Training techniques for uniform interpretation of attributes and sensory rating

Claire Sulmont-Rossé
Introduction

Sensory profile

- Creamy
- Sour
- Sweet
- Fatty
- Firmness
- Viscosity

Artificial Vanilla
Natural Vanilla
Butter
Farm, cowshed
This wine has an integrated apple, citrus and white flower character. Complex notes of mineral and oak spice weave through the smooth, silky fruit flavors and linger on the finish.
Introduction

Are we able to identify odors?

- For a long time, olfaction has been considered as a primitive sense, dedicated to animals which by essence do not talk.
Are we able to identify odors?

- Most of the world languages (~99% of the languages) has abstract words to designate colors but not odors
- Odors are identified by their action (pleasant odor = odor that makes me feel comfortable) or by their source
Introduction

Are we able to identify odors?

- On average, we are able to identify about 1 familiar odor over 2

Why are we so bad?

- Our culture does not favor odor name learning while object or color names are systematically learned since childhood
Implication for descriptive tests

- There is no consensual language to describe the sensory sensations elicited by a food
- The challenge of descriptive tests is to cope with this lack of consensus

*Flavor Profile® & Profile Attribute Analysis®*
*Quantitative Descriptive Analysis® (QDA)*
*Texture profile® and Sensory spectrum®*
*Free-choice profile and Flash profile*

...
Sensory profile

- Panelists selection
  Selection of panelists according to various criteria / skills
- Panelists training
  Descriptor generation and/or descriptor learning and/or rating training
- Measurement session
  Measurement of the perceived intensity of each descriptor in each product through several replications
Introduction

To be reliable, a sensory panel should be...

- **Discriminative**
  
  *Panelists should make difference between the products*

- **Homogeneous**
  
  *Panelists should agree on the difference between the products*

- **Repeatable**
  
  *Panelists should give the same ratings at different measurement occurrences*

One could not conclude on the profile results if the panel is not reliable!
Sensory profile

- **Panelists selection**
  
  *Selection of panelists according to various criteria / skills*

- **Panelists training**
  
  *Descriptor generation and/or descriptor learning and/or rating training*

- **Measurement session**
  
  *Measurement of the perceived intensity of each descriptor in each product through several replications*
Selection
Selection criteria

- Basic criteria
- Sensory abilities
- Cognitive abilities
Selection criteria

- Basic criteria
  - Availability
  - Age, gender...
  - Food habits

- Sensory abilities

- Cognitive abilities
Selection criteria

- Basic criteria
- Sensory abilities
  - Ability to detect sensory stimulation
  - Ability to discriminate between different intensities
- Cognitive abilities
Selection

Selection criteria

- Basic criteria
- Sensory abilities
- Cognitive abilities
  - Prior knowledge
  - Memory
Assessment of prior knowledge

- Forced-choice identification test

Familiar odors

- strawberry
- coffee
- vanilla
- rose
- soap
- mint

Percentage of correct identifications
Assessment of memory

- Recognition test
Do selection tests predict panelists’ performances?

- A case study on cheese: Lesschaeve & Issanchou, 1996
- Prior knowledge & memory

*Panelists who had higher discrimination power obtained higher scores on the forced-choice identification test and on the recognition test*

*Prior knowledge on the name of sensory stimuli and/or efficiency to memorize such associations improve training efficiency*
Sensory profile

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  Measurement of the perceived intensity of each descriptor in each product through several replications
Sensory profile

- Quantitative Descriptive Analysis® (QDA) – conventional profile (norms) – Stone et al., 1974
  
  *Training specific to one type of product*

- Sensory spectrum® - Civille & Lyon, 1996
  
  *Extensive and “universal” training*

- Free-choice - Williams & Langron, 1984
  
  *No training*
Sensory profile

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Conventional sensory profile training
Conventional sensory profile training

Principle

- Descriptor generation
  
  Panelists generate vocabulary to describe the sensory properties of the product of interest

- Descriptor learning
  
  Panelists agree on a consensual definition for each descriptor (vocabulary alignment)

- Profiling training
  
  Panelists are trained to rate the perceived intensity of the descriptors in the product of interest
Conventional sensory profile training

Impact of the training content

- A case study on orange juice: Sulmont et al., 1998
  - 3 groups of 10 panelists
  - 8 descriptors: lemon, floral, smoked, orange, artificial odor of orange, grapefruit, peach-apricot, medicinal
  - 8 training sessions
  - Each training session was divided in two parts: descriptor learning and profiling training
  - Four descriptors were learned at each session
Conventional sensory profile training

Impact of the training content

- A case study on orange juice: Sulmont et al., 1998
  
  \textit{Descriptor learning with standards: groups 1R and 3R}

- Fresh grapefruit juice
- Pink grapefruit concentrated juice
- Grapefruit syrup

Fresh grapefruit juice
Conventional sensory profile training

Impact of the training content

➢ A case study on orange juice: Sulmont et al., 1998

*Descriptor learning without standards: group 0R*

In which sample(s) do you perceive the descriptor “grapefruit”?

In which sample, the descriptor “grapefruit” is the most intense?

- Bitter, aggressive odor which reminds either the fruit, either the peel (odor more bitter), either the juice (odor sweeter).
- Background odor. This odor is sweeter than odor of lemon. Odor which is first perceived as acid and secondly as bitter. Confusion with lemon odor.
- Odor of the juice.
- This odor is perceived after the odor of orange.
Conventional sensory profile training

Impact of the training content

- A case study on orange juice: Sulmont et al., 1998
  The use of one standard per descriptor seemed to be only efficient when the standard was typical of the odor perception in the orange juices. Learning one odor concept with 3 standards led to redundant use of discriminant descriptors and failed on the agreement among assessors.
  Group 0R was a discriminant as well a homogenous panel.

- Standards are useful if they are typical of the sensory stimulation encountered in the product.
  They should be validated by the panel.
  Their intensity should be adapted to the intensity range encountered in the product space.

- Practice of tasting the products improves panel performance.
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Specificity

- **Standardized lexicon of terms**
  - *No descriptor generation*
  - *Same language for all products within a category over time*
  - *Scales are standardized and anchored with multiple reference points*
  - *Panelists are extensively trained to use these scales*
Example of scales

- **Sour scale**
  - 2.0 – 0.05% citric acid in water solution
  - 4.0 – Natural apple sauce (Motts)
  - 5.0 – Reconstituted frozen orange juice (Minute Maid)
  - 8.0 – Sweet pickle (Vlasic)
  - 10.0 – Kosher dill pickle (Vlasic)
  - 15.0 – 0.20% citric acid in water solution
Sensory Spectrum

Example of scales

- Hardness scale
  1.0 – Cream cheese (Kraft)
  2.5 – Egg white (hard-cooked, 5 minutes)
  4.5 – American cheese (Land O Lakes)
  6.0 – Olive (Goya Foods)
  7.0 – Frankfurter (Hebrew National Kosher Foods)
  9.5 – Peanut (Planters, Nabisco Brands)
  11.0 – Almond (Nabisco Brands)
  14.5 – Hard candy Life Savers (Nabisco brands)
Example of scales

- Orange aroma scale
  - 3.0 – Orange drink (Hi-C)
  - 6.5 – Reconstituted frozen orange
  - 7.5 – Freshly squeezed orange juice
  - 9.5 – Orange concentrate (Tang)
Sensory profile

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Free-choice profile
Free-choice profile

Specificity

- Panelists use their own list of descriptors
  
  No consensual vocabulary

  Panelists individually generate descriptors and then use their own unique list of terms to evaluate the products

- Data are analyzed using generalized Procrustes analysis

  Rotation of the individual matrices to obtain a consensual space
Free-choice profile and Flash profile

Conventional profile versus Flash profile

Delarue & Sieffermann, 2004
Conclusion
**Free-choice profile and Flash profile**

### Conventional profile versus Flash profile

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Example of scales

- **Hardness scale**
  1.0 – *Cream cheese* (Kraft)
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# Free-choice profile and Flash profile

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Conclusion

The measure phase is often the shortest and the training phase the longest...

- But training is crucial step to obtain reliable sensory profile

The key-points for a successful training are...

- Let panelists reach a consensus by themselves, through discussion
- Expose panelists to the products of interest as soon as possible
Thank you for your attention!