
Comparing Sensory Profiles derived from Consumer and Trained Panels

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Introduction

Comparing Sensory Profiles

- F. Husson at al. (2001): 28 beverages derived from a series of consumer tests
 - **consumers were:**
 - **discriminant** (the product effects are significant)
 - **reproducible** (despite their significance, interactions are not troublesome)
 - **The differences in the relative scaling of the products have no practical impact.**

➤ ...This reinforces the industrialist practises who include descriptive questions in consumer surveys.

- Meullenet at al. (2008): 10 vanilla ice cream products
- Worch at al. (2008): 12 luxurious perfumes

Materials & Methods

- **7 kinds of cigarettes:** 4 in-market products
3 purpose-developed products (mint, sweet, creamy)
- **Consumer profile:** Sequential monadic
2-days in-home placement
Face-to-face interview
14 flavour attributes (supported by visuals,
respondents were asked to select at least one, free choice)
- **Conventional profile:** Trained panel, N=12
The same 14 attributes, plus 6 additional attributes
Intensity rating (11-point scale)
3 Repetition
3 Products/session

Attributes Used:

Trained assessors	Consumer
Minty	Minty
Smoky	Smoky
Woody	Woody
Spicy	Spicy
Green	Green
Sweet	Sweet
Nutty	Nutty
Creamy	Creamy
Roasted	Roasted
Attribute 10	Attribute 10
Attribute 11	Attribute 11
Attribute 12	Attribute 12
Attribute 13	Attribute 13
Attribute 14	Attribute 14
Attribute 15	
Attribute 16	
Attribute 17	
Attribute 18	
Attribute 19	
Attribute 20	

- Same attributes in both panels

Methodological Details

■ **Assumptions:**

- I. The probability of detecting a sensory property increases with its intensity (and vice versa).
- II. The probability of mentioning a sensory property not present is constant.
- III. An attribute which is more likely to be present in a product category will have a higher probability of being mentioned than an attribute which is less likely to be present.
 - Positive/negative connotation of attributes might be an additional influential factor regarding the above-mentioned probability.

■ **Practical aspects:**

- Comprehensible attributes (no technical terms)
- Concept visualisations (checked e.g. in group discussions)
- Attributes of the consumer profile included in the attribute list for the trained panel
- Free choice of the flavour attributes by consumers (at least one).
- Products must be sensorially differentiated.

Data Format

- **Consumer profile:**

- **Frequencies** of mentioning a distinctive perceivable sensation when consuming the product.

The relative frequencies were calculated from the raw frequencies (by attribute for all products).

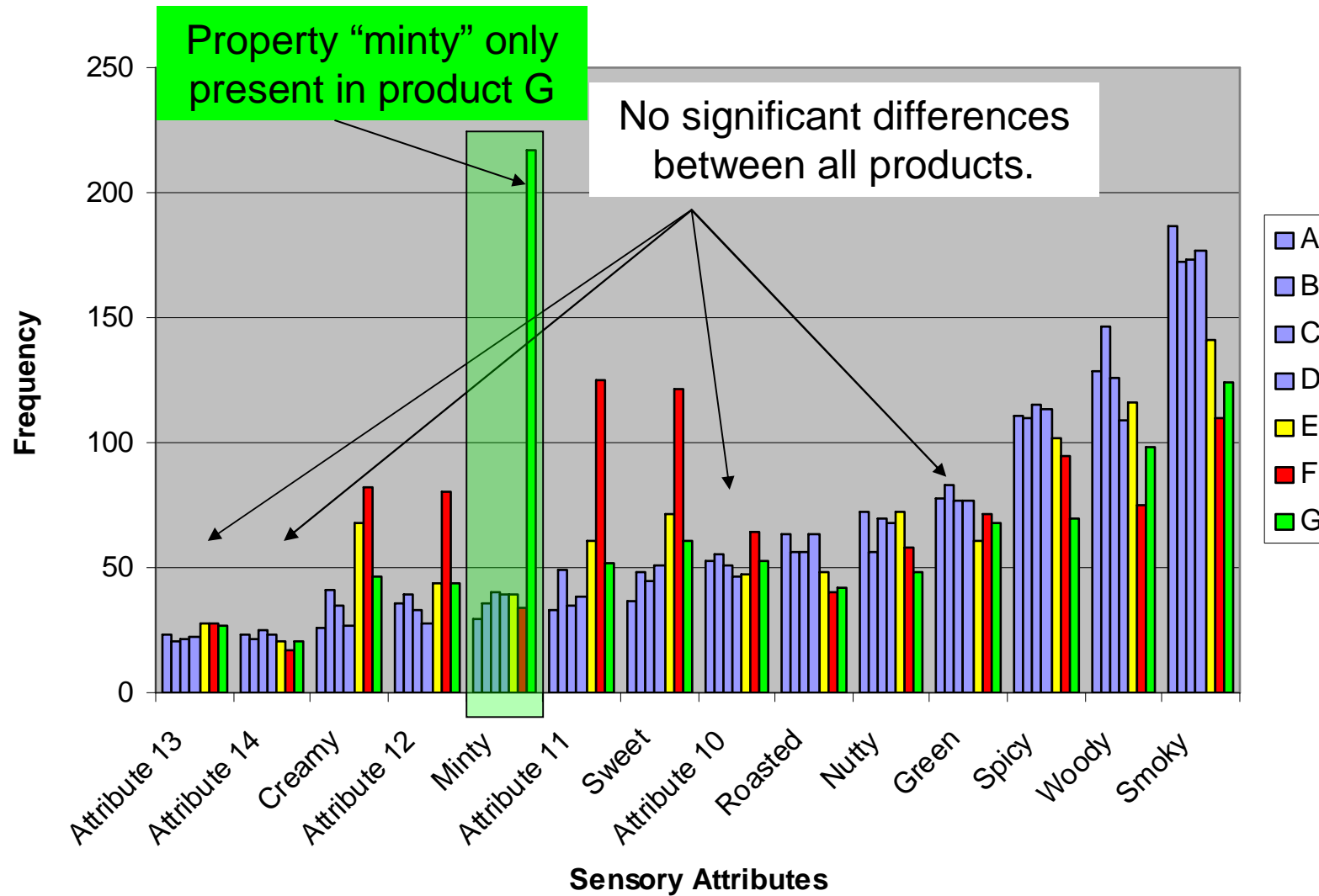
- **Conventional profile:**

- **Attribute mean values** of the 3 repetitions for each product.

Data Analysis

- **Inspection of frequencies:**
 - Contingency tables, Chi-Square Test.
- **Comparison between consumer profile and conventional profile.**
 - Principal Component Analysis (PCA), covariance matrix, VARIMAX rotation.
 - Generalised Procrustes Analysis (GPA).
 - Multiple Factor Analysis (MFA)
- Software: XLSTAT

Frequency of mentioning a certain sensation



Chi²-Test: Contingency Table

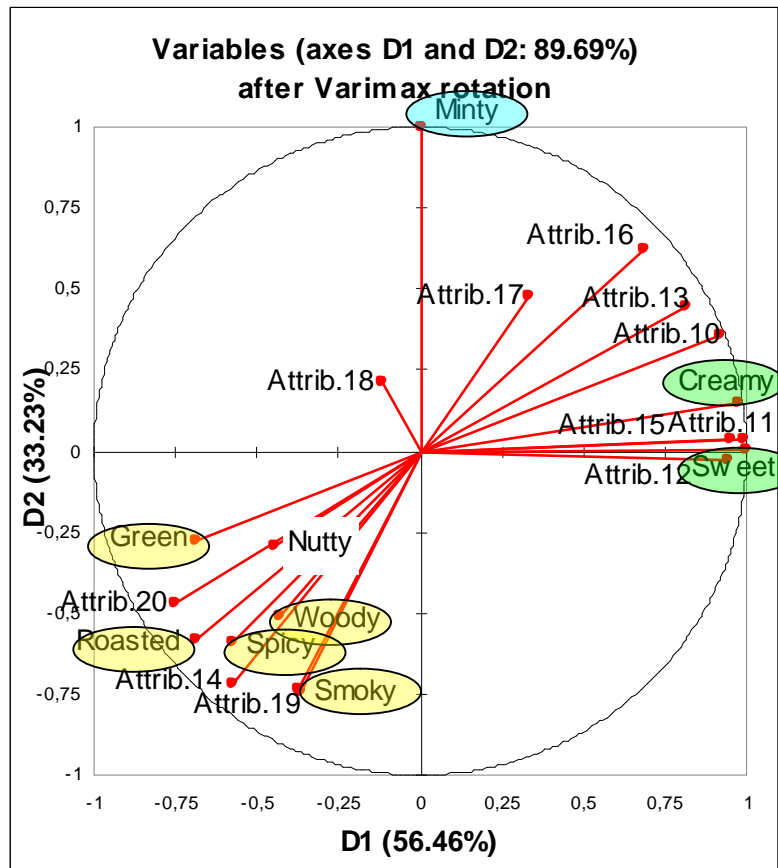
- The 4 products A, B, C, D **do not significantly differ** in the frequencies of mentioned flavour attributes:

Chi-square (Observed value)	24.7
Chi-square (Critical value)	54.6
DF	39
p-value	0.964
alpha	0.05

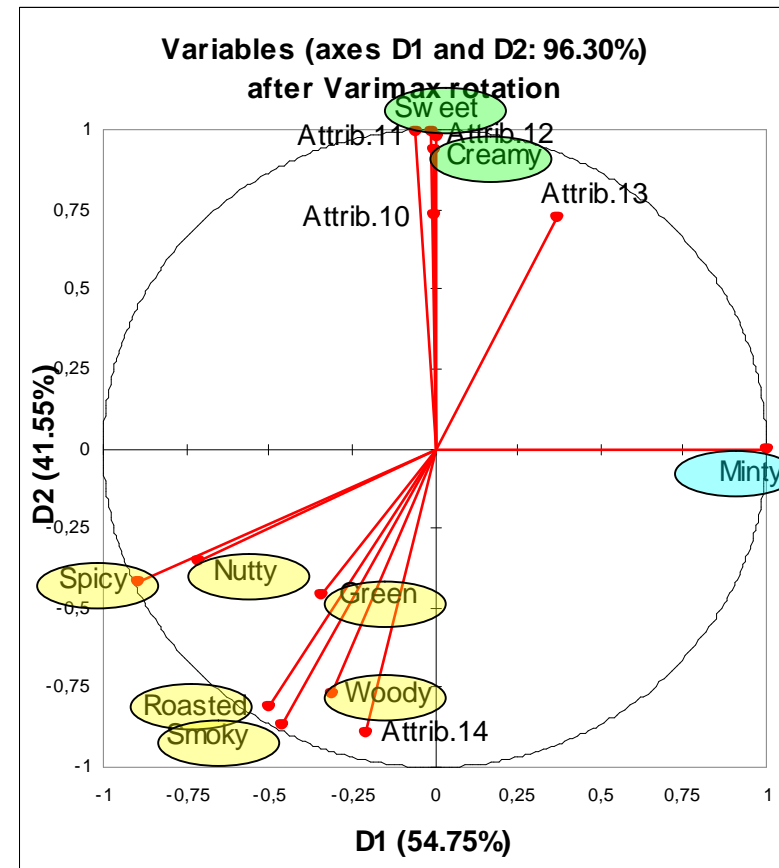
- The 3 products E, F, and D **differ significantly** in the frequencies of mentioned flavour attributes:

Chi-square (Observed value)	337.1
Chi-square (Critical value)	38.9
DF	26
p-value	<0.0001
alpha	0.05

Variable Plots after VARIMAX Rotation



Conventional Profile



Consumer Profile

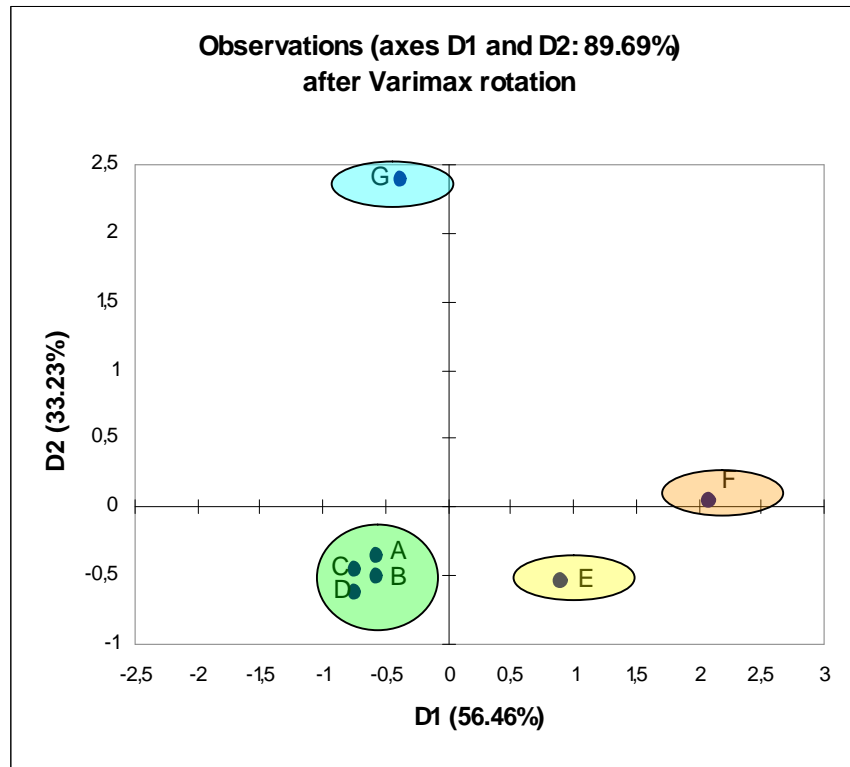
Correlations with the Factors

Attributes	D1 Panel	D2 Consumer
Sweet	1.00	0.99
Attribute 11	0.99	0.99
Creamy	0.97	0.94
Attribute 15	0.95	
Attribute 12	0.94	0.98
Attribute 10	0.92	0.73
Attribute 13	0.82	0.73
Attribute 16	0.68	
Attribute 17	0.33	
Minty	0.01	0.00
Attribute 18	-0.12	
Smoky	-0.37	-0.87
Attribute 19	-0.38	
Woody	-0.43	-0.77
Nutty	-0.45	-0.35
Spicy	-0.57	-0.42
Attribute 14	-0.57	-0.89
Roasted	-0.68	-0.81
Green	-0.69	-0.46
Attribute 20	-0.75	

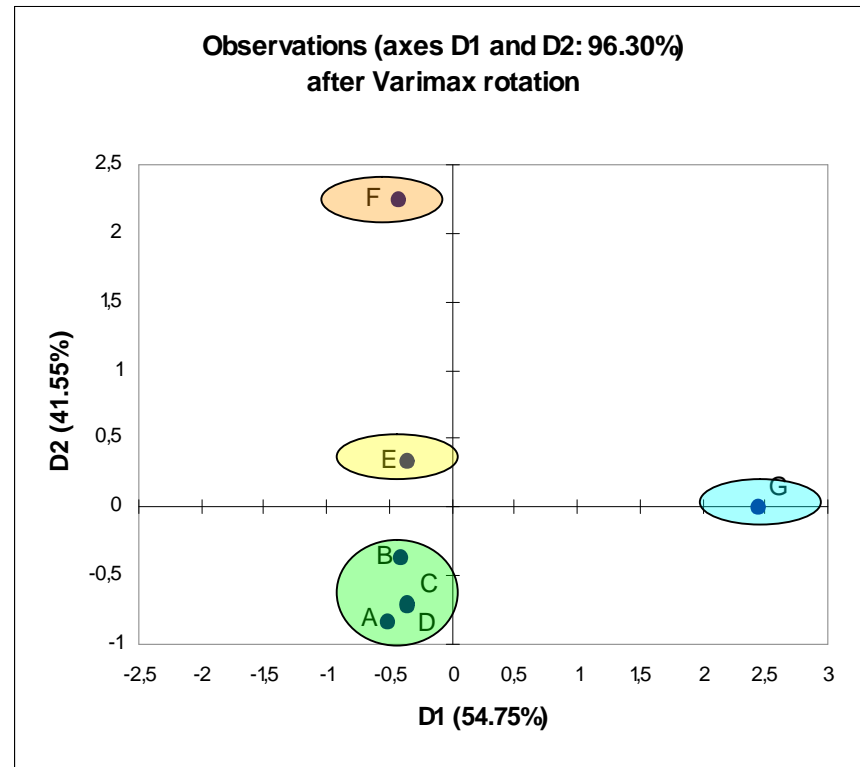
Attributes	D2 Panel	D1 Consumer
Minty	1.00	1.00
Attribute 16	0.62	
Attribute 17	0.48	
Attribute 13	0.44	0.36
Attribute 10	0.35	0.00
Attribute 18	0.21	
Creamy	0.14	0.00
Attribute 11	0.04	-0.06
Attribute 15	0.04	
Sweet	0.00	-0.01
Attribute 12	-0.03	0.00
Green	-0.27	-0.35
Nutty	-0.29	-0.72
Attribute 20	-0.47	
Woody	-0.51	-0.31
Roasted	-0.58	-0.50
Spicy	-0.59	-0.89
Attribute 14	-0.72	-0.21
Attribute 19	-0.73	
Smoky	-0.74	-0.46

Sorted by the correlations of the trained assessor panel

Object Plots after VARIMAX Rotation

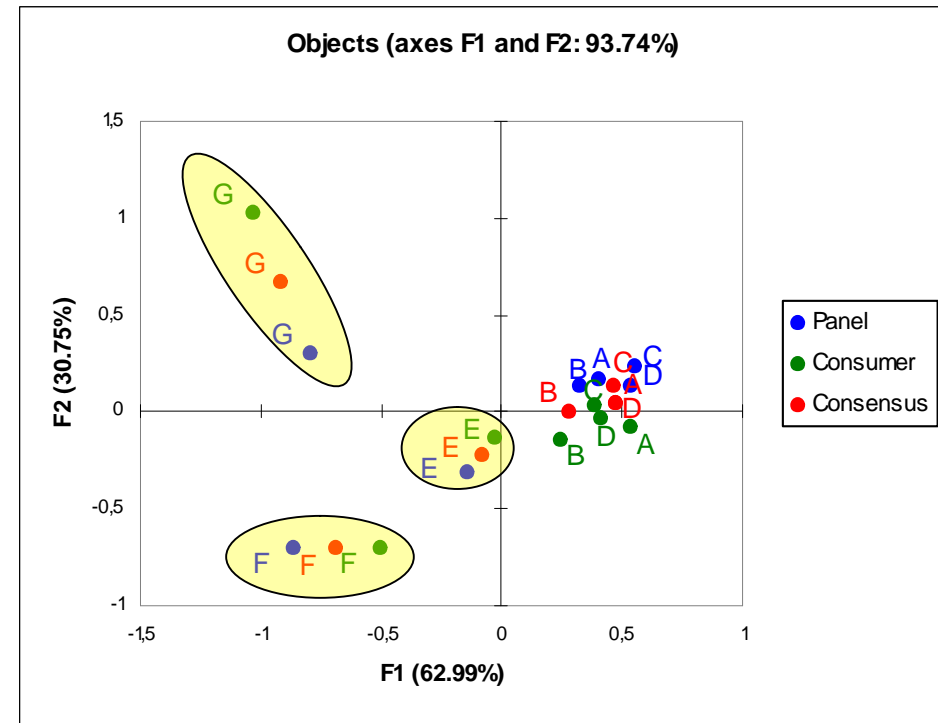
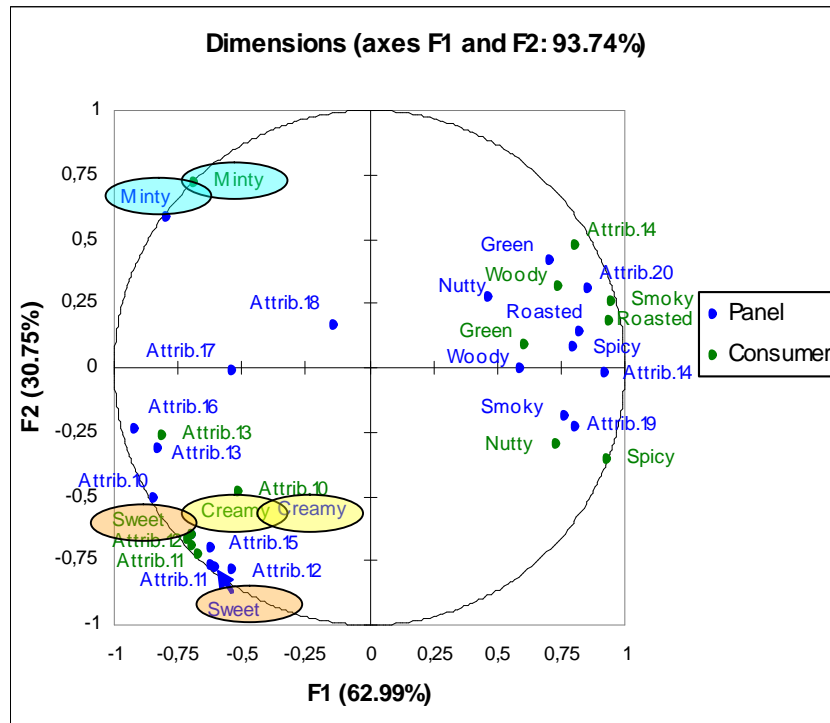


Conventional Profile



Consumer Profile

Consumer vs. Panel: GPA



Results

- **Both profiling methods** – consumer test and conventional profiling with trained judges – give the same results regarding:
 - ☑ The content of the 2 flavour constructs.
 - ☑ The position of the objects within the perceptual space.
 - ☑ The distance between the objects within the perceptual space.
 - ☑ The variance explained by the 2 factors (~90-95%).
- Objectivity: independent analysts would come to the same conclusions.
- Face validity: the intended flavour differences were detected.

Why Consumer Profiling?

Attribute	Mint Flavour	w/o Flavour
Minty	46	8
Smoky	26	37
Woody	21	23
Spicy	15	24
Green	14	16
Sweet	13	11
Attribute 10	11	10
Attribute 11	11	8
Nutty	10	14
Creamy	10	6
Attribute 12	9	6
Roasted	9	13
Attribute 13	6	5
Attribute 14	4	5

Attribute	Sweet Flavour	w/o Flavour
Attribute 11	26	8
Sweet	26	11
Smoky	23	37
Spicy	20	24
Creamy	17	6
Attribute 12	17	6
Woody	16	23
Green	15	16
Attribute 10	14	10
Nutty	12	14
Roasted	8	13
Minty	7	8
Attribute 13	6	5
Attribute 14	4	5

It gives us the proportions of consumers who perceive a certain sensation during consumption! **We don't get that information without asking consumers.**

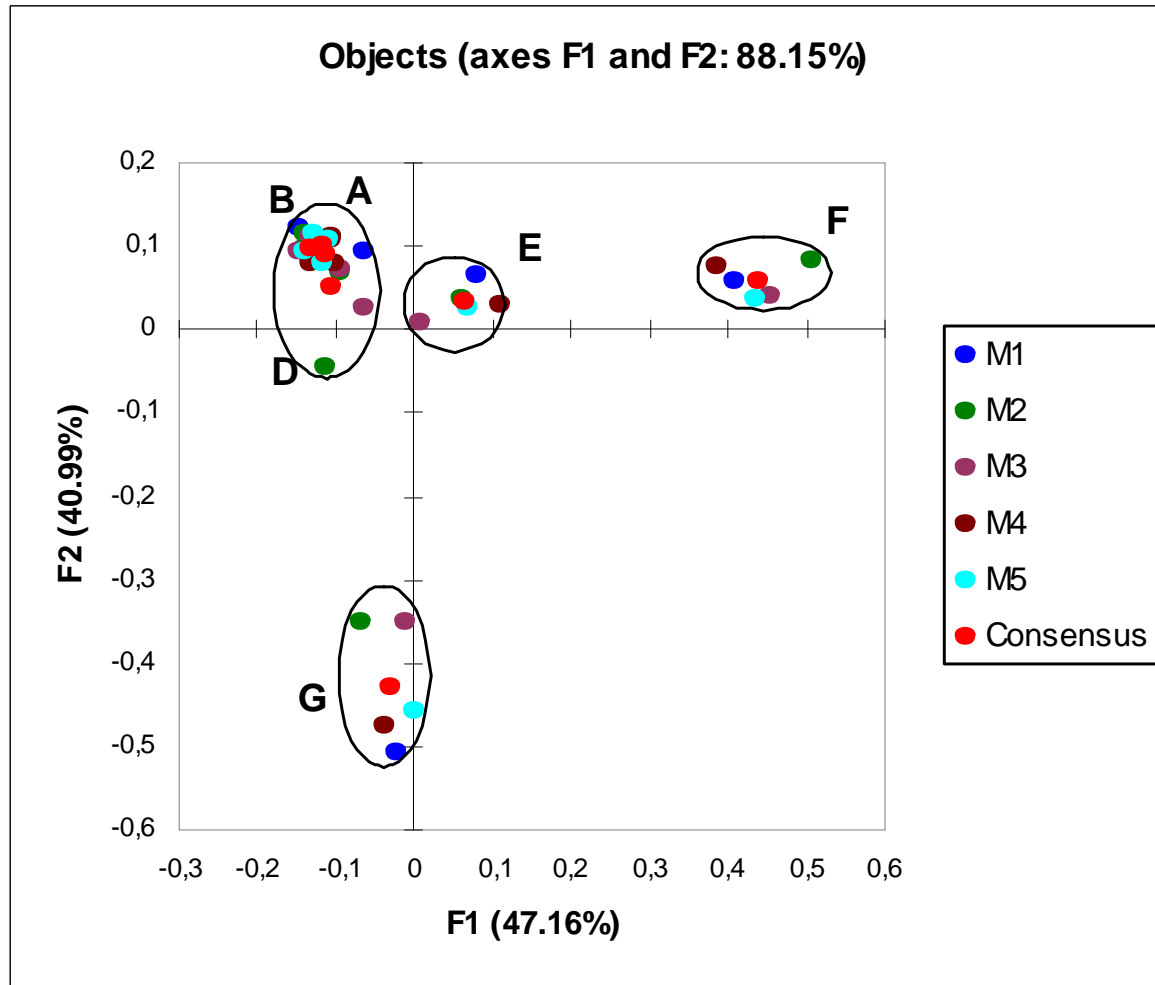
Conclusions

- **Profiling can be conducted as part of a consumer test.**
 - The frequency of mentioning a sensation would be sufficient since rating results do not deliver additional information (J.-F. Meullenet: “check-all-that-apply”).
- **If products are differentiated, consumers deliver the same results as one gets from trained profiling panels.**
- **A consumer profiling task delivers additional information about proportions of consumers who perceive a certain sensation.**

Reproducibility: Cross-Market Validation

- **Consumer profiling in 5 European markets**
 - N~450 (in each market)
- **Consumers in all markets rated the 7 test products the same regarding the 2 flavour constructs.**
 - GPA: See next slide
 - MFA: RV-Coefficients between all 5 markets are 0.8-0.9
(RV between M1-consumer and trained assessors: 0.86)

Consumer Profile: Objects by Market



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A special thank you also goes to a colleague who, despite current doctrines, had the courage to realise this idea (consumer profiling): Srijib Maitra. His premature death, however, meant that he was not alive to see his vision be proved right.



References

- Husson, F., Le Dien, F., Pages, J. (2001). Which value can be granted to sensory profiles given by consumers? Methodology and results. *Food Quality and Preference*, 12, 291-296
- Meullenet, J.-F., Lee, Y., Dooley, L. (2008). The application of check-all-that-apply consumer profiling to preference mapping of ice cream and its comparison to classical external preference mapping. *Presentation at the 9th Sensometrics Meeting, St. Catherines, Canada.*
- Worch, T., Le, S., Punter, P. H. (2008) Comparison of sensory profiles from consumer and experts. *Presentation at the 9th Sensometrics Meeting, St. Catherines, Canada.*