Relationship between dynamic sensory profiles and static liking: Dominance vs. description

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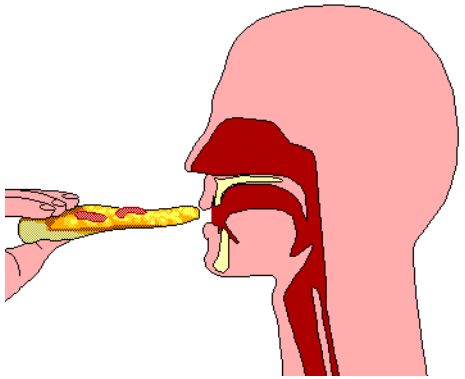
Introduction

- Sensory perception is a dynamic process (Hutchings & lillford, 1988; Sudre et al., 2012):
  - Breakdown and physical changes due to mastication
  - Mixture with saliva
  - Temperature changes



- The dynamics of sensory perception can affect consumer hedonic perception.

- Research on the topic is still limited (Paulsen et al., 2013; Thomas et al., 2015; Veldhuizen et al., 2006).

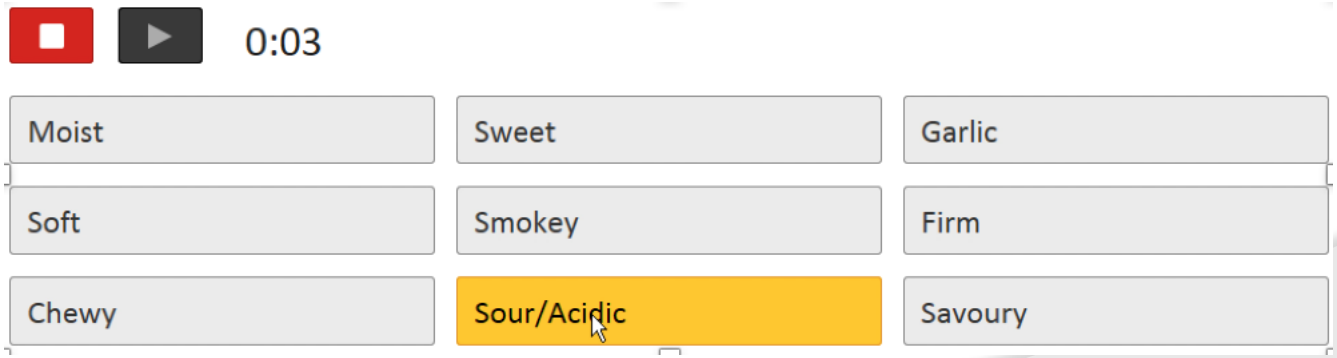
Methodologies for dynamic sensory characterization

- Methodologies based on attribute intensity
  - Time-intensity
  - Multiple attribute time-intensity
- Methodologies based on attribute selection
  - Temporal Dominance of Sensations (TDS)
  - Temporal Check-all-that-apply (TCATA)

Temporal Dominance of Sensations (TDS)

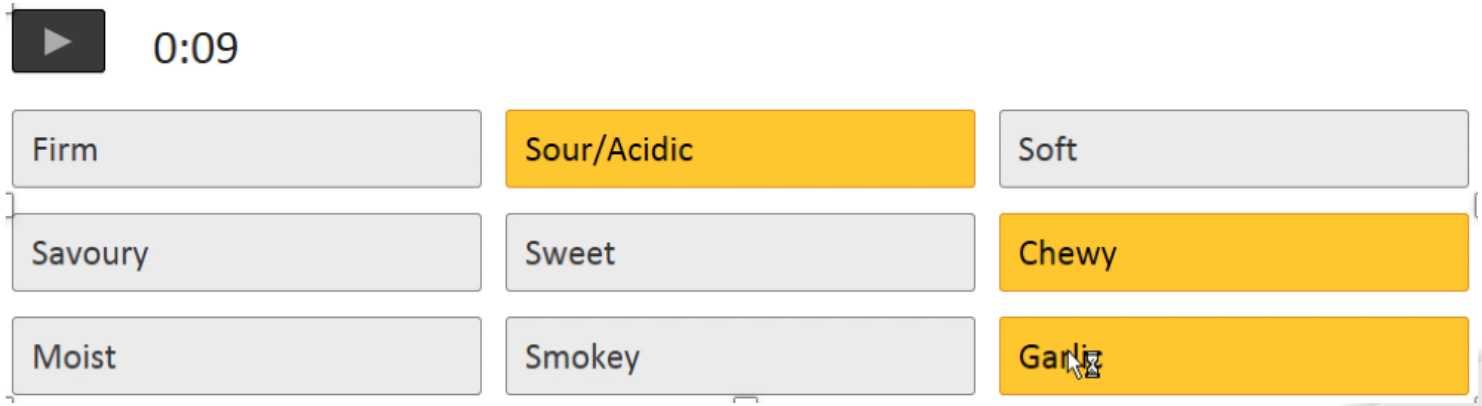
Identification of **the dominant** sensory characteristic at each moment of the evaluation (Pineau et al., 2003).

- The characteristic that **catches attention at a given time**, not necessarily the most intense (Pineau et al., 2009)



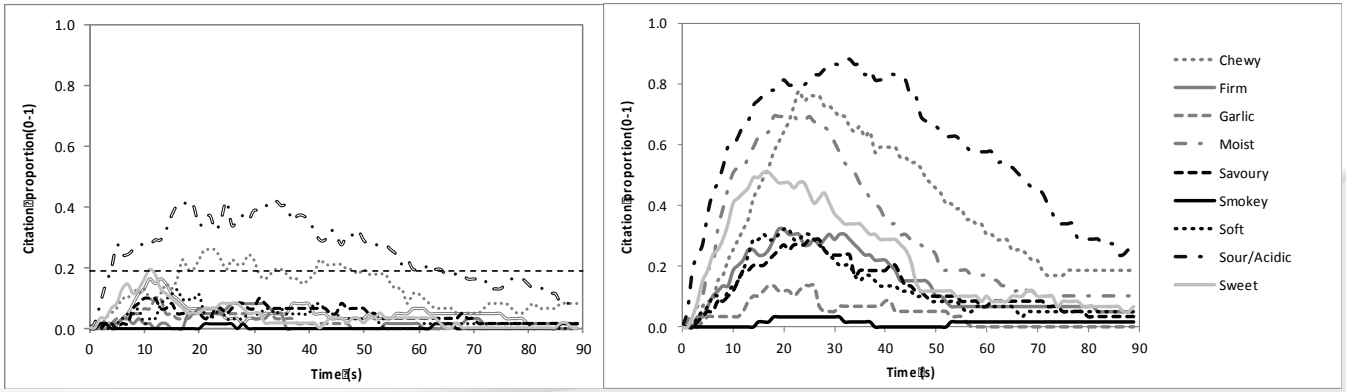
Temporal Check-all-that apply (TCATA) questions

Selection of **all the terms that are applicable to describe** the sample at each moment of the evaluation (Castura et al., 2016).



Do TDS and TCATA provide the same information?

- TDS and TCATA provide complementary information
- Across several studies with trained assessors and consumers (Ares et al., 2015):
  - TCATA provided a more detailed description of the temporal evolution of the sensory characteristics of samples than TDS.
  - TCATA enabled greater discrimination among samples than TDS.



The aim of the present work was to compare TDS and TCATA in terms of their ability to identify the influence of the dynamic sensory profile of food products on consumer overall liking scores.

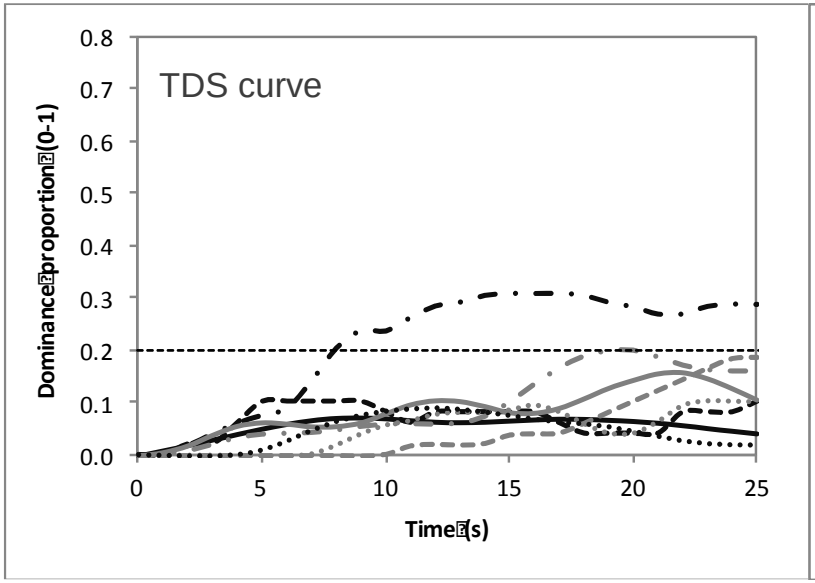
DESIGN OF THE STUDIES

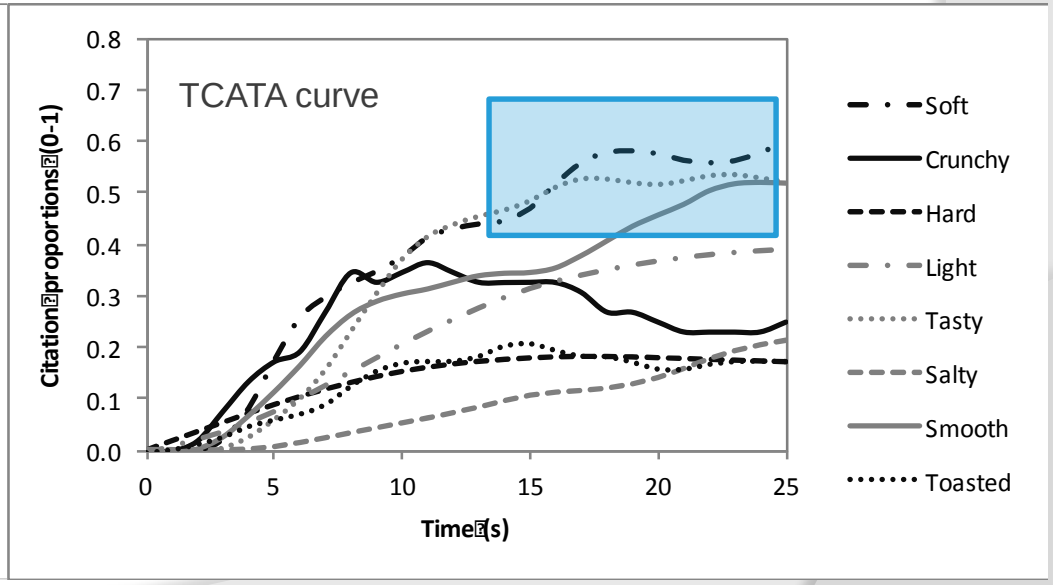
Study	Product category	Number of samples	Total number of consumers	Task duration (s)	Number of terms	Design of the study
1	Orange juice	5	200	25	11	Between-subjects design: TDS (50), TCATA (50) or overall liking (100)
2	French bread	5	100	25	8	Between-subjects design: TDS (50) or TCATA (50) All consumers rated their overall liking after the dynamic sensory-characterization task
3	Chocolate	5	100	60	10	

RESULTS

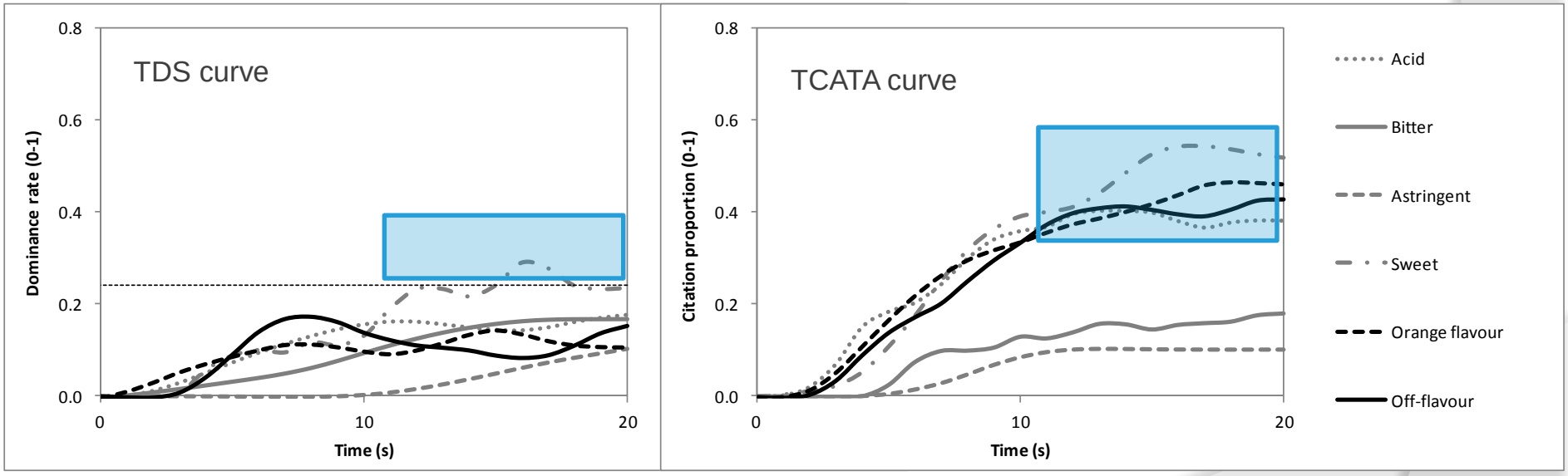
TDS and TCATA curves

- Significantly dominant attributes in TDS tended to show the highest citation proportions in TCATA.
- Several attributes showed high citation proportions in TCATA but did not reach significance in TDS.





- In some cases significantly dominant attributes did not explain consumer overall liking scores.



Overall liking score of the orange juice: 4.7

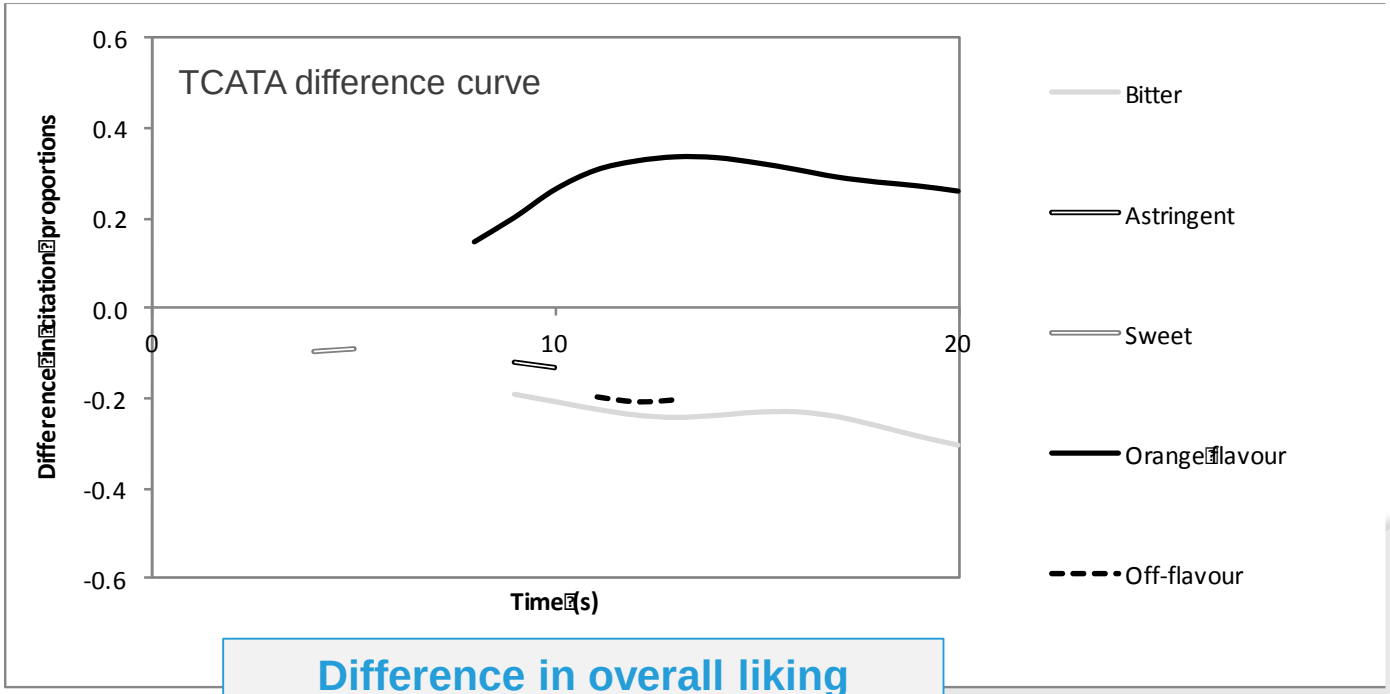
Difference curves

- In the French bread and Chocolate studies, both methodologies identified significant differences between all the pairs of samples for several sensory attributes.

- The information provided by TDS and TCATA was similar

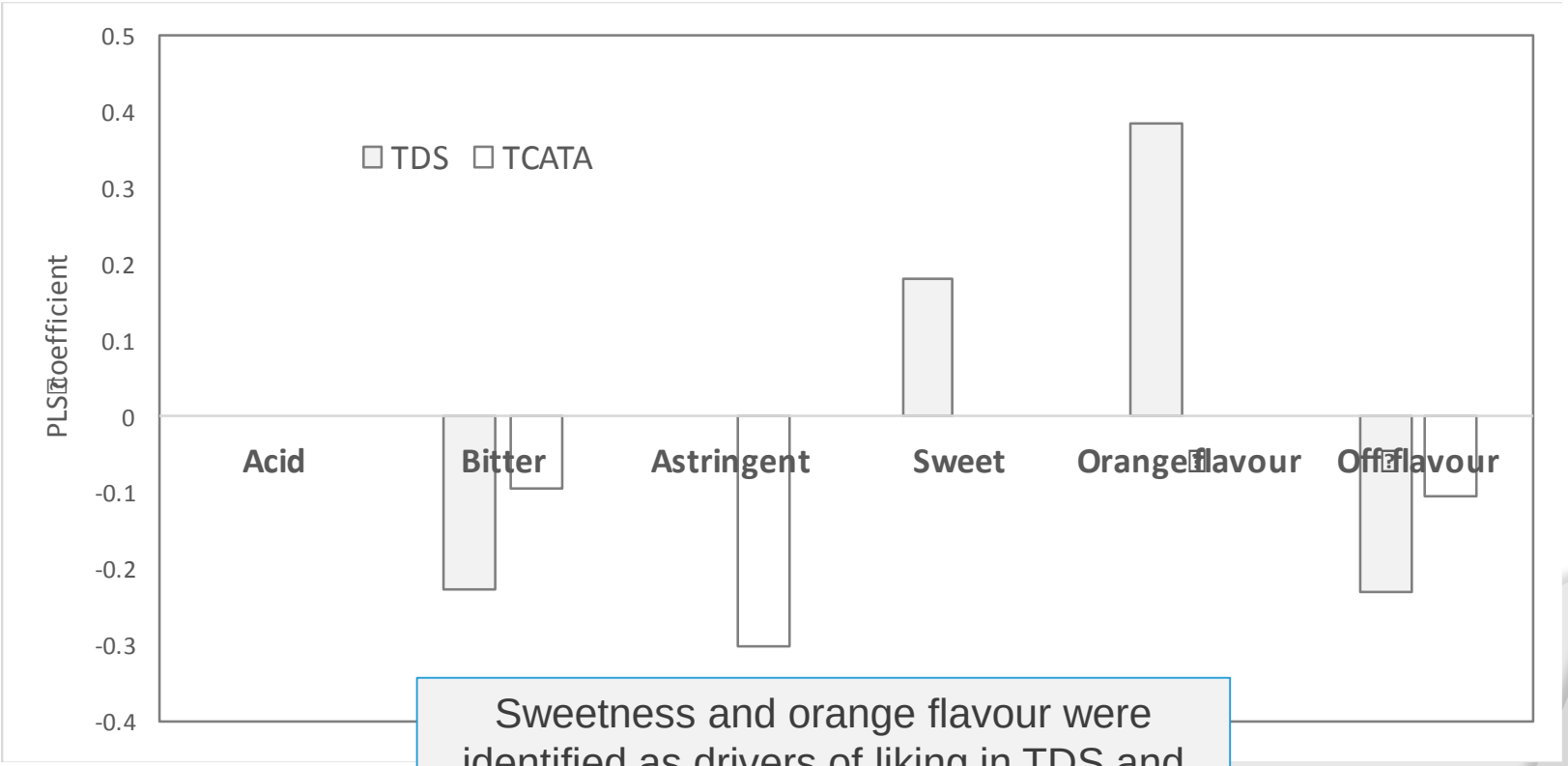
Study ID	Pair of samples	Difference in overall liking scores	Discriminating attributes in TDS (duration of significant difference, in seconds)	Discriminating attributes in TCATA (duration of significant difference, in seconds)
2 – French bread	S1-S2	-0.7	+soft (4), -crunchy (8), **-tasty (5)**	+soft (19), -crunchy (8), **+smooth (1)**
	S1-S3	-0.6	+soft (19), - crunchy (21), +light (5s), **-tasty (2), +salty (1)**, -toasted (2)	+soft (22), -crunchy (23), +light (16), **+smooth (2),** -toasted (1)
	S1-S4	-0.9	+soft (21), -crunchy (14)	+soft(14), -crunchy (23), **+tasty (1), +smooth (1)**

- In the orange juice study, TDS was not able to identify significant differences between a couple of samples with significantly different overall liking scores.



Difference in overall liking scores: 1.4

PLS regression on the areas under TDS or TCATA curves



Sweetness and orange flavour were identified as drivers of liking in TDS and not in TCATA (equi-sweet juices)

TDS and TCATA data treated as CATA (Meyners, 2016)

- Responses for each individual sample were split into four identically long periods of time (Q1 to Q4) and analyzed as CATA.

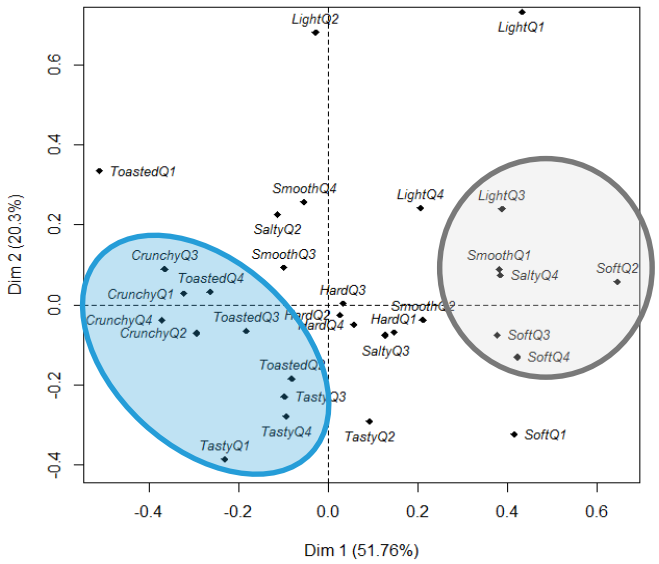
Cons	Sample	Attribute	0	1	2	…	30	31	32	…	45	46	47	…	59	60	Q1	Q2	Q3	Q4
1	1	Hard	0	1	1	…	0	0	0	…	0	0	0	…	0	0	1	0	0	0
1	1	Chocolate	0	0	0		0	0	1		1	1	1		1	0	0	0	1	1
…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…

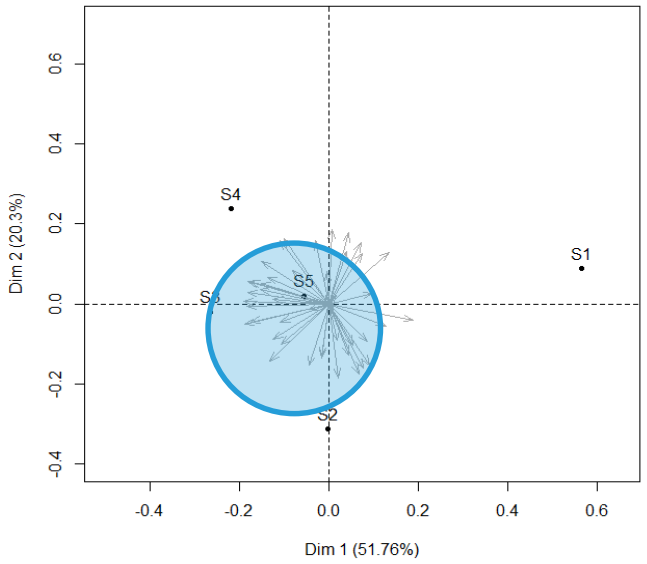
- Correspondence analysis (CA) was performed on the frequency table and consumer liking scores were projected onto the map.

Sample	Hard Q1	Hard Q2	HardQ3	...	Chocolate Q1	ChocolateQ2	…	Cons1	…
1	43	38	…	…	15	43	…	5	
2	35	21	…	…	13	26	..	6	
…	…	…	…	…	…	…	…	…	

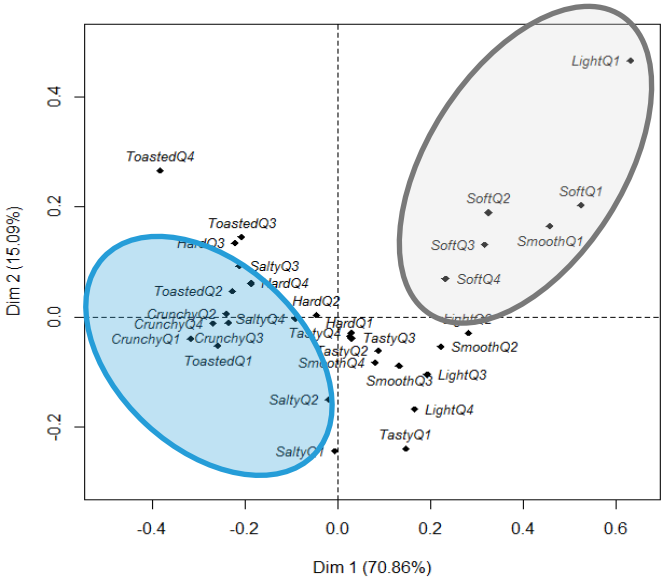
French bread study

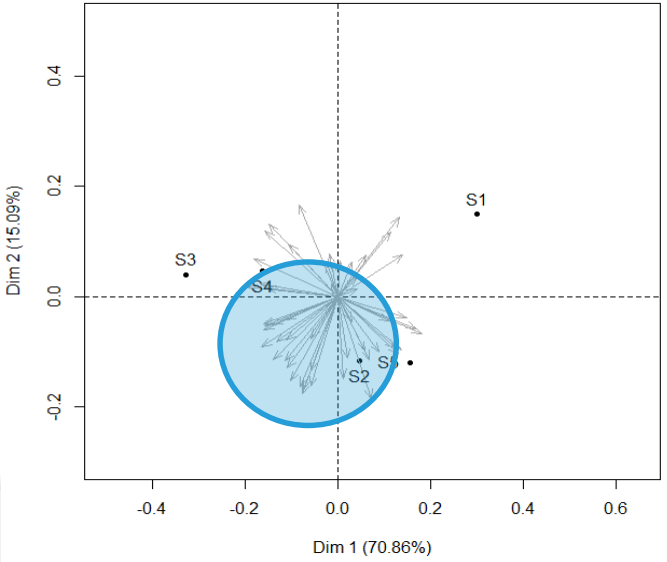
TDS





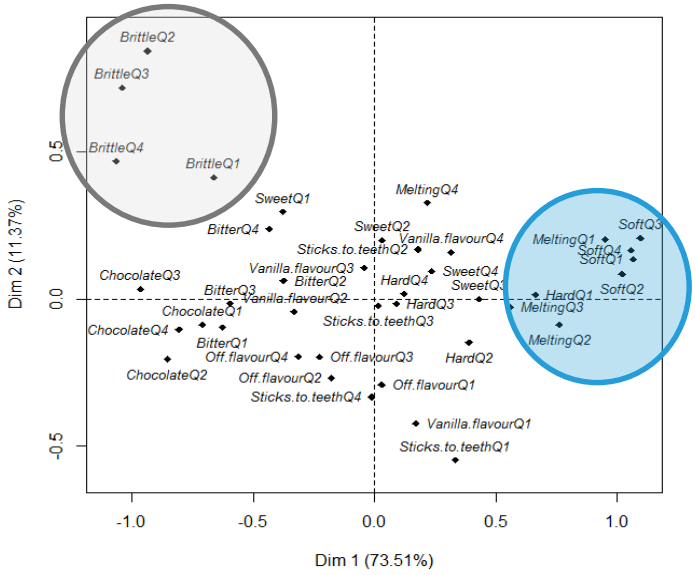
TCATA

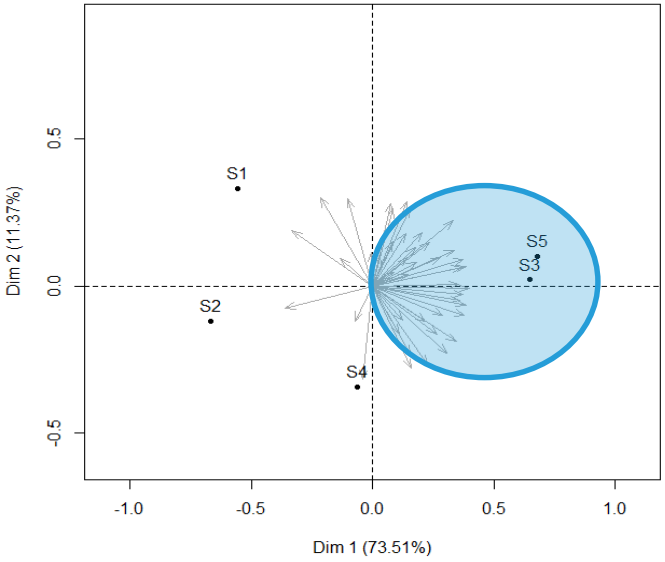




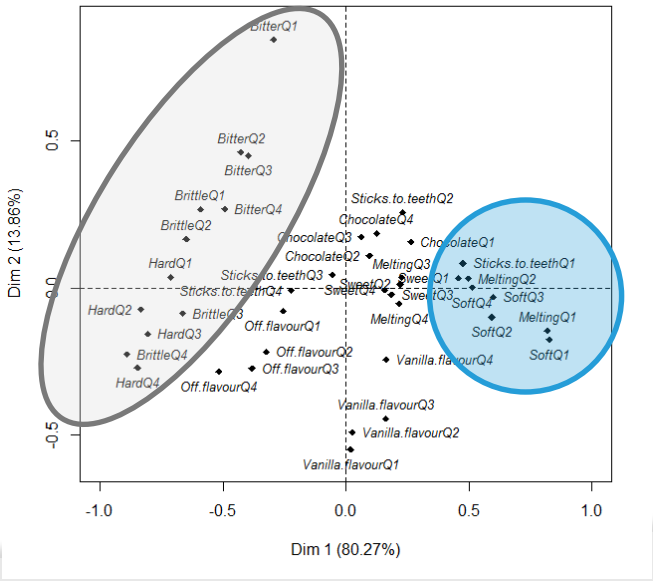
Chocolate study

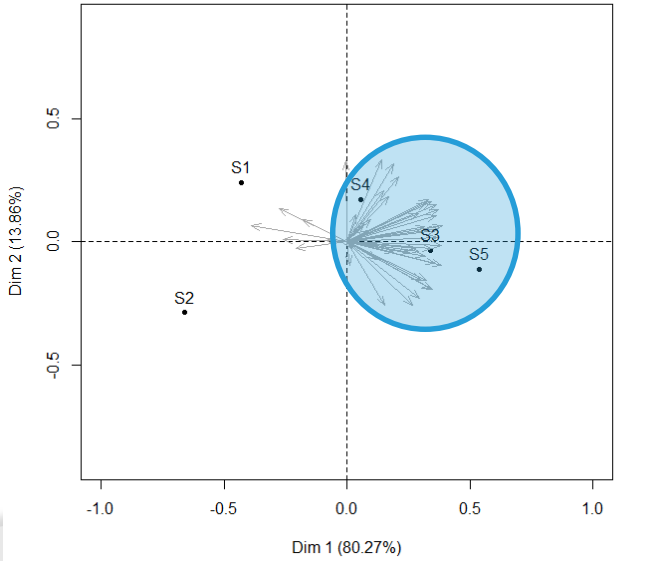
TDS





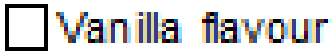
TCATA





Penalty-lift analysis (Meyners et al., 2013)

Average overall liking (X=1,Q1) = OV1



Average overall liking (X=0,Q1) = OV2

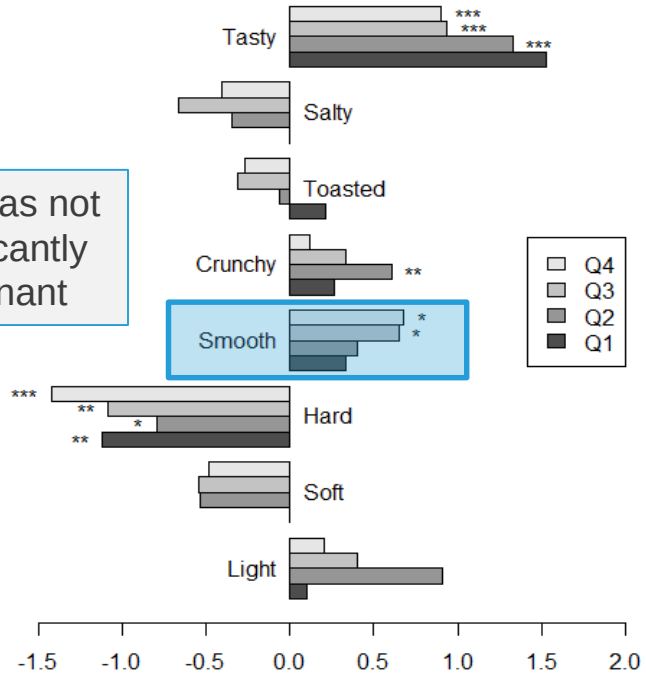
Penalty lift (X, Q1) = OV1-OV2

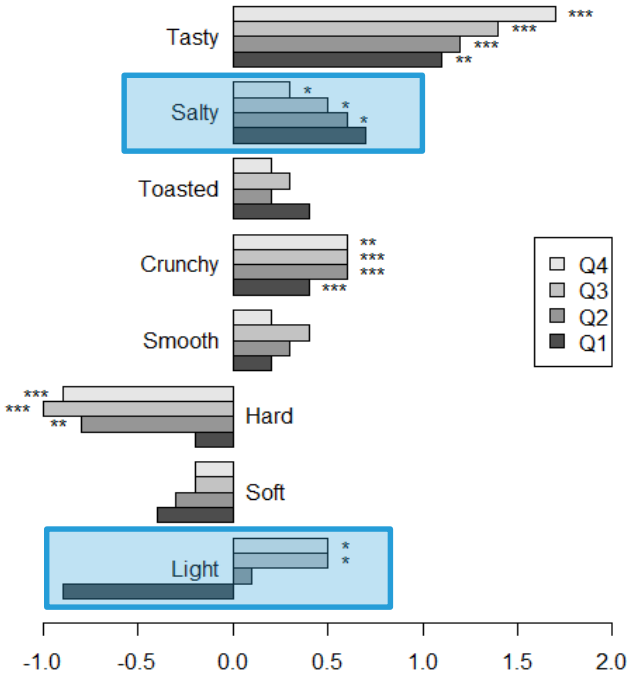
- Differences between the two average values were calculated and their significance evaluated using an unpaired t-test assuming equal variance

French bread study

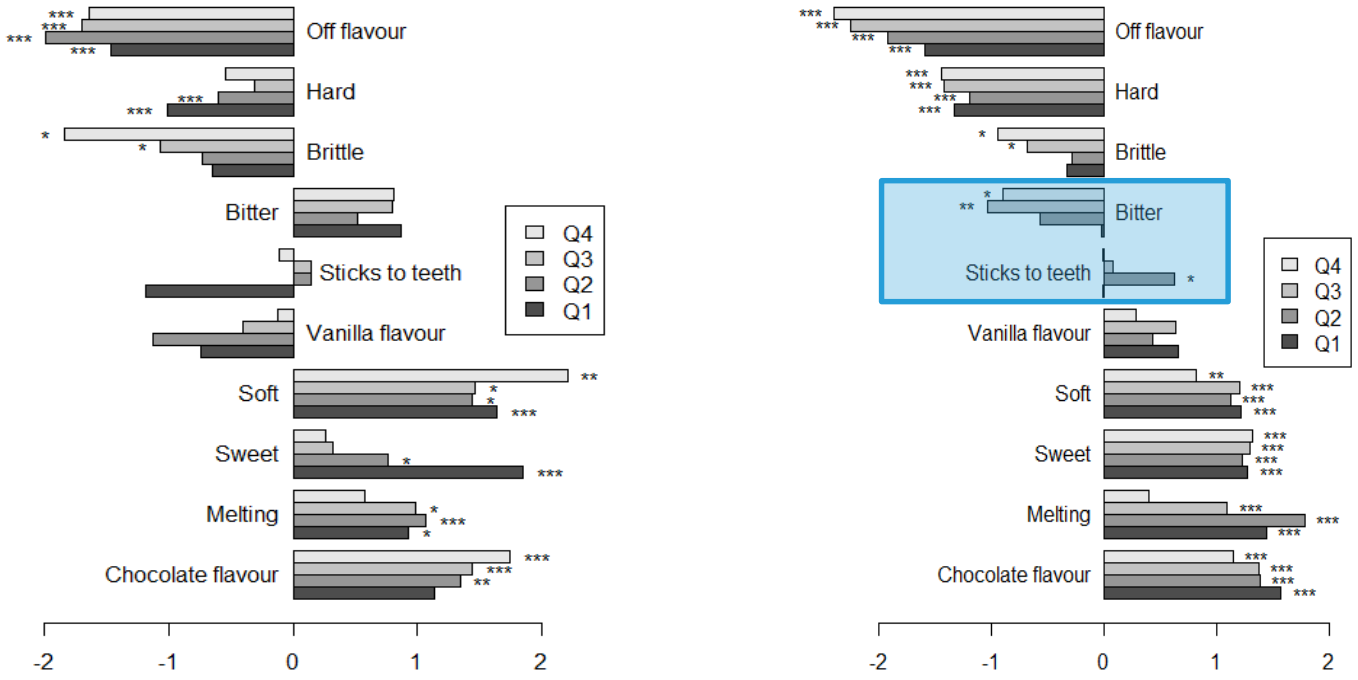
Tasty (Q1-Q4), Hard (Q2-Q4) and Crunchy (Q2) were significant drivers of (dis)liking in both methodologies

Hard was not significantly dominant





Chocolate study



Off-flavour (Q1-Q4), Hard (Q1-Q2), Soft (Q1-Q4), Sweet (Q1, Q2), Melting (Q1-Q3) and Chocolate flavour (Q2-Q4) were significant drivers of (dis)liking in both methodologies

CONCLUSIONS

- Evidence of greater detail in the dynamic sensory profiles obtained using TCATA compared to TDS was obtained
- In many cases the more detailed dynamic sensory profiles led to additional insights on the sensory attributes that influenced consumer overall liking.
- In other cases, dominance provided complementary information to attribute description.
- Further research is necessary to determine if the drivers of liking identified in only one of the methodologies contribute to product optimization efforts

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