Sensory Analysis techniques for materials selection in the education and in the industry context

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**RESEARCH FIELD**

Professional appliances are characterized by an intense use in harsh environment. Materials and finishes employed in professional products have to fulfill different technical requirements: high thermal resistance, food contact compliance and durability to food chemicals and detergents used in frequent cleaning processes. Moreover, they have to meet also sensorial and intangible properties required by the professional appliances market: among all, smoothness, shininess, elegance, quality, robustness and reliability.

The need for the integration of aesthetical-related properties in materials selection is particularly evident in metal replacement case studies, where a material change could affect the overall quality perception of the product [5].

**MATERIALS AND METHODS**

- **Sensory analysis tests**
  - Among standard Sensory Analysis techniques, discrimination tests (Paired comparison) and descriptive techniques (Napping\textsuperscript{R}, Ranking test) have been selected and readapted to fulfill the industrial context needs.

- **Sensory attributes**
  - The descriptors analysed by the tests were selected from literature together with design experts of the company.
  - **Assessors** (or test panel)
    - The panel group is composed by expert and non-expert in materials and by expert and non-expert in professional appliance field.
  - The assessors of the tests, whose results are described in this poster, have been selected from different company departments (Electrolux Professional Spa) and from Politecnico di Milano students (Design & Engineering MD).

**RESULTS AND DISCUSSION**

**PAIRED COMPARISON TEST** - Aged material samples

- **Samples**: 6 samples of sintered ceramic (2 colors)
  - Reference samples (non-aged)
  - Simulation 3 years of use through an accelerated life test (Dry and Wet abrasion)
- **Test modality**: only touch
- **Sensory attribute**: roughness

<table>
<thead>
<tr>
<th>Sample</th>
<th>Touch Roughness</th>
<th>Visual Smoothness</th>
<th>Transparency</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>Rough</td>
<td>Shiny - Matte</td>
<td>Transparent</td>
</tr>
<tr>
<td>D</td>
<td>Dry</td>
<td>Uniform - Non-uniform</td>
<td>Opal</td>
</tr>
<tr>
<td>W</td>
<td>Wet</td>
<td>Intense - Light</td>
<td>Semi-opaque</td>
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<tr>
<td>B</td>
<td>Brown</td>
<td>Rough - Smooth</td>
<td>Shiny</td>
</tr>
<tr>
<td>C</td>
<td>Cream</td>
<td>Warm - Cold</td>
<td>Luminous</td>
</tr>
<tr>
<td>T</td>
<td>Test</td>
<td>Slicky - Not Slicky</td>
<td>Paper</td>
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**RESULTS**

- **180 observations** on samples roughness perception:
  - **reasonable level of correlation** ($p < 0.05$)
  - **Pearson’s chi-squared test** ($\chi^2 = 80.210$; $DF = 25$; $P < 0.001$)
- **Roughness evaluation**
  - Ref. cream > Wet cream > Dry cream > Ref. brown > Wet brown > Dry brown
  - dry abrasion impacts on lowering roughness perception ($\chi^2 = 9.000$; $P = 0.003$)
  - wet abrasion had a significant effect compared to dry aging:
    - Wet-Dry cream ($\chi^2 = 5.835$; $P = 0.016$)
    - Wet-Dry brown ($\chi^2 = 4.410$; $P = 0.038$)

**CONCLUSIONS**

- **Sensory Analysis tests** valuable instruments to be applied in materials selection;
- **Statistical evaluation of results evidence concordance in user answers**;
- **Metal replacement case studies** particularly suitable for the evaluation of qualitative and quantitative properties of materials. It allows also to evaluate the perception of usability of materials and finishes in time;
- **Further development**:
  - **Ranking test** on aged metal-look samples to rate the level of acceptance by user;
  - **Comparison of some sensorial properties with 10-point scale ranking used in CES Edupack Products, Materials and Processes Database**;
  - **Apply Sensory Analysis tests to evaluate other material trends**.

**REFERENCES**