Large Scale Product Mapping Using Incomplete Block Sorting

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Introduction

- It is often important to characterize the sensory properties of large groups of products to understand market products, map flavor portfolios, or screen through samples
- Descriptive methods, like Quantitative Flavor Profiling (QFP™, Stampanoni, 1993), are often used to understand the sensory profiles of market products or map flavor portfolios for large numbers of samples
- These approaches are time consuming and often the full sensory profile is not needed to fulfil the objective
- Sorting or Flash profiling provide similar information in less time, but are not easily implemented with large numbers of products because they require the panelists to evaluate all products simultaneously

The objective of this study was to investigate Incomplete Block Sorting, where each panelist evaluates only a subset of products, and compare it to Descriptive Evaluation in terms of positioning and clustering on the sensory map and resources required to execute the study

Materials & Methods

Products
63 artificially-sweetened powdered soft drinks, including mixed fruit, berry, citrus, and tea flavors; 7 brands labeled A-G

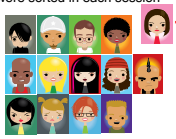
Lexicon
56 sensory descriptors (from Sense It™) with unique chemical references & definitions were used for both the Descriptive and Sorting Evaluations

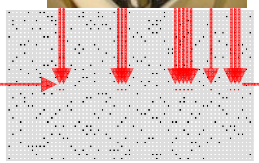
Descriptive Evaluation
All products evaluated over 9 sessions; Panelists individually rated intensity of the attributes on 0-100 point scale, group scores were discussed, resulting profile was agreed upon by consensus

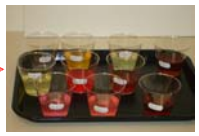


Panelists
14 trained descriptive panelists with an average of 8 years experience utilized for both the Descriptive and Sorting Evaluations

Sorting Evaluations
84 evaluations* completed in 6 sessions over 3 days; 10 products were sorted in each session







* For Sorting, each product was presented the same number of times over the course of 84 evaluations

Results

Sensory Maps & Product Clusters

RV coefficient = 0.64 (p<0.1%)

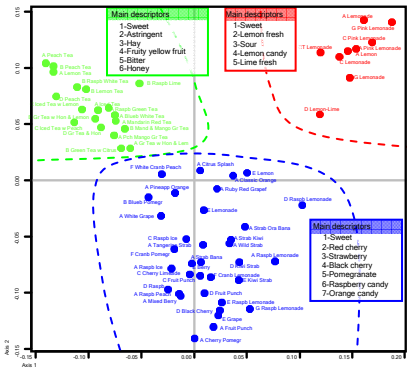


Figure 1. Incomplete Block Sorting Map

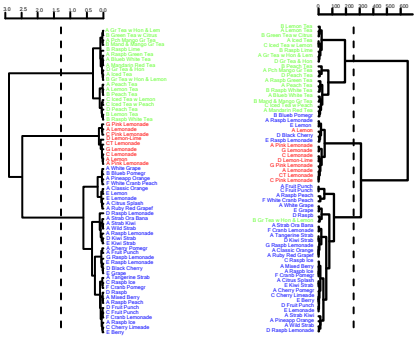


Figure 2. HCA Dendograms for Incomplete Block Sorting (left, a) and Descriptive Evaluation (right, b)

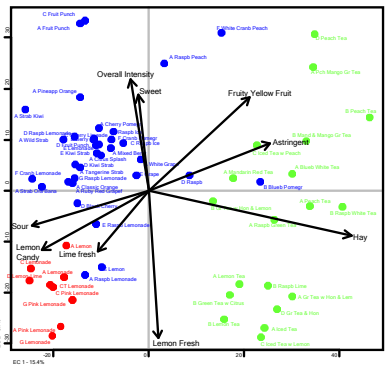


Figure 3. Descriptive Evaluation PCA Map

Analysis



Sensory Maps

- Incomplete Block Sorting, Figure 1
  - The sensory map was created with Distatis
- Descriptive Evaluation, Figure 3
  - The sensory map was created with Principle Component Analysis (PCA) on non-standardized sensory attributes; only attributes with a cos2 superior to 0.2 were plotted

Hierarchal Cluster Analysis (HCA - Ward's Criterion)

- Incomplete Block Sorting data, Figure 2a
  - Hierarchical Cluster Analysis (HCA) was performed on the co-occurrence matrix
- Descriptive Evaluation data, Figure 2b
  - Hierarchical Cluster Analysis (HCA) was performed on the distance matrix from the average scores

RV Coefficient

- The RV coefficient between the two 2D maps was computed and tested for significance

All calculations were performed with R version 2.11.1

Conclusions

If the sample set comprises a large number of stimuli and individual profiles are not needed, Incomplete Block Sorting seems to be a promising methodology. In this study, it provided similar product maps and clusters to Descriptive Evaluation and required less time and resources to execute the study. More work is needed to understand how this technique would perform with other types of stimuli.



Table 1. Comparison of Methods

Method	Ease of Task	Evaluation Time	Map Detail	Cluster Type	Product Profiles
Incomplete Block Sorting	Simple & intuitive	Quick	Placement on map indicates product similarity but no attribute intensity drivers	Products are tightly grouped within the cluster; clusters are more separated	Not available
QFP or other Descriptive	Significant training required	Longer	Attribute drivers/vectors available; placement of products on map related to attribute intensities	Products are spaced farther apart within the cluster	Available

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