soft," and "Vivid." Similarly, seven tactile sensation common-evaluation-words were identified: "Thin," "Thick," "Flat," "Rustic," "Crisp," "Soft," and "Stretch." This result suggests that "Thin", "Thick" and "Soft" in both meanings of the appearance and tactile sensation of clothes should be evaluated. Furthermore, the tactile sensation common-evaluation-words and the material axis (Kimie, 2006), which has been experimentally used in the fashion field, were investigated in terms of the common term. Conclusively, nine tactile sensation common-evaluation-words were obtained, by adding two axes: "Dry" and "Wet."

5. CONCLUSION

The purpose of this study was to identify evaluation scales that can accurately express the appearance and tactile sensation of clothes which apply to a wide range of people who participate in online shopping. Specifically, assessment words relevant to the appearance and tactile sensation of clothes were identified from the literature, and then these words were evaluated for their appropriateness in assessing clothes, and were clustered using various observer groups. Finally, appearance representative common-evaluation-words and tactile sensation representative common-evaluation-words were identified by investigating the similarity of these obtained words. As a result, eight appearance common representative evaluation words and nine tactile sensation common representative evaluation words were clarified.

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