

Influence of Knowledge about Clothes and Sensation Modalities on Texture Evaluation of Beige Textile

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ABSTRACT

This study aimed to clarify the influence of the extent of knowledge about clothes and the sensation modalities of observers upon texture evaluation of beige textiles. We carried out two experiments, one using only tactile sensation (TE) and the other using both visual and tactile sensations (VTE), for texture evaluation using 39 types of actual beige textile. TE and VTE were conducted by forty observers, using 13 and 14 words (in TE and VTE) measured on a 5-point scale. These observers comprised two groups, 20 students majoring in fashion design (FS group) and 20 students majoring in engineering (ES group). Three factors were extracted from a factor analysis examining the evaluation data for both groups of observers for each experiment: Wet/Like as first factor, Thin/Cold as second factor, and Soft/Stretch as third factor. Each textile was mapped in the factor space comprising these three axes based on the factor score, and then was discussed in terms of influences of the extent of knowledge about clothes and sensation modalities of observers. The results indicated that the FS group recognized the difference between the material and structure of the textiles more clearly than the ES group. Given the difference in sensation modalities, the evaluation score of the hemp textile in case of VTE indicated the tendency to estimate the textile more coolly than TE.

KEYWORDS: Texture evaluation of textile material, Clothes knowledge, Sensation modalities

INTRODUCTION

Recent years have seen a rapid uptick in the number of online shoppers, who are expected to exceed two billion people by 2020 [1]. However, a characteristic problem relating to the use of online shopping is the discrepancy arising between textures that buyers assume based on the visual perception of image data concerning fabrics, etc. and textures that can be appraised by visual and tactile perception of actual fabrics. To address this problem, we clarified a fabric texture evaluation words, and then, from considerations such as fabric texture evaluation and fabric photography conditions, we validated a method of creating fabric image groups that could be directly evaluated using the evaluation words. As a result, we clarified a method of creating images and videos able to represent fabric textures [3][4]. Furthermore, we also thought that if we could clarify relationships between fabric texture and other properties such as materials used and the weave of fabrics, this would provide useful information for fabric producers and expand possibilities for new avenues of clothing production and the development of new fabrics. While existing studies have clarified the relationship between fabric properties and texture [5], few academic studies have undertaken a comprehensive consideration of fabric properties as a whole, the only existing example being a survey based on rules of thumb used by apparel merchandising experts [6].

On the other hand, because texture evaluations are influenced by buyers' individual knowledge of fabrics even when they are faced with the same fabric image, there is a need to clarify how such considerations influence the judgement of fabric texture. Also, because fabric texture is judged by a complex sensation modality involving both the visual and tactile senses, clarifying the degree to which each sensory modality contributes to the judgement of fabric texture is a point of extreme interest in the context of cognitive science. While Takatera et al.

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have studied fabric search systems based on fabric texture evaluation by Japanese and Swedish designers and Japanese students [7][8], they have not addressed the influence of sensation modalities in the relationship between texture evaluation and fabric properties. Therefore, this study seeks to clarify the influence of knowledge about clothes and sensation modalities on the textural perception of beige textiles. Specifically, we prepared subject groups (ES and FS) with different levels of knowledge about clothes and arranged for each group to perform a textural evaluation using two modes of evaluation (TE and VTE) with regard to collections of beige fabrics made from different materials and weave structures. Then, from the results of factor analysis of the textural evaluation data obtained, we examined differences in levels of knowledge about clothes and sensation modalities.

EXPERIMENTAL

For fabric samples, we used 39 squares of fabric measuring 20 cm by 20 cm stored for at least 24 hours at a temperature of 20°C with 65% humidity. These were chosen from combinations of fibers (7 types: cotton, hemp, fur, silk, nylon, polyester, cupra), knit/weave (5 types: plain weave, oblique weave, satin weave, single, double), and thread thickness (3 types: fine, medium, thick) based on condition of completeness, purchase availability, and uniformity of color (beige). Subjects consisted of 20 fashion students (FS) and 20 engineering students (ES), for a total of 40 participants. We carried out two types of texture evaluation experiment, namely a tactile evaluation (TE) involving only the touching of fabrics and a visual tactile evaluation (VTE) involving the touching and viewing of fabrics (Figure 1). For both experiments we used the Macbeth Judge II made by X-Rite. In the TE experiment, a blackout curtain was hung to cut out visual information, while the VTE experiment was conducted with lighting from a standard light source (D65). The experiment was carried out by randomly presenting the 39 fabrics in 3 sets of 13 samples. In terms of the order in which the experiment was performed, to prevent subjects from memorizing the visual impression left by the fabric, the TE experiment was conducted first, followed by a 15-minute break, followed by the VTE experiment. Table 1 shows the evaluation words used in the experiment. The TE experiment involved 13 words, with the addition of the word “glossy” to make up the 14 words used in the VTE experiment. We used a 5-point evaluation scale that was scored from 0 to 4 (0: Not at All; 1: Slightly; 2: Yes; 3: Quite So; 4: Very Much So). The evaluation words were presented in random order.

Table 1. Fabric texture Evaluation Words

Experiment	Evaluation Words
TE (13 words)	Thin, Thick, Flat, Rustic, Crisp, Soft, Dry, Wet, Stretchy, Warm, Cool, Like, Comfortable
VTE (14 words)	Thin, Thick, Flat, Rustic, Crisp, Soft, Dry, Wet, Stretchy, Warm, Cool, Like, Comfortable, Glossy

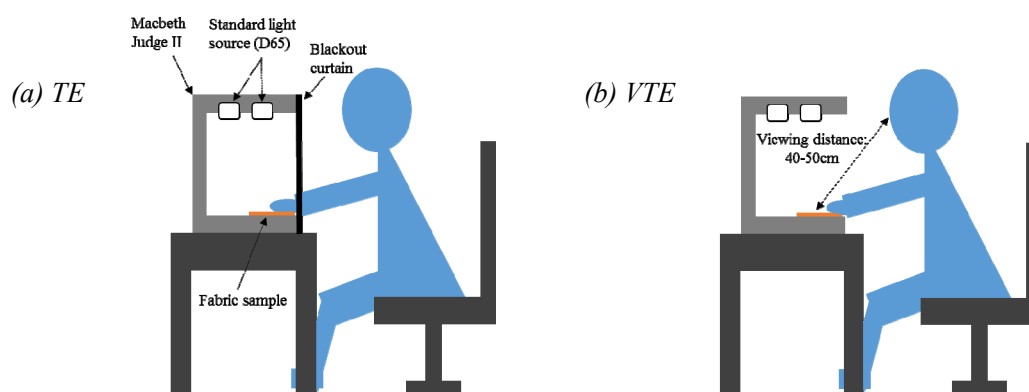


Figure 1: Experimental environment

RESULTS AND DISCUSSION

We calculated and compared the average value of evaluation scores for each subject group (FS and ES). As a result, in the evaluation of hemp fabric, differences were found in terms of sensation modalities and knowledge about clothes. Specifically, in both subject groups, evaluations of hemp as “thin” and “cool” in the VTE

experiment were demonstrated to be higher than in the TE experiment, whereas, conversely, evaluations of hemp as “thick” and “warm” in the VTE experiment were lower than in the TE experiment. Furthermore, this tendency was more pronounced in the FS group than in the ES group. This means that an impression of “thin” and “cool” attributes was more strongly conveyed when viewing and touching hemp than when merely touching it. That is, the expression of such a marked tendency seems to derive from the fact hemp is a material used for summer apparel and so may have been evaluated more highly as “thin” and “cool” as soon as its presence was recognized visually, as well as the fact that the FS group’s knowledge of clothing manufacturing was more advanced than that of the ES group.

Next, in order to compare evaluation tendencies among the evaluator groups as a whole, we conducted a factor analysis of the evaluation data from the FS and ES groups together and compared these in the context of the evaluation space. Specifically, in the TE and VTE experiments, respectively, we carried out a factor analysis of the evaluation results for 39 fabric samples in the FS and ES group and compared these in terms of their factor scores. Factor analysis involved the performance of a varimax rotation using the principal factor method, and three factors were extracted by extracting factors with eigenvalues of 1 or more. Here, we show only the results from the TE experiment. The first factor obtained was a “Wet/Like” factor consisting of “wet,” “comfortable,” “like,” “dry,” and “rustic.” The second factor was a “Thin/Cold” factor composed of “thin,” “cool,” “flat,” “thick,” and “warm.” The third factor was a “Soft/Stretch” factor composed of “soft,” “stretchy,” and “crisp.” In addition, as the cumulative contribution rate up to the second factor was 84%, we compared the evaluator groups within the fabric texture evaluation space delimited by the Wet/Like factor and Thin/Cold factor. Figure 2 shows the space obtained by plotting the factor scores for each factor based on the evaluation results for (a) FS and (b) ES. The enclosures on Figure 2(a) and (b) indicate identical materials, and the dot in the middle of the enclosure indicates the median point for the same material.

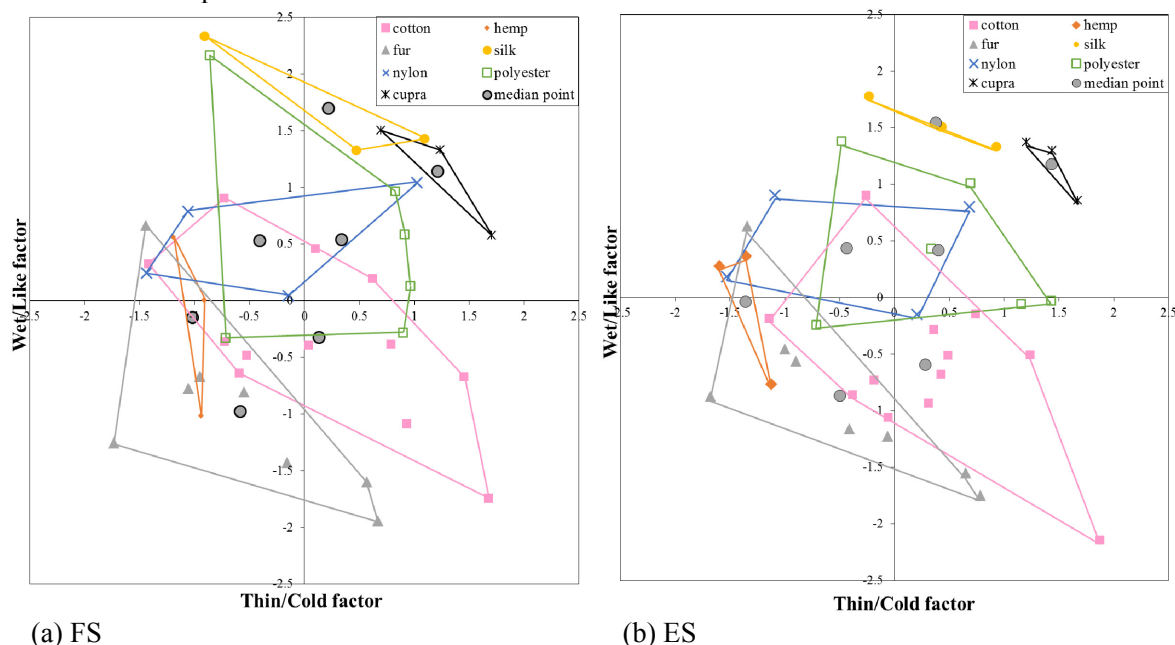


Figure 1: Result of Factor Analysis for Fabric Evaluation

First, in terms of the spatial areas obtained from the factor scores for each of the materials in Figure 2 (a) and (b), it may be seen that those for FS are much wider in comparison to those for ES. In other words, we find that the FS group, in comparison with the ES group, more clearly evaluates fabric texture on each factor axis and clearly judges differences in materials. In particular, we find that the extent of the evaluation spaces for fur, silk, and polyester on the FS Thin/Cold factor axis is much larger compared to the same spaces for the ES group. Further, from the fact that the median points for the FS group for cotton, hemp, and cupra are closer to the Thin/Cold factor axis than those of the ES group seems to suggest that in the TE experiment, the FS group was more consciously aware of evaluations relating to Thin/Cold factors than the ES group.

CONCLUSION

For this study, we conducted two types of tactile evaluation experiment on 39 types of fabric with different properties, namely a tactile evaluation (TE) involving only touching and a visual tactile evaluation (VTE) involving touching and viewing. Also, we performed each evaluation experiment with the participation of subject groups with different levels of knowledge about clothes, and examined the influence of differences in the level of fabric knowledge and sensation modalities on textural evaluation. As a result, in the evaluation of hemp, differences were observed in terms of both sensation modality and knowledge of fabrics. In addition, as a result of factor analysis of the evaluation results for the FS and ES groups in the TE and VTE experiments, respectively, three factors were extracted, namely a Wet/Like factor, a Thin/Cold factor, and a Soft/Stretch factor. After this, comparison of evaluation results for the FS and ES groups in the TE experiment within the fabric texture evaluation space for the Wet/Like and Thin/Cold factors demonstrated that the FS group, compared to the ES group, more clearly judges differences in fabric materials on each factor axis, and are also more conscious of evaluations related to Wet/Like factors.

It may also be noted that the findings obtained in these experiments allow the possibility of estimating influence on texture evaluation with regard to new fabrics. For example, Yūki-tsumugi is a traditional Japanese silk textile with a unique texture [9] that, because it is described as “thick” and “warm” in comparison silk textiles produced elsewhere, could be described as a textile that is subject to the Thin/Cold factor. Accordingly, the possibility is suggested that it may be highly susceptible to the influence of knowledge about clothes. In other words, this can be interpreted as indirect evidence that connoisseurs familiar with Japanese kimonos may have a higher regard for kimonos made from Yūki-tsumugi.

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