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Sensory evaluation of meat and meat products

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Outline

- ✓ Why we need sensory science
- ✓ A central paradigm (and what should not be done)
- ✓ What can be learned from it (examples)



Why sensory evaluation?

Do you have **human beings** among your customers?

Do you have **competitors** in your product segment?

Could the choice expressed by your customers have sensory **explanations**?

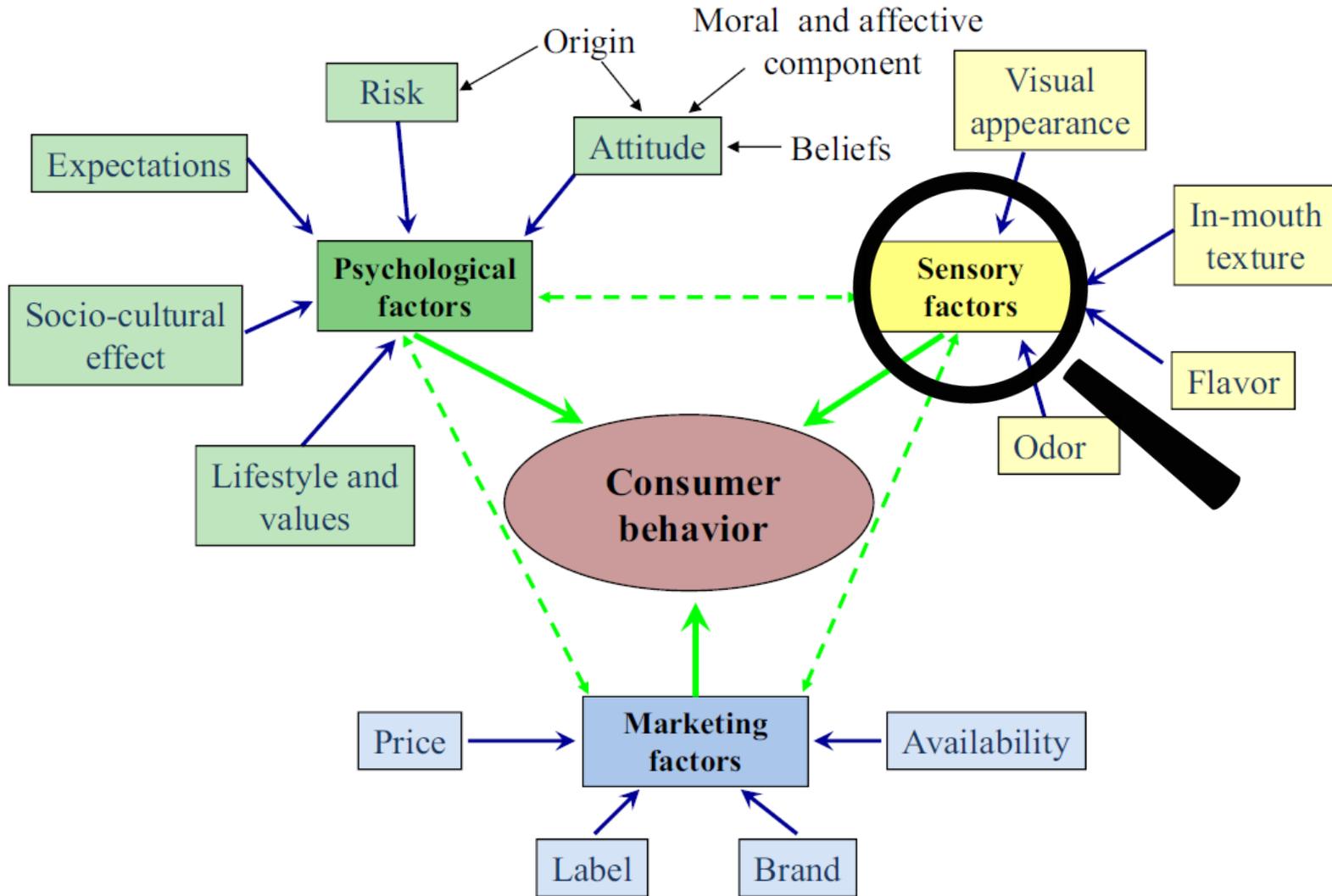


Fig. 2. Multidisciplinary model of the main factors affecting consumer behavior in a food domain.

Various sensory evaluation techniques are used to answer distinct questions.

Discrimination tests

Is there a noticeable difference between old & new recipe?

Could we successfully copy the competitor's product

How long can the product be stored without affecting its sensory properties?

Descriptive analyses

Which sensory properties characterize the successful competitor's product?

To what extent do our products differ from others?

What are the key drivers of consumer acceptance?

Affective tests

Which product is liked the most?

Does our „clean labelling“ recipe get the same liking?

Are all consumers the same or do we need to consider segments?

Beware: Never ask trained sensory assessors to indicate liking. Instead, invite consumers.

Trained assessors
for objective tests



Naive consumers
for hedonic tests



vs.

consumer insights
product development **quality control**
fundamental research
marketing

Quality control: at-line vs. off-line sensory evaluation of boar carcasses

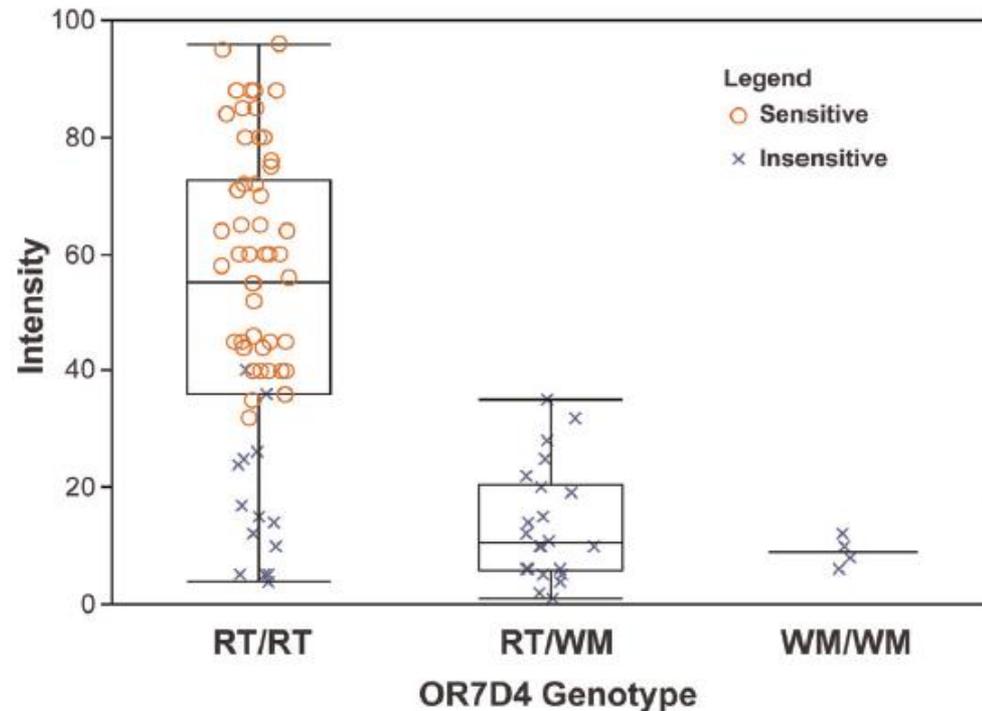


Photographs: SUS

Sometimes, our ability to smell affects whether we like a product: the case of boar taint

Partial **anosmia**:

- disability to perceive a given odorant by otherwise norm-osmic subjects
 - Incidence for androstenone 7...75 %
 - Partially determined by genetics (OR7D4)
- Consider for trained panels and consumer tests



LUNDE et al., 2012 PLoS one

AMOORE, 1977

HAVLICEK et al., 2010. Vitamins and Hormones.

KELLER et al., 2007, Nature.

Intensive training is required for quantitative descriptive analyses (“profiling”).

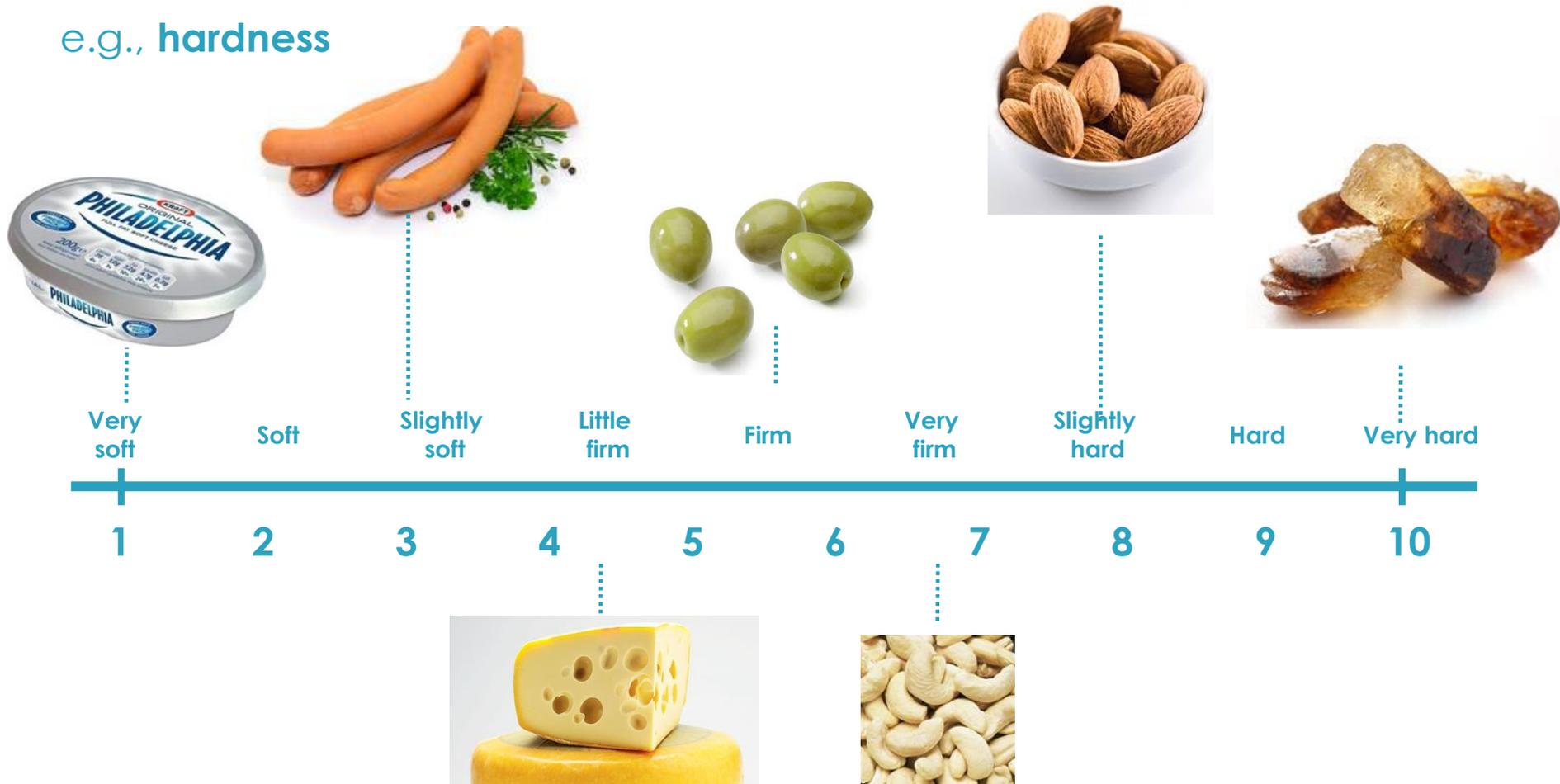
Definitions of sensory attributes used in sensory profiling

Sensory attributes	Definition
<i>Odour</i>	
Intensity of odour	Intensity of sum of all odours
Sweetness	Odour of sugar
Fruity acidic	Odour of fruity/fresh and sour/sweet
Metallic	Odour of ferrosulphate
Liver	Odour of animal liver
Gamy	Odour of wild animal
<i>Flavour</i>	
Flavour intensity	Intensity of sum of all flavours
Sweet	Flavour of sugar
Acidic	Flavour of fruity/fresh and sour/sweet
Metallic	Flavour of ferrosulphate
Liver	Flavour of animal liver
Gamy	Flavour of wild animal
Cloying	Flavour of flat, stale, sweetlike
Bitter	Flavour of bitter substance, like quinine

Use reference materials, so every assessor understands the attribute.

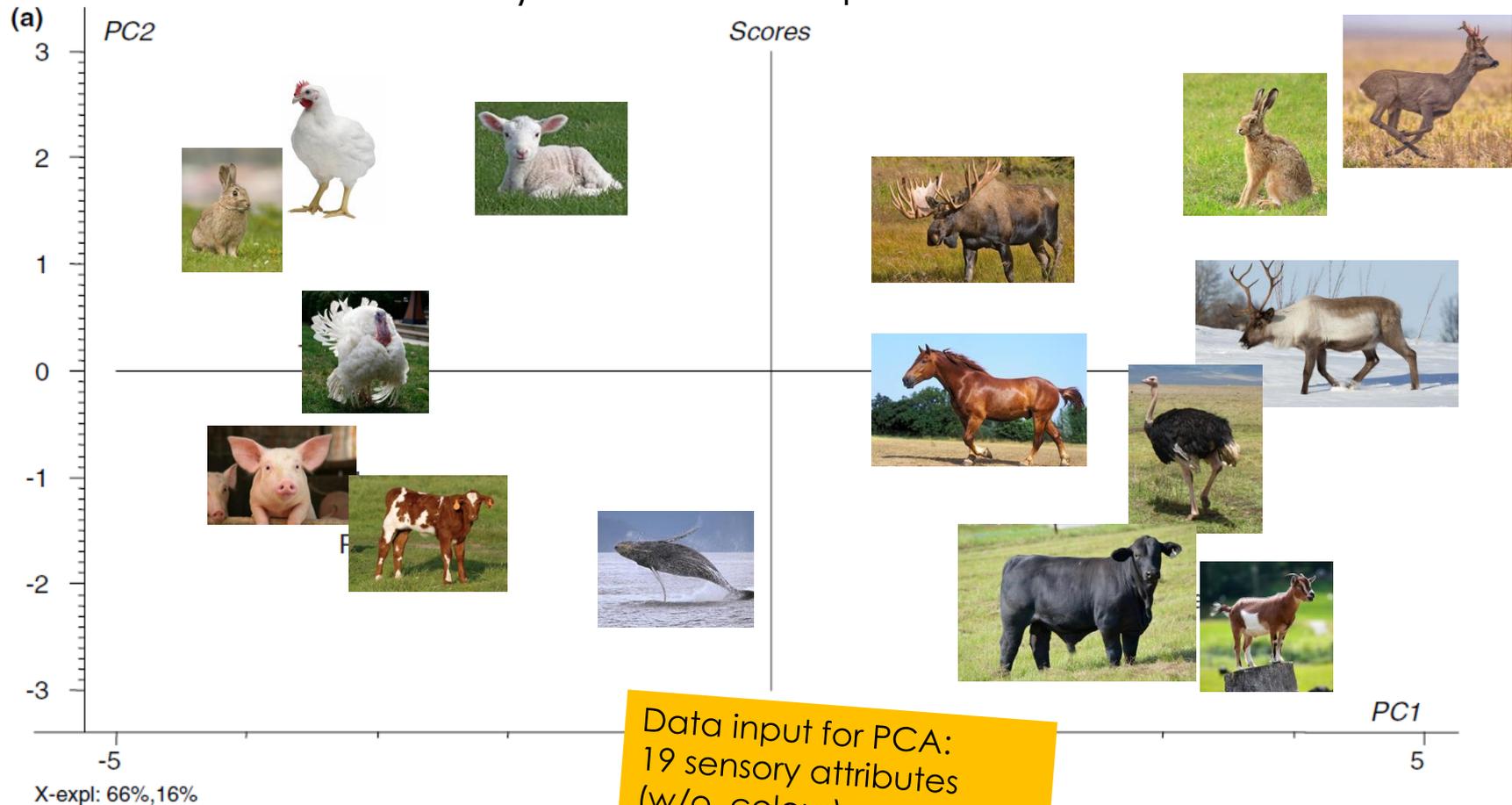
The use of scales for quantitative descriptive analysis (QDA) can be trained using references.

e.g., hardness



A „sensory landscape” is created using multivariate statistical analysis (e.g., PCA).

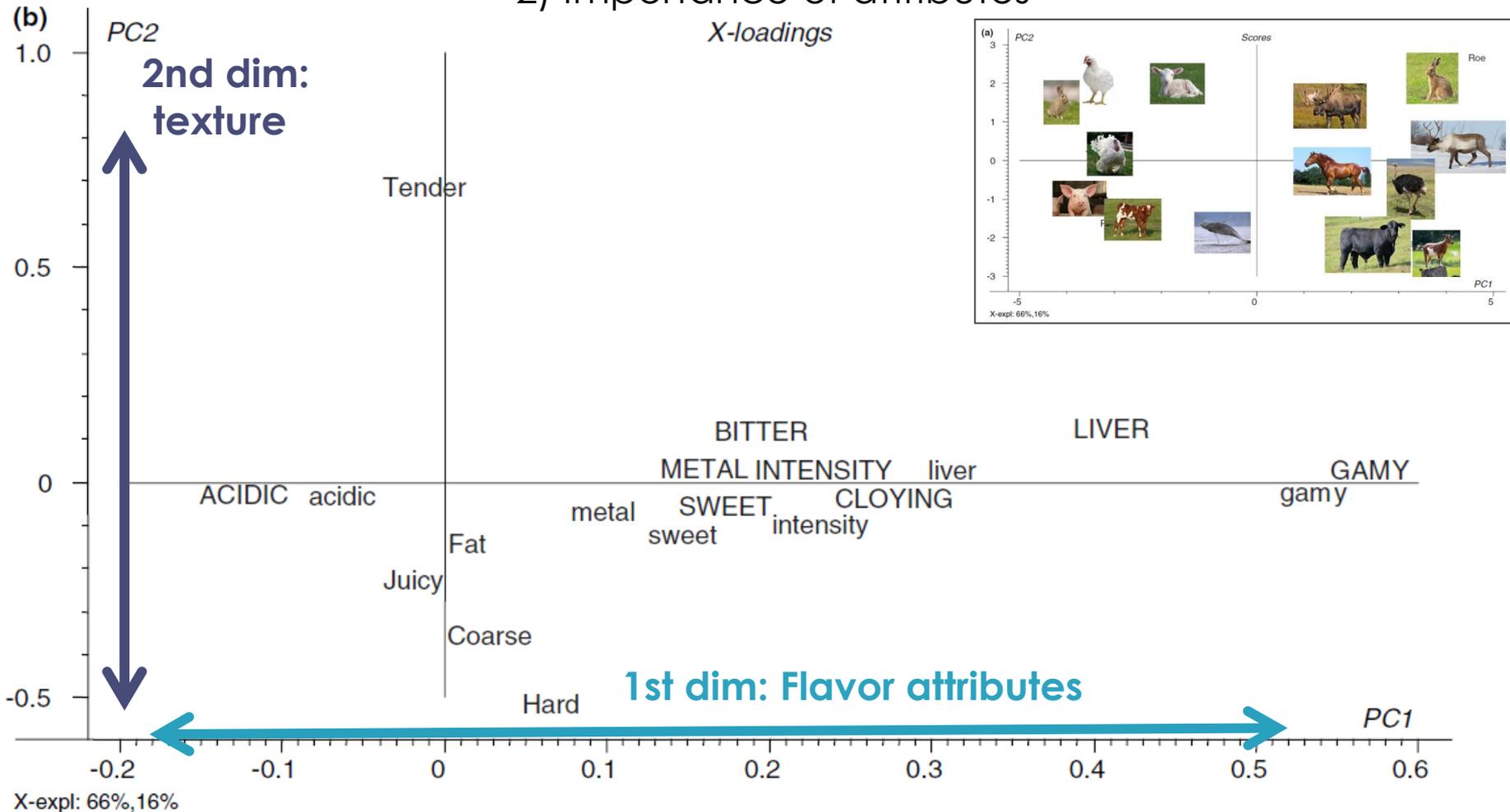
1) Position of the products



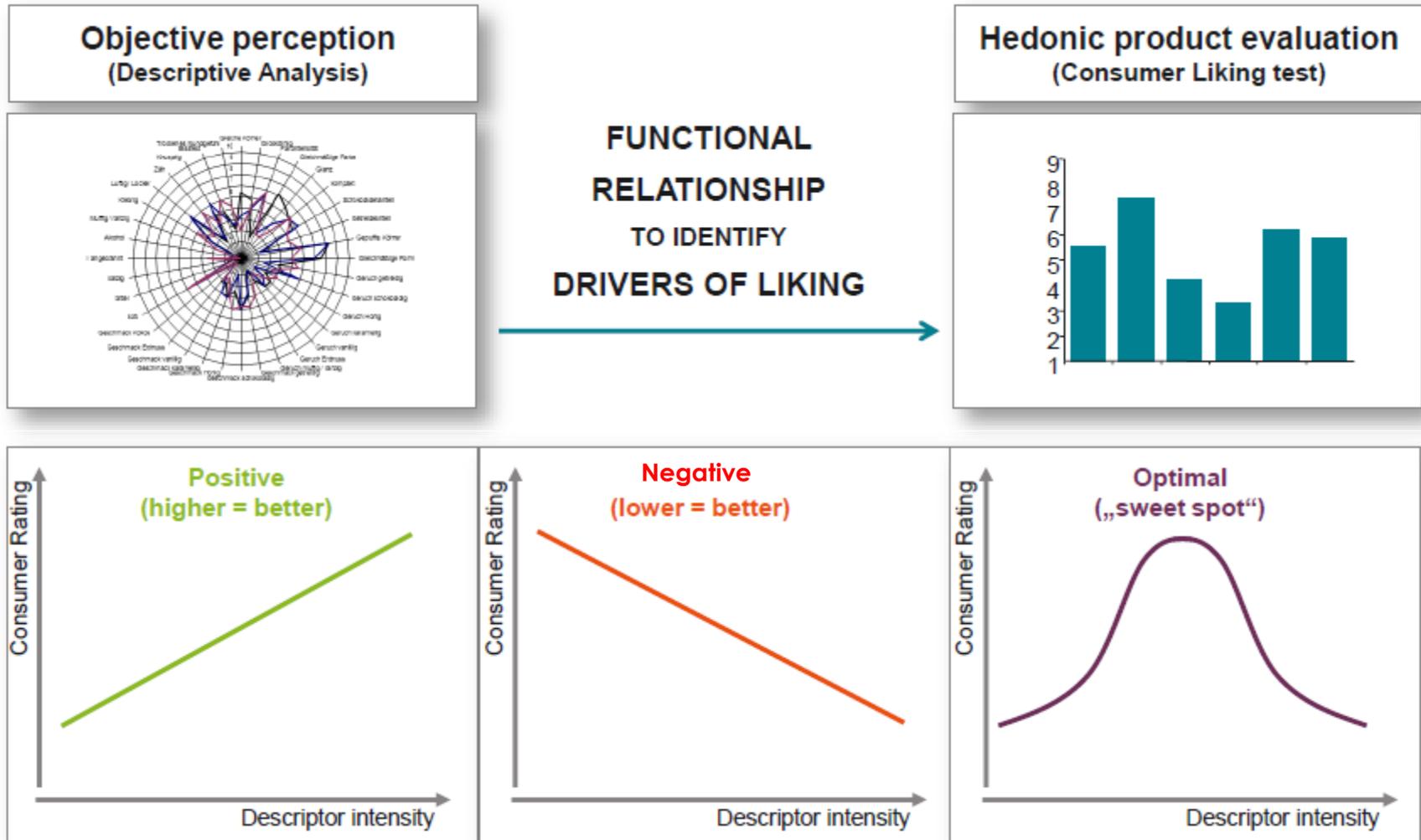
Data input for PCA:
19 sensory attributes
(w/o colour)

Acidic vs. gamy flavor & tender vs. hard texture determine the sensory space of meat.

2) Importance of attributes



Link trained panel data with consumer ratings to understand drivers of liking



Link trained panel data with consumer ratings to understand drivers of liking

Table 9
Pearson correlation coefficients among descriptive flavor attributes, consumer sensory scores, proximate comp

Attribute	Consumer sensory evaluation scores		
	Overall liking	Flavor	Tenderness
Initial flavor impact	-0.04	-0.11	0.13
Beef ID	0.36*	0.35*	0.22
Overall sweet	0.47**	0.46**	0.45**
Oxidized	0.15	0.13	0.27
Warmed-over	-0.65**	-0.67**	-0.53**
Fish ID	-0.40**	-0.48**	-0.22
Sour	-0.10	-0.14	-0.07
Bitter	-0.20	-0.18	-0.11
Salty	0.28	0.34*	0.23
Umami	0.59**	0.59**	0.51**

Positive drivers:

Fat-like ($r = .69$)
Bloody/serummy ($r = .53$)
Umami ($r = .59$)

Negative drivers:

Warmed-over ($r = -.53$)
Cardboard ($r = -.63$)
Fish-ID ($r = -.40$)

Beef strip loins

Fat: 2 ... 26%

Incl. Wagyu, gras-fed, corn-fed



”
Fat level was the primary driver of beef flavour acceptability in all samples when no undesirable off-flavours were present

* Correlation coefficient differs from 0 ($P < 0.05$).

** Correlation coefficient differs from 0 ($P < 0.01$).

¹ All steaks were classified as tender (<33.34 N; 3.4 kg) according to Miller et al. (2001).

Bloody/serummy is also liked in veggie burgers
-and mimicked there using plant heme-



Beware, olfactory information is sometimes discounted by visual information



"tastes like yellow fruits"



"tastes like red berries"



+
odorless
red dye

"tastes like red berries"

Hence, one may **mask** product colour if focus is on flavor only.



Good Sensory Practice

control of:

- Test facilities (e.g. light, temperature, ventilation)
- Products (preparation, amount, temperature, appearance)
- Test subjects (trained vs. consumers)
- Coding, serving order
- Context



Sometimes, context does not affect the results.

Meat Science 122 (2016) 119–124



Contents lists available at ScienceDirect

Meat Science

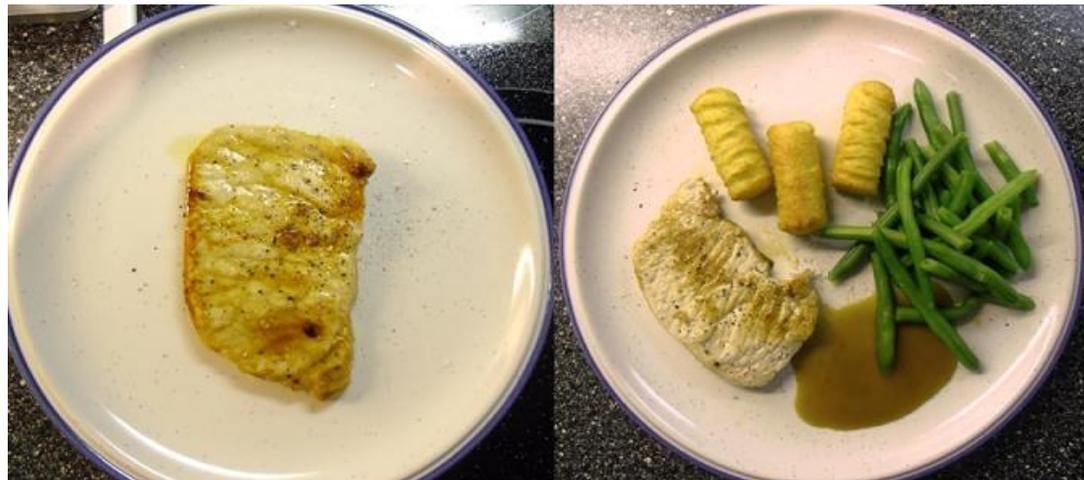
journal homepage: www.elsevier.com/locate/meatsci



Consumers dislike boar taint related off-flavours in pork chops regardless of a meal context



Lisa Meier-Dinkel^a, Micha Strack^{b,c}, Kathrin Höinghaus^d, Daniel Mörlein^{a,c,*}



Sometimes, however, it does: „Organic“ and „free range“ improve liking.



This is called assimilation. Actual rating follows the expectation.

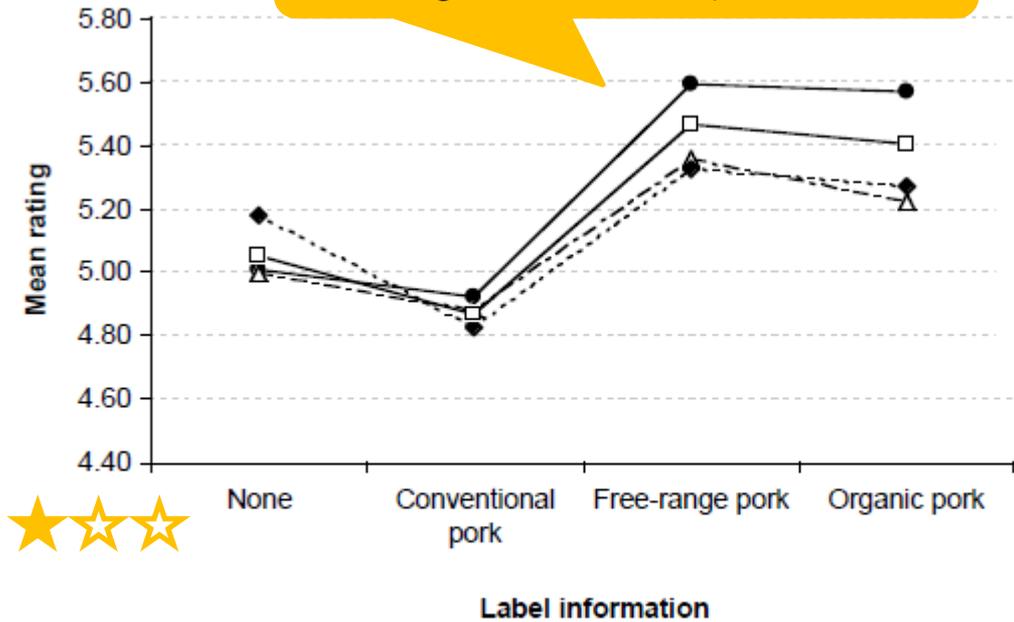


Figure 6. Marginal means of experienced quality (on four dimensions) under different information conditions, independent of actual meat type (measured after each sample had been tasted).

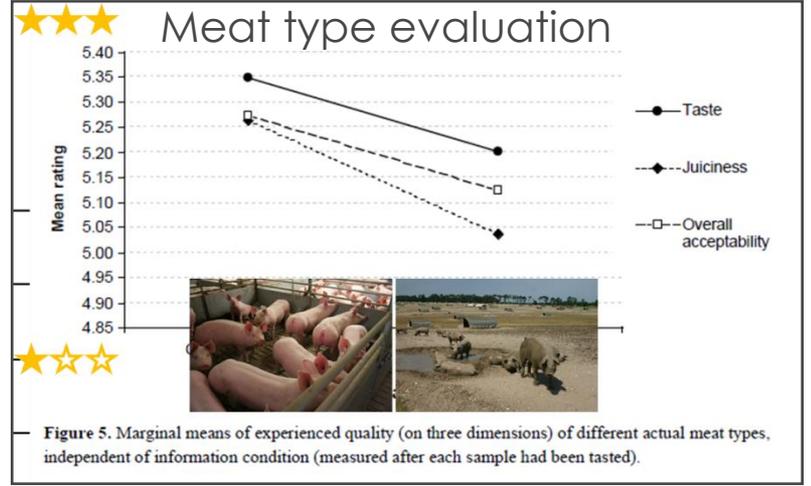
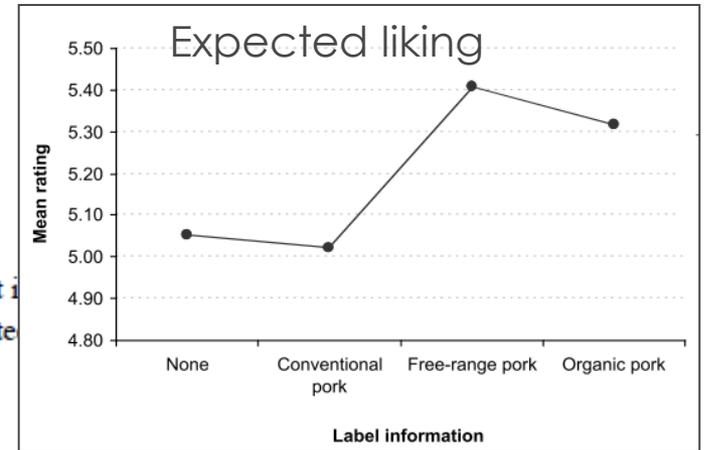


Figure 5. Marginal means of experienced quality (on three dimensions) of different actual meat types, independent of information condition (measured after each sample had been tasted).



A close-up photograph of a woman with short, blonde hair, wearing a blue top. She has her eyes closed and is holding a glass of red wine up to her nose, appearing to be smelling it. The background is blurred, suggesting an indoor setting like a restaurant or a wine cellar.

**What can be learned from the
wine marketing?**

Potential applications of sensory claims



Local specialities

...which one of your senses
would be **worst to lose?**

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Losing your sense of smell. How bad can it be?

HEALTH 24 April 2013

LOSING your sense of taste or smell might not rank very high on the list of things to worry about. Going blind or deaf would surely be worse.

Yet anosmia, as it is called, has a disproportionately negative effect. Deprived of the pleasure of eating and drinking, anosmics often descend into depression. With around 1 in 20 people affected – more than are visually impaired – the condition is responsible for an awful lot of human misery.

Thank you for your time!
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