



Where
consumer and
product meet

The Ideal Profile Method

combining classical profiling with JAR methodology

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Some *sensory* thoughts on profiling

- product success is a function of liking
- higher liking = more success
- so what drives liking?
 - the standard *sensory* approach is to obtain a sensory profile from a trained panel or experts
 - liking data from target consumers
 - and to link the information through statistics like Preference Mapping
- sensory professionals also start thinking about using consumers, but in a non-verbal way
- they use mapping, napping, sorting, Flash Profile, Ultra Flash Profile and other techniques which do not require ratings on specific attributes (NOTE: these techniques are not suitable for all products !)



- BUT, what happens on the other side of the wall?

Some *market research* thoughts on profiling



- at the other side of the wall

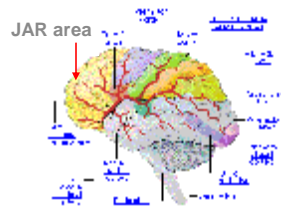
- market researchers also need to know what drives liking but they derive this information in a different way
 - since they have no access to experts or trained panels they go directly to the consumer
 - they need liking data and they need diagnostic information about the perception of the products
 - so they ask whether the intensity is too weak, too strong or just right (the JAR question) for the relevant sensory attributes

The JAR question

- this question looks very simple and straight-forward:
 - *do you think the citrus flavour is just about right, too weak or too strong*
- the response is simple, but the task for the respondent is actually quite complex and consists of several steps
- this all happens within the brain of the respondent

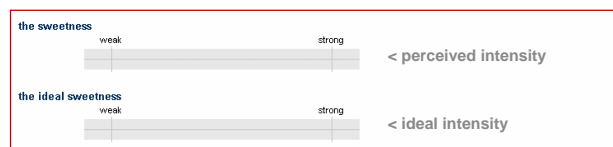
Too weak	Just about right	Too strong
1	5	9

1. Rate the intensity of the citrus flavour.
2. Make an estimate of the ideal or preferred citrus flavour intensity.
3. Subtract the ideal intensity from the perceived intensity.
4. When the result is close to zero, say "JUST RIGHT", when it's negative say "TOO WEAK" and when it's positive "TOO STRONG"



Making the implicate explicit

- we can ask the respondent if we can look inside his brain by letting him do this internal arithmetic aloud:
 - Ø tell me how strong the perceived intensity is
 - Ø tell me what the ideal intensity would be
 - Ø and let me calculate the difference
- this looks quite similar to the procedure used by the sensory professionals, except that two questions are asked instead of one:



- the difference between the methods lies in the estimation of the ideal, JAR and the Ideal Profile Method measure the ideal; in classical sensory profiling the ideal is calculated

On either side of the wall

- actually, there are no fundamental differences between the procedures used by sensory professionals and market researchers
 - ∅ both use human assessors to estimate the perceived intensities, either as a deviation from ideal or as an intensity estimate and to estimate liking
 - ∅ from these data, the optimal product is derived
- the differences have to do with assumptions about the capabilities of the assessors
 - ∅ sensory professionals have doubts about the capabilities of consumers to verbalize their perceptions
 - ∅ the question is whether consumers know the meaning of sweet or bitter
 - ∅ market researchers don't question these capabilities and simply ask consumers
 - ∅ consumers do have extensive experience with food products but need some help to find the right words

Perception, ideal and liking: the model

- liking is maximized when all sensory attributes are ideal
- there is an underlying ideal which is stable over products and people
- not all deviations from ideal have the same importance for liking
- ∅ in other words: the deviation from Max-liking (A_j) is a weighted linear combination of the deviations from ideal (i.e. the perceived attribute intensity minus the ideal intensity multiplied by the weight)

$$A_j = - \sum_{i=1}^n b_i |X_{ij} - I_i|$$

A_j is the averaged deviation from Max-liking for product j
 b_i is the relative importance of deviations on attribute i for overall liking
 X_{ij} is the perceived intensity of product j on attribute i
 I_i is the ideal level of attribute i

liking is maximized if $|X_{ij} - I_i| = 0$

“All roads lead to Rome”

- the different procedures to obtain the ideal product show a high degree of convergent validity
- they all come to similar conclusions, and they all have some advantages and disadvantages
- the main differences are:
 - Ø type of respondents (trained or expert tasters versus consumers)
 - Ø question asked (relative judgement or perceived intensity)
 - Ø measurement of the ideal intensity (implicit, asked or calculated)
 - Ø the wording of the final recommendations (technical specifications or consumer terms)
- the choice of any specific method depends on the local circumstances, the resources and the requirements of the “client” (and of course on the kind of product tested)

A “business case”: optimization of fruit yoghurts

- in commercial sensory evaluation, the following questions have to be answered:
 - Ø what are the sensory and ideal profiles of the products?
 - Ø how are the different products appreciated?
 - Ø how can they be improved to increase liking?
- so the following information is needed:
 - Ø sensory and ideal profiles and acceptance ratings
 - Ø the deviations from ideal for each attribute and the relevance of this specific attribute for overall liking
 - Ø the question in this case was which of eight new fruit yoghurts are suited for introduction and which how can they be improved (if needed)?

Materials and Method

- products**

Raspberry/Peach yoghurt	Orange yoghurt
Fruit mix yoghurt	Mandarin yoghurt
Cherry/Orange yoghurt	Maracuja yoghurt
Mango yoghurt	Dades yoghurt
- attributes**

Acceptance (9-point scales)	Intensity and ideal (100 mm line scales)		
appearance	gloss	fruity taste	thick in mouth
odour	colour intensity	freshness fruit	smooth in mouth
taste	amount fruit	sweetness	not-watery/thick
mouth feel	recognizable fruit	sourness	airy mouth feel
aftertaste	thick appearance	bitterness	firmness fruit
overall liking	odour intensity	astringent	amount fruit mf
buying intention (5-p)	fruity odour	creamy taste	aftertaste intensity
	sweet odour	mild taste	aftertaste length
	sour odour	fresh taste	
	taste intensity	off taste	
- subjects**

total n=130 (78 females and 52 males)

age between 19 and 65 years, median age 42

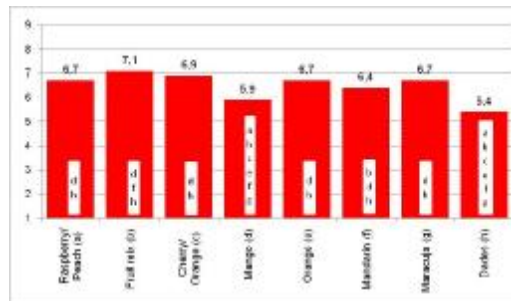
users of fruit yoghurt (49% heavy user and 51% light user)

recruited by telephone from the OP&P consumer database
- method**

ideal profile test, sequential monadic design, balanced presentation order, 125 g servings, two 60-minute sessions

Results: overall liking

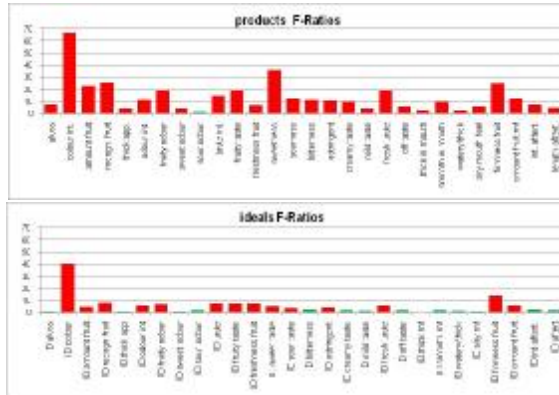
- the eight variants clearly differ in overall liking
 - ∅ Fruit mix and Cherry/orange have the highest ratings
 - ∅ Dades and Mango have the lowest ratings



averaged liking ratings, the letters indicate from which other variant the variant in question differs significantly

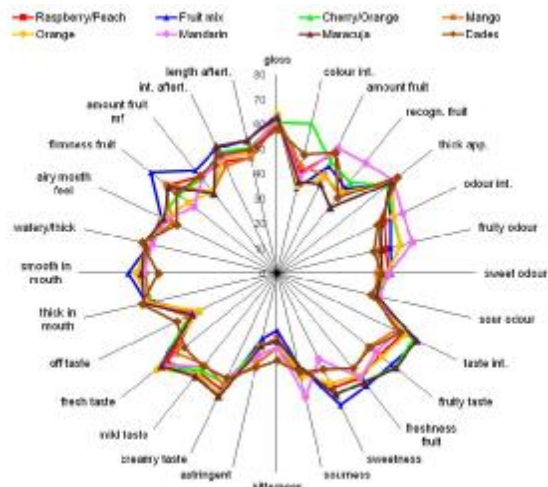
Results: differences between the variants

- analysis of variance shows that the eight yoghurts differ significantly ($p=5\%$) from each other on all attributes except sour odour (the F-ratio's are shown on the right)
- the largest difference refers to colour intensity followed by and sweetness and fruit aspects
- the ideals differ on 50% of the aspects
- the largest difference is in colour intensity, followed by differences on the fruit aspects
- as can be seen from the F-ratio's, the differences for the ideals are much smaller (as is to be expected)



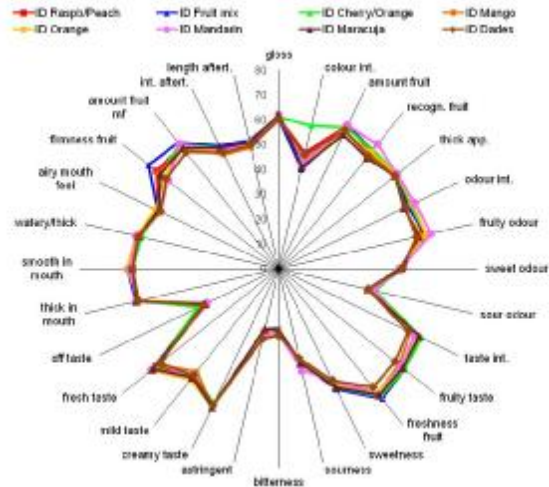
Spiderplots for the eight variants

- the variants differ on all but one attribute (sour odour)
- the Cherry/orange variant is the most dark one
- Mandarin has the most recognizable fruit and the most intense sour taste
- the Fruit mix has the sweetest taste and the firmest fruit
- Dades is characterized by off taste and bitterness



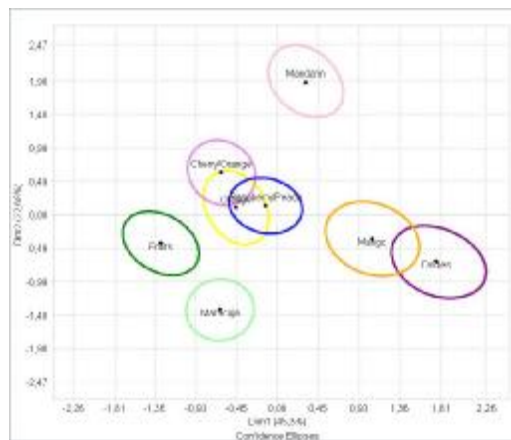
Spiderplots for the eight ideals

- compared to the sensory profiles, the ideals are identical or almost identical for most aspects
- the largest differences are found for colour and fruit aspects
- the variants are very different on these aspects and have different ideals



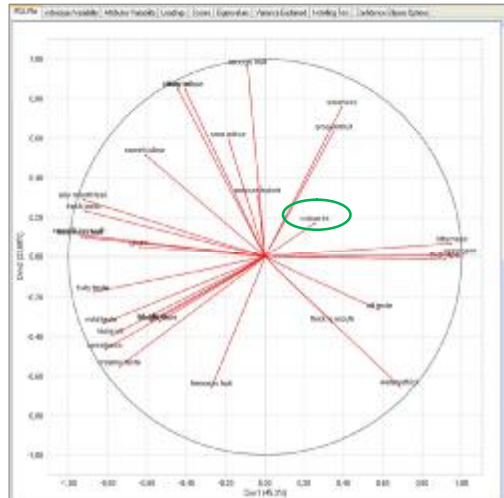
Confidence ellipses: visual representations of products

- to get insight in the variability of the results, confidence ellipses around the products have been computed (based on the PCA product space)
- the dataset has been resampled 500 times, in each case a virtual panel has been sampled with replacement from the original panel and a 2-dimensional product space has been computed
- this results in 500 positions for each product in this 2-dimensional space
- the confidence ellipses contain 95% of the resulting data
- as can be seen on the right, there are clear differences between the positions of the products
- they all differ significantly from each other, except Cherry/orange - Orange and Rasp-berry/peach - Orange



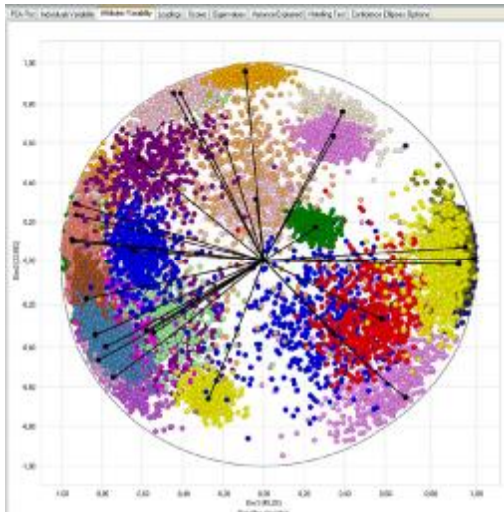
Confidence ellipses: representation of the attributes

- to get an impression of the variability of the attributes in the sensory space, the same procedure has been carried out
- in this case, all 500 projections of the attributes are shown in the plot
- the biplot on the right shows the position of the attributes in the 2-dimensional product space
- the next figure shows the positions for the resampled attributes



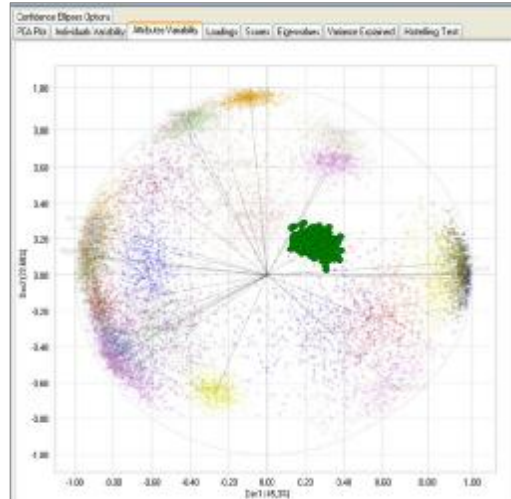
Confidence ellipses: variability of the attributes

- this figure shows the variability of all attributes in one plot
- as can be seen from this figure, some attributes are very stable while others show more scatter



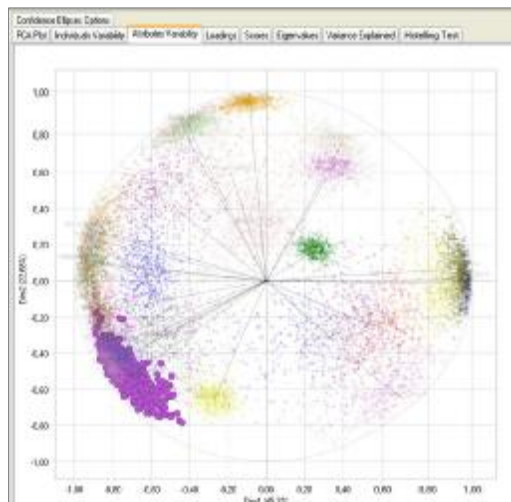
Confidence ellipses: attribute colour intensity

- colour intensity shows very little scatter
- in general the ratings for colour, size and other appearance aspects show little variability among respondents (irrespective of the amount of training)



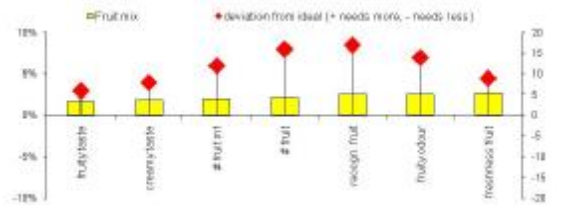
Confidence ellipses: attribute creamy taste

- creamy taste is a more complex attribute, nevertheless the variability is relatively small

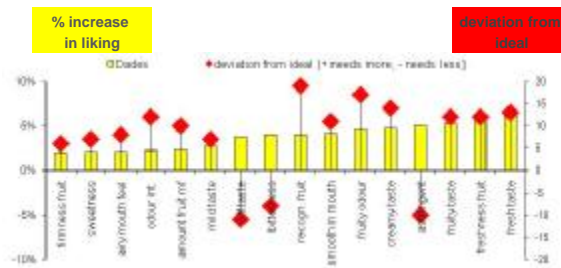


Fishbone plots for two yoghurts

- *Fruit mix* (which has a liking rating of 7,1) can still be improved by increasing the amount and freshness of the fruit and increasing the creamy taste
- as can be seen from this figure, a large increase in amount of fruit has the same effect on liking as a small increase in creamy taste



- *Dades* (liking rating 5,4) needs considerably more improvements
- it needs much more freshness, fruity character, creaminess and smoothness and it should be less bitter and astringent



- NOTE: the recommendations are in consumer terms and not in technical terms of ingredients or processing

Summary and conclusions

- both sensory professionals and market researchers try to improve products but use different methodologies (viz. profiling with trained panels versus JAR scaling with consumers)
- the Ideal Profile Method combines the two approaches by asking consumers to rate both their acceptance and their perceived and ideal intensities for products
- in the past decade, a number of studies have shown that the results from the different sensory methodologies lead to the same conclusions (although they all point out that "knowledgeable researchers" are essential in the final interpretation and implementation of these results)
- they produce very similar product maps, but they differ in the quantitative characterization of the sensory profiles (quantification in technical terms, quantification in consumer terms or in qualitative terms)
- in practical business applications, it is an advantage when quantitative sensory profiles are available to aid the interpretation of the results (as in classical profiling and the Ideal Profile method)
- in terms of speed, Ideal Profile and JAR are faster than classical profiling (all information is obtained in one session) and the results from both can be presented as fishbone plots
- the different non-verbal methods (mapping, napping, sorting etc.) are also fast but lack quantitative sensory profiles and are not suited for every kind of product

Thank you for your attention

- are there any questions



Selected references

- Dooley L., Worch T., Meullenet JF., Punter P.H. (2009). Comparison of PLS and the Fishbone method to determine optimal product characteristics. Paper presented at the 8th Pangborn symposium, Florence, Italy
- Husson F., Le Dien S., Pagès J. (2001). Which value can be granted to sensory profiles given by consumers? Methodology and results. *Food Quality and Preference*, 12, 291-296
- Husson F., Le S., Pagès J. (2005). Confidence ellipse for the sensory profiles obtained by principal component analysis. *Food Quality and Preference*, 16, 245-250
- Husson F., Le S., Pagès J. (2007). Variability of the representation of the variables resulting from PCA in the case of a conventional sensory profile. *Food Quality and Preference*, 18, 933-937
- Moskowitz, H.R. (1996); Expert versus consumers: a comparison. *Journal of Sensory Studies*, 11, 19-37.
- Popper, R., & Kroll, D. R. (2005). Just-about-right scales in consumer research. *Chemo Sense*, 7, 1-6.
- Rothman, L. and Parker, M.J. (2009). Just About Right (JAR) Scales: Design, Usage, Benefits, and Risks. ASTM International, MNL 63 (committee E 18 on sensory evaluation)
- Trijp van, H.C.M., Punter, P.H., Mickartz, F., Kruihof, L. (2007). The quest for the ideal product: Comparing different methods and approaches; *Food Quality and Preference*, 18, 729-740.
- Worch, T., Lê, S., Punter P.H. (2009). How reliable are the consumers? Comparison of sensory profiles from consumers and experts; *Food Quality and Preference*, In Press.