New methods in sensory analysis

Lenka KOUŘIMSKÁ
Viet Phu TU
Thi Minh Hang VU

Department of Quality of Agricultural Products, CULS Prague

Department of Food Science and Technology, BOKU Vienna

Department of Food Quality and Management,
Hanoi University of Science and Technology

HISTORY OF SENSORY ANALYSIS

sensory analysis <u>in the past</u> → **information** if the food is:

- **nutritious**
- **not bad** (spoiled)
- without **toxic compounds**

favourable – **sweet** and **fatty** food
unfavourable – **bitter**, **too sour** or **astringent** food

civilization development:
- variety of different quality foods
- better culinary technologies

today's:
- offer is bigger than demand
- food safe products

Sensory quality → consumer can evaluate

sensory analysis is a **multidisciplinary** subject

psychology sociology biology chemistry biochemistry

SENSORY ANALYSIS DEFINITION

Sensory analysis involves the use of people (their senses) to evaluate the sensory attributes of food and food products.

"… scientific method used to evoke, measure, analyze and interpret those responses to products as perceived through the senses of sight, smell, touch, taste and hearing." **(Stone, H and Sidel, JL. 1993. Sensory Evaluation Practices. Academic Press: San Diego.)**

Stimulus → **Sensation** → **Response**

<u>conditions:</u>

objective, accurate and **reproducible** – ISO standards

ASSESSORS IN SENSORY ANALYSIS

assessors, panellists

panel

Type of sensory panel (based on number of panellists):

- Single expert assessor
- Analytical sensory panel
- Consumer panel

SENSORY TESTS

- by assessors
- conditions for objective, accurate and reproducible evaluation

General requirements for a good assessor:

a) Ability to describe and discriminate

b) High motivation

c) Reliability and availability

d) Good eyesight, no colour, taste or odour blindness

e) Good general health

d) No allergies to tested products

Optimal conditions for sensory analysis

Factor	Optimal conditions for evaluation
Sound level	around 40 dB, doors and windows insulation
Temperature	21 – 23 °C, air-conditioning
Air humidity	40 – 70 %, air humidification in winter
Air flow	no, only during brakes
Smells	protection against smells: ventilation, filters, paintings
Visual sensations	no decorations, walls: light grey or white colour
Personal contact	testing booths for assessors

ISO 8589:2007 Sensory analysis - General guidance for the design of test rooms

The most common methods in sensory analysis:

Analytical

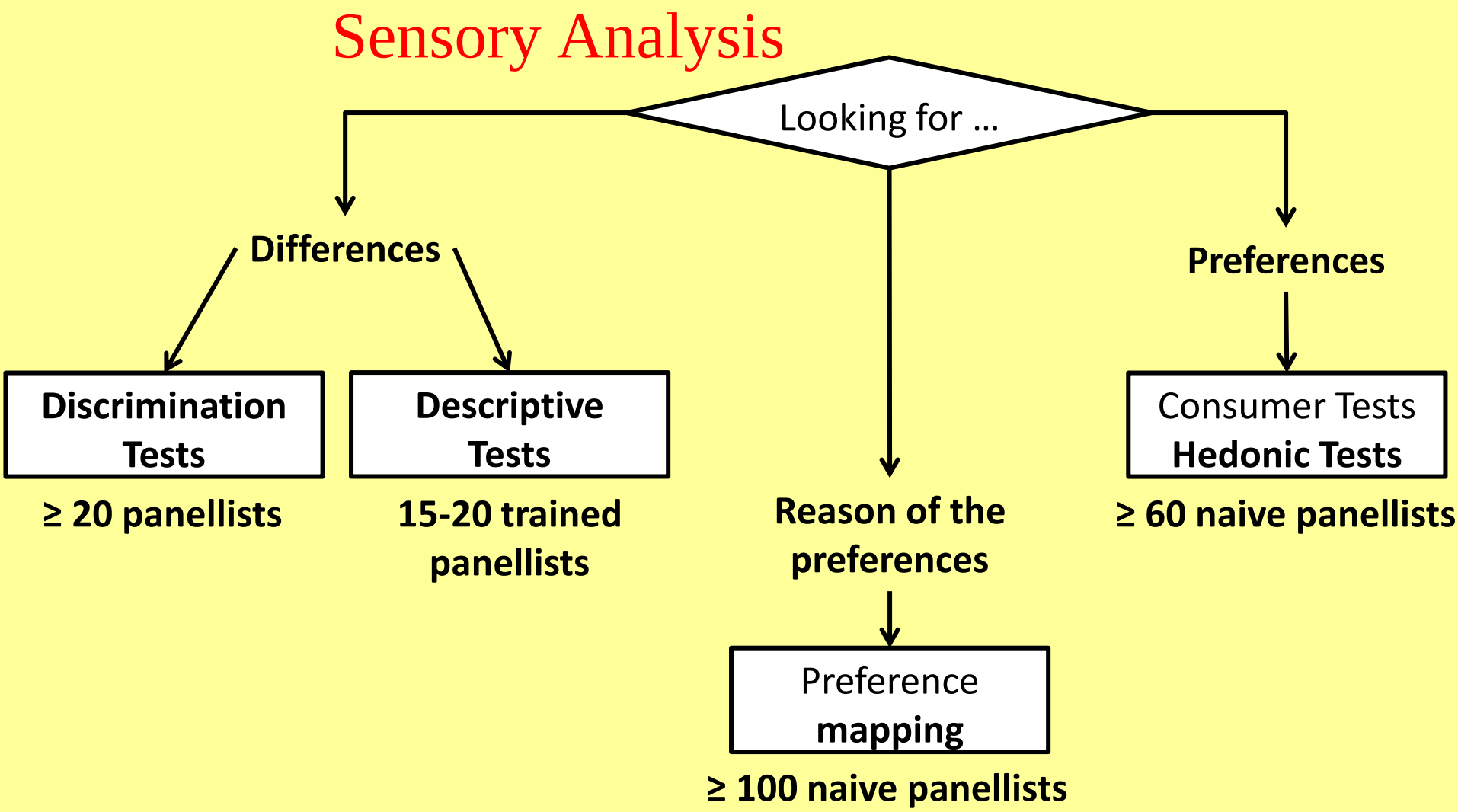
Discriminative – determine whether the difference between products is perceived at some significance level

Descriptive – quantitative descriptions of products obtained from the perceptions of qualified subjects

Affective

Hedonic – providing a measure of liking

Preference – determining which product is preferred


Sensory Analysis
Looking for …
Differences
Preferences
Discrimination Tests
Descriptive Tests
Consumer Tests Hedonic Tests
≥ 20 panellists
15-20 trained panellists
Reason of the preferences
≥ 60 naive panellists
Preference mapping
≥ 100 naive panellists

The most common laboratory methods in sensory analysis

Question	Suitable methods
Is there a difference between samples?	discrimination tests: pair, duo-trio, triangle, tetrade, two-out-five, four-out-ten one-stimulus, two-stimuli tests
How big is the difference between samples?	discrimination tests scaling methods
Which sample do you prefer?	discrimination tests scaling methods
Comparison of several samples	ranking tests (preference or intensity)
Acceptability and intensity evaluation	scaling methods, dilution methods, marking against a predetermined scale
Determination of perception (sensation) character	sensory profile methods, free-choice profile comparison with standards

WHAT IS DESCRIPTIVE ANALYSIS?

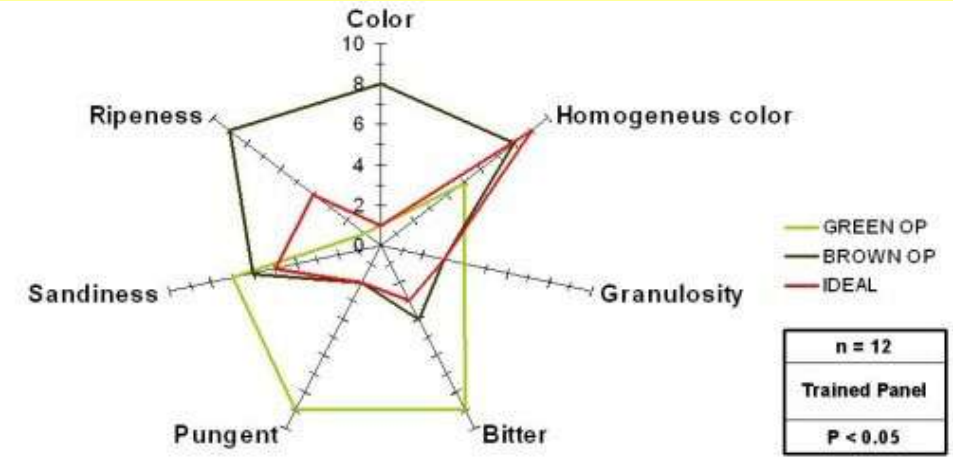
Descriptive analysis is a conventional sensory profiling method used to describe the characteristic of a product

- by identifying the list of descriptors

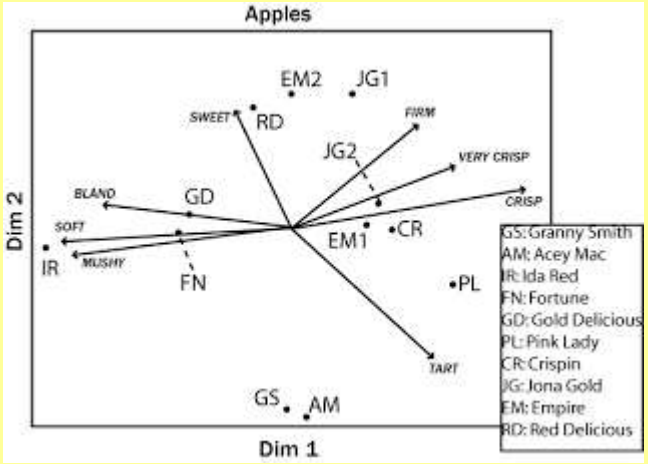
- and quantifying the difference between products on these descriptors

The difference between products is investigated → Product Map

Each product is characterized by a profile…



Olive Powder – Sensory Profile
http://www.olivepowder.com/sensoryprofile.html



http://substancep.ataraxis.org/2009_09_01_archive.html

Quantitative Descriptive Analysis (QDA®)

- **Panel Selection**
- **Descriptor generation**
- **Training**
- **Sample sensory analysis**

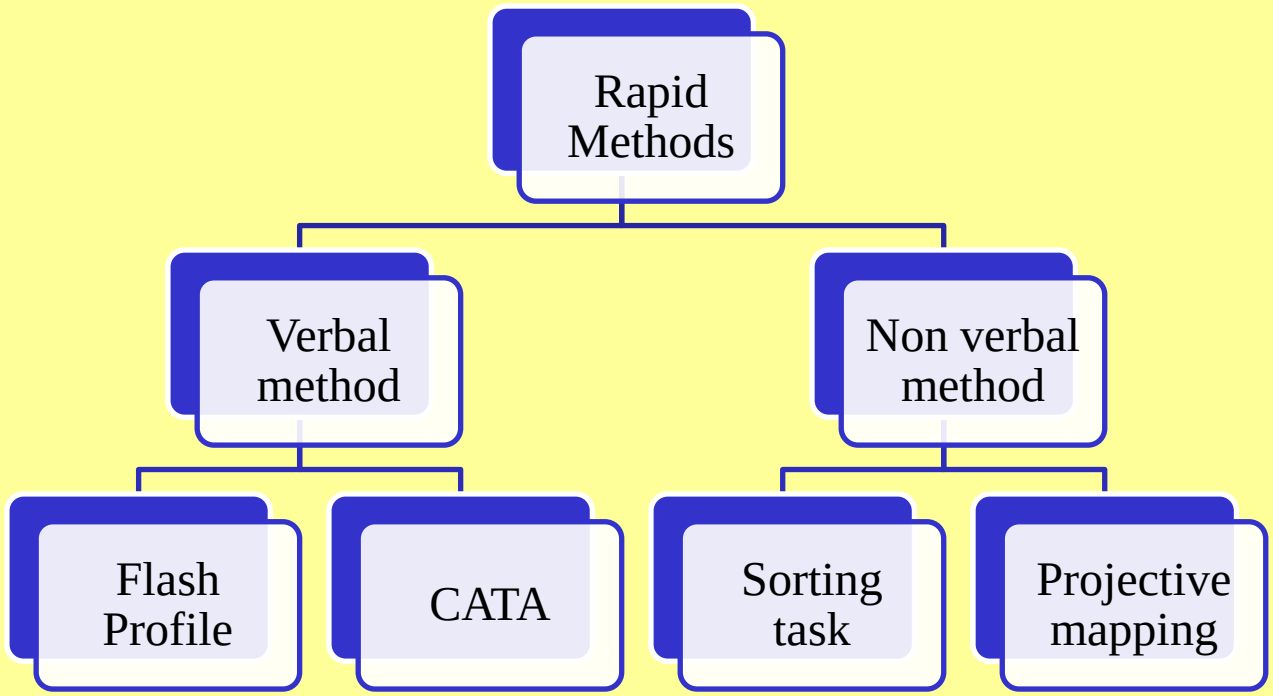
Food Industry needs faster methods with lower cost and better applicability.

➢ Advantages:
- Accurate
- Precise
- Repeatable

➢ Disadvantages:
- Long training time
- Time consuming
- Expensive

Rapid Methods

Group of methods which tries to reduce time and cost of the conventional method by reducing the investigation on panel training but having an acceptable product map.



FLASH PROFILE

FP is an alternative sensory analysis technique adapted from Free Choice Profiling.

Untrained subjects select their own terms to describe and evaluate a set of products simultaneously, and then rank the products for each attribute that they individually create. They are asked to focus on the descriptive terms, not on the hedonic terms.

Principle

- Free description of sensory properties
- All products are presented at the same time
- Ranking of products following the intensity of each perceived sensory attribute

Assessors:

6 to 10 panellists

Number of products:

Max 15 depending on the nature of products

Repetition:

twice or presentation of some products in duplicate to test the reproducibility

Results analysis:
Generalized Procrustes Analysis (GPA) to create a consensus configuration

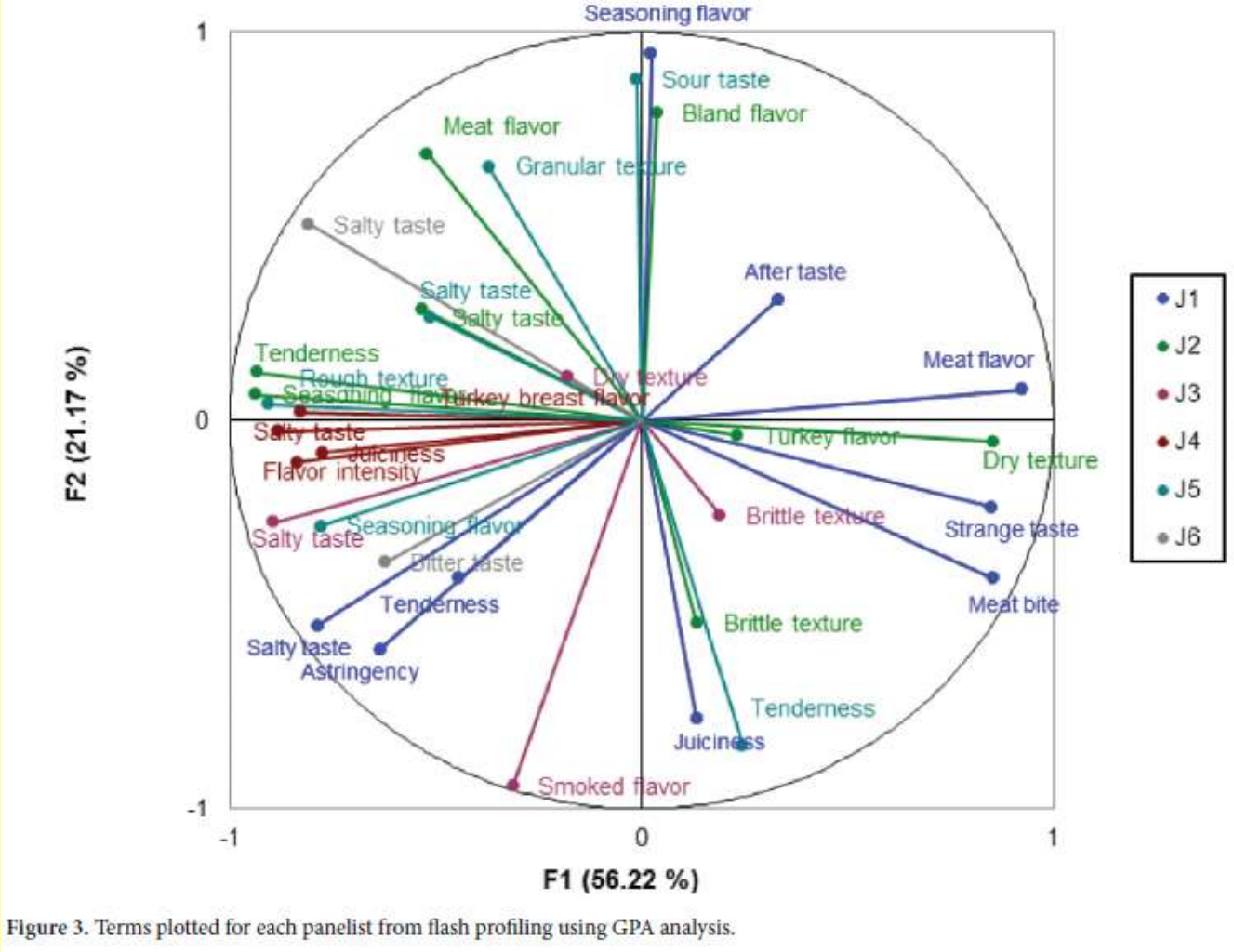


Figure 3. Terms plotted for each panelist from flash profiling using GPA analysis.

http://www.scielo.br/img/revistas/cta/2014nahead/aop_cta_6267fig03.jpg

CATA

CATA (check-all-that-apply) surveys allow to focus on consumers instead of trained assessors.

The principle is that each assessor receives a questionnaire with attributes or descriptors that the respondent may feel, or not, that they apply to one or more products.

If it does, he/she simply needs to check the attribute, otherwise he does not need to do anything.

An example of check-all-that-apply (CATA) questions for vanilla ice cream (Dooley et al. 2012)

Check all attributes that describe this sample:

- ❑ Buttery
- ❑ Sweet
- ❑ Milk/dairy flavor
- ❑ Custard/eggy flavor
- ❑ Corn syrup
- ❑ Artificial vanilla
- ❑ Natural vanilla
- ❑ Creamy flavor
- ❑ Soft
- ❑ Hard
- ❑ Gummy
- ❑ Icy
- ❑ Creamy/smooth

SORTING TASK

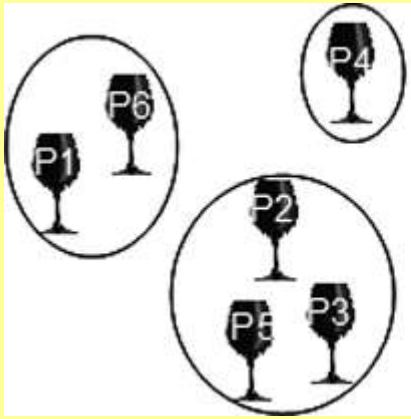
http://www.learning4kids.net/wp-content/uploads/2012/01/Sorting-Buttons-4.jpg

A similarity-based methods:

- **Based on similarities between products**
- **Without using language**
- **Easily applicable to many food products**

Principle

- **Smell and taste the products, then make groups according to their similarity.**



	P1	P2	P3	P4	P5	P6
P1	1	0	0	0	0	1
P2	0	1	1	0	1	0
P3	0	1	1	0	1	0
P4	0	0	0	1	0	0
P5	0	1	1	0	1	0
P6	1	0	0	0	0	1

- **You can make as many groups as you want and group together as many products as you want.**

Assessors:

~ 20 trained or untrained panellists

Number of products:

9 – 20, depending on the nature of products

Not for hot food product

Application:

Preliminary selection of products for other sensory tests like QDA or hedonic testing

Results analysis:

Matrix of individual co-occurrence: Prod i is in the same group with Prod j – Matrix of Judge 1

	P1	P2	P3	P4	P5	P6	P7	P8	P9
P1	21	7	3	11	4	1	7	2	3
P2	7	21	2	4	9	3	4	1	1
P3	3	2	21	2	4	6	5	9	10
P4	11	4	2	21	6	2	6	1	2
P5	4	9	4	6	21	3	3	6	4
P6	1	3	6	2	3	21	2	7	6
P7	7	4	5	6	3	2	21	6	7
P8	2	1	9	1	6	7	6	21	9
P9	3	1	10	2	4	6	7	9	21

Global similarity matrix: Prod i is in the same group with Prod j – Matrix of all Judge

Product Map

PROJECTIVE MAPPING (NAPPING)

Projective mapping serves as a simple and quick technique to obtain product inter-distances.

This technique can be applied to product sets with as many as 12 samples.

Each panelist is presented with a large sheet of paper, usually 60 cm x 60 cm.

http://blog.esensorics.com/wp-content/uploads/2015/03/cola_taste_map_blank.png

PROJECTIVE MAPPING

An example of the instructions provided to panelists would be:

Please taste all the samples in front of you and arrange them on the paper in such a way that similar samples are located near one another and different samples are placed far apart. You are free to evaluate the samples according to any criteria that you choose, and you do not need to specify your criteria. Feel free to use as much of the paper as is necessary to express the differences you may perceive. When you are finished, please mark the location of each sample with the corresponding number.

https://www.youtube.com/watch?v=dW1nLk5JJGs

SUMMARY

Rapid methods:

- Aim to describe the product map => which are differences between products?
- No need the assessor's training, but they should be product experts
- Free/no selection of descriptors
- Free perception of intensity and free ranking or grouping the products

Applications:

- alternatives or complementary to conventional descriptive methods
- used to capture sensory perception
- in new product development and consumer research
- in testing specific populations

THANK YOU
FOR YOUR ATTENTION

Rapid Sensory Profiling Techniques: Applications in New Product Development and Consumer Research

J Delarue, B Lawlor, M Rogeaux

Elsevier 2014