Sensory evaluation on string-formed interior materials
Characteristic research on the materials used for interior design (3)

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Abstract: Interior design materials greatly influence the quality of living space. Recently, in addition to
good design, environment and health conditions must also be considered, and various materials in addition
to conventional ones are being used. We have been researching materials which are currently used, and
those which are expected to be used, as interior design materials and have categorized such material
according to form- board form, sheet form, and string form. In this report, sensory evaluation of sight
and sight-and-touch experiments of string-formed materials made from natural materials using the SD-
method were conducted, in order to create an application guideline. From the results of factor analysis,
five factors: ‘Grade’, ‘Massiveness’, ‘Sensory of touch’, ‘Freshness’, and ‘Openness’ were extracted in
conjunction with sight and sight-and-touch. Furthermore, by creating a factor configuration map figure,
the relationship between the characteristics and the image of 20 types of string-formed materials could be
clearly identified in order to understand the tendency of the sensory characteristics.

Key words: string-formed, interior materials, Sensory evaluation

1. Introduction
Materials used for interior design has become more diversified. This is thought to be caused by the diversification in
customer taste and human and environmental considerations, such as the problem of waste products, health hazards as
typified by sick-house syndrome, etc. Specifically the development of new materials which are conducive to recycling
or can avoid toxic substances etc., and diversification of interior design materials to materials which have been used for
other purposes up to now. This also serves another purpose of creating interior spaces with a new image.
We have already categorized interior materials into board form and sheet form, and explored the sensory characteristics
of each, researched the mechanical characteristics of some, and have suggested an application guideline [1, 2]. In this
report, the sensation of string-formed materials made from natural materials is evaluated. String-form is a material
form with high potential in design development, which can be used on flat surfaces and even three-dimensional curbed
surfaces by secondary processing such as knitting, weaving, etc. We have demonstrated the sensory characteristics of
various string-shaped materials and considered their possible application as interior design materials.
2. Sensory Characteristics Of String-Formed Materials

2.1 Experiment Methods

These experiments are sensory experiments of sight and sight-and-touch for string-formed materials that are currently used, or are expected to be used, for interior design. In the sight experiment, only the sense of sight was measured and touch conditions were excluded, while in the touch experiment, the sense of sight-and-touch without excluding sight conditions was measured. Subjects were 32 students from the Department of Industrial Design, Faculty of Technology, at Takushoku University. First, the sight experiment was conducted, where the subjects could see but not touch, and then the sense of touch while seeing was measured.

Both were evaluated by SD-method, with seven levels of evaluation items with 17 pairs of adjectives. For test samples, string-formed materials were parallel aligned without gaps on a 210×297 mm board to form a flat surface and then covered with Kent paper with a 150 mm square window cut out. The subjects could see and touch the samples through this window. The width of the materials was approximately 0.5-14 mm, thickness 0.1-6.5 mm, and there were a total of 20 types of samples. Table 1 shows the type and quality of the materials. Test samples were chosen from among natural materials or processed natural materials.

Evaluation words for SD-method were obtained by questionnaire from professionals who deal with or have dealt with interior design materials.

2.2 Results

Using sensory evaluation data of each sample obtained by SD-method, factor analysis and cluster analysis were conducted for each sight experiment and sight-and-touch experiment. For the factor experiment, 16 of the 17 pairs

Table 1. Sample

<table>
<thead>
<tr>
<th>Name</th>
<th>Reed</th>
<th>Hemp A</th>
<th>Paper ribbon</th>
<th>Split wood A</th>
<th>Cane A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross section size (Other)</td>
<td>0.5</td>
<td>6.5</td>
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Table 2. Factor Loading after Varimax-method in Sense of Sight Experiment

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</thead>
<tbody>
<tr>
<td>Freshness</td>
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<td>Openness</td>
<td>Freshness</td>
<td>Openness</td>
<td>Freshness</td>
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<tr>
<td>factor 1</td>
<td>factor 2</td>
<td>factor 3</td>
<td>factor 4</td>
<td>factor 5</td>
<td>factor 6</td>
<td>factor 7</td>
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</tbody>
</table>

Table 3. Factor Loading after Varimax-method in Sense of Sight-and-touch Experiment

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of adjectives, excluding “like-dislike” were used. In the sight experiment, factor loadings with an absolute value of 0.5 or more were set as objects of interpretation, and five factors were determined to be appropriate from the factor number and the reduction of proper values. The accumulation contribution rate after varimax rotation was 66.38%. Furthermore, 5 factors were named- the first factor ‘Grade factor’, second ‘Massiveness factor’, third ‘Sensory of touch factor’, fourth ‘Freshness factor’, and fifth ‘Openness factor’ (Table 2). As a result of creating a tree diagram, five clusters were extracted in the cluster analysis.

Similar to the sight experiment, five factors were determined to be appropriate in the sight-and-touch experiment. The accumulation contribution rate after varimax rotation was 66.13%. Furthermore, regarding the naming of the five factors, although there was a slight difference in adjectives and the factor loading value consisting of each factor, naming became the same as the sight experiment (Table 3). Similar to the sight experiment, cluster analysis was conducted and five clusters were extracted.

Next, a configuration map between factors was created based on these results and each extracted cluster was shown on the configuration map. Figure 1 is the configuration map of sight and Figure 2 is the configuration map of sight-and-touch, both horizontal axes are the first factor (Grade factor), and the vertical axes are the second factor (Massive factor). In the sight configuration map, ropes made of coarse grass materials such as abaca or palm were considered as graceless, while rush, leather and paper ribbon were valued as graceful and quiet. Also, relatively thick materials with dark color such as split wood B, water hyacinth, paper cords, and paper ribbon were evaluated as strong and heavy, while thin materials with light color were evaluated as weak and light.

In sight-and-touch, while abaca and palm were evaluated as graceless and cheap, water hyacinth and hemp were evaluated as quite graceful as compared to the results of the sight experiment. Leather was evaluated as the most graceful and expensive looking, and belonged to the same cluster as paper ribbon and kigami with smooth surfaces. Paper cord B was considered to be the strongest and heaviest followed by palm, split wood B, bamboo C, paper cord (single ply), and water hyacinth. Kudzu, kigami and cane B (flat heart) were the weakest and light.

There were common points in both senses. Canes are used for furniture and baskets, and even within the same material,
cane A (with bark) and cane B (flat heart) had slightly different evaluations. Cane with the outer bark was slightly more graceful, but had greater massiveness and belonged to different clusters in sight-and-touch. In Japanese construction, split wood A and B used for the wickerwork pattern in ceilings and furniture fittings are wood materials from different kinds of trees. The grade of split wood B is evaluated slightly higher, but their massiveness differs greatly, seemingly due to the influence of wood color. Each of these also belongs to a different cluster. Regarding paper cords that have traditionally been used for the seating surface of chairs, single ply and triple ply samples were used. Single ply was evaluated as more graceful while triple ply was evaluated as having more massiveness, with a larger difference seen for sight-and-touch than for sight alone. Among paper ribbons of the same paper material used as samples at this time, ribbon-shaped material with 12 ribs had the highest degree of processing and was evaluated in all senses as the most graceful material.

3. Discussion And Future Challenge Tasks
While rush was considered to be the most elegant by sight, in sight-and-touch, leather was the most graceful and processed materials such as craft tapes and kigami were considered to be more graceful than rush. Smoothness of touch, fineness and steadiness (evenness) seem to determine the evaluation. This also seems to be the reason why rush, unlike coarse grass rope materials, is evaluated as graceful although a grass material. Also, paper ribbons and craft tapes have a sense of graceful equal to or better than cane or split wood, which are conventionally used as interior materials, so it is possible to use them in furniture fittings and wall-covering materials.

On the other hand, the same material was evaluated differently depending on the cross-section shape and processing method. This difference seemed to become more prominent when the factor of touch sensation was included. It is thought that it is possible to use material shapes with high development potential as interior design material after their mechanical characteristics have been determined.

4. References