

Food oral processing, a key step at the origin of texture and aroma perceptions of bread



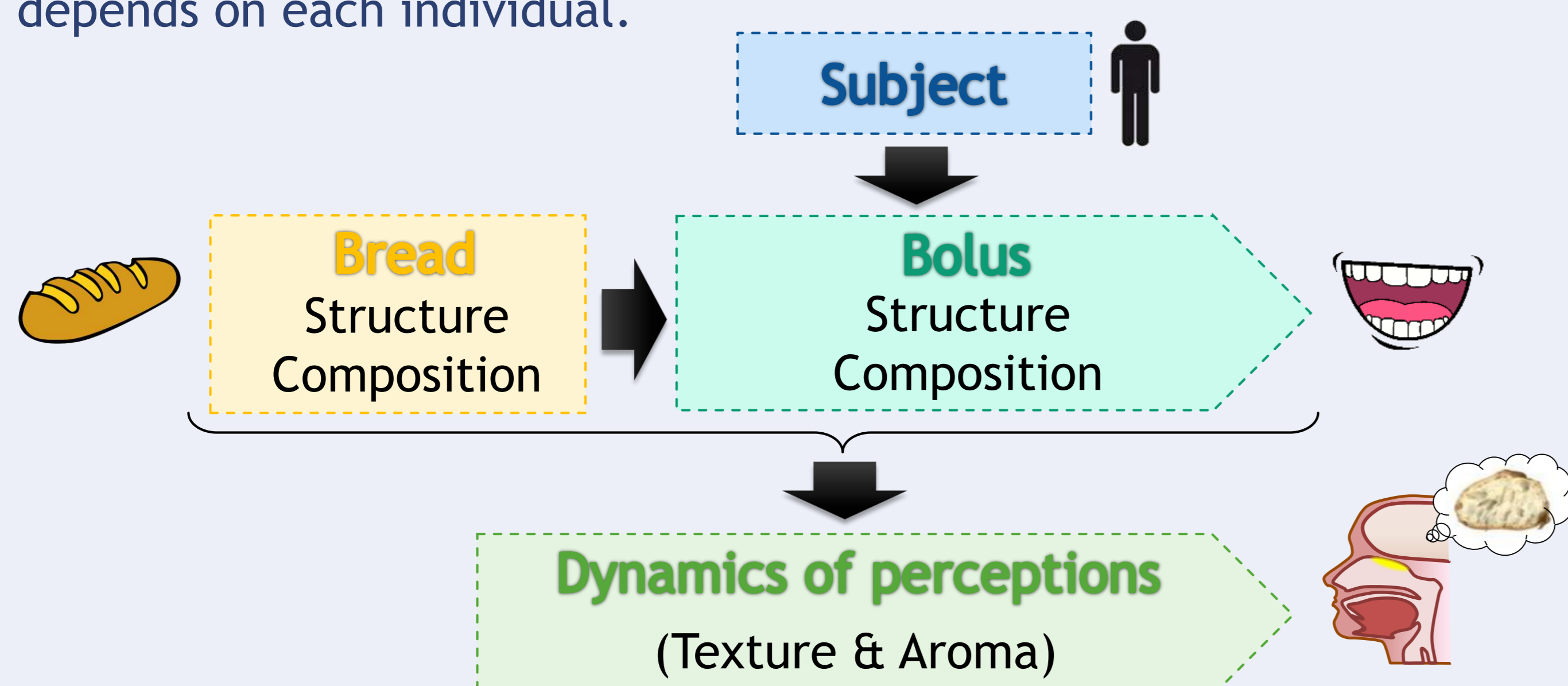
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Context and objectives

- The liking of bread by the consumers is largely impacted by its sensory properties, and notably the aroma and texture perceived during in-mouth consumption.
- These perceptions cannot be only explained by the volatile composition of the bread or by its structure. In fact, they also depend on dynamic phenomena, resulting from the breakdown of the bread in mouth, which depends on each individual.



→ This PhD project aims to better understand the determinants linked to the product and to the individual at the origin of the dynamics of aroma and texture perceptions of bread.

Structure of breads and dynamics of texture perceptions

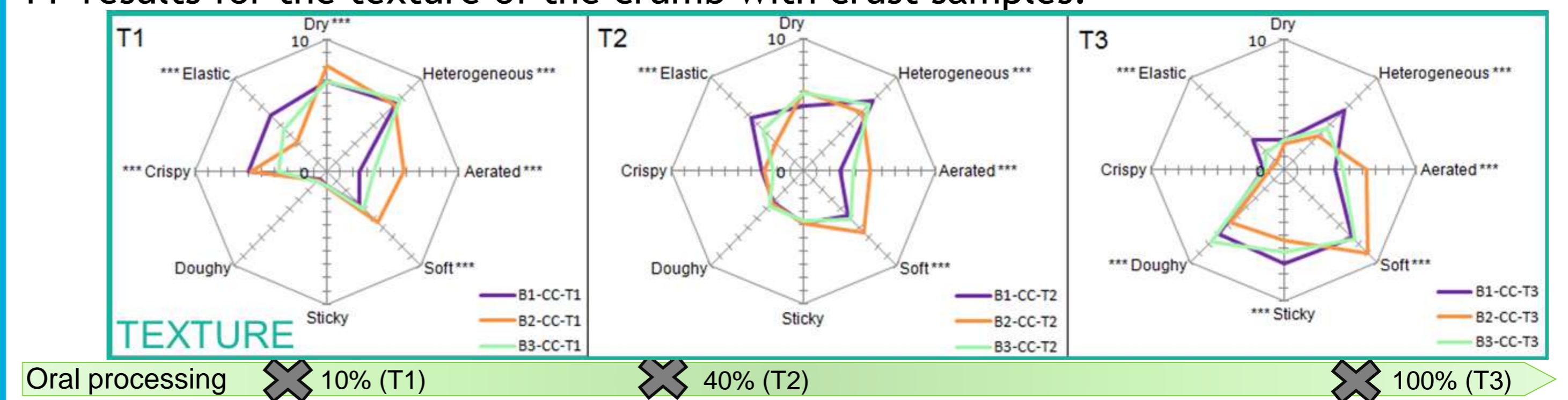
Characterizations at three key steps:

- of bolus properties (texture, hydration and structure) - Jourden et al. (2016a)
- of perceptions by progressive profiling (PP) - Jourden et al. (2016b, 2017a)

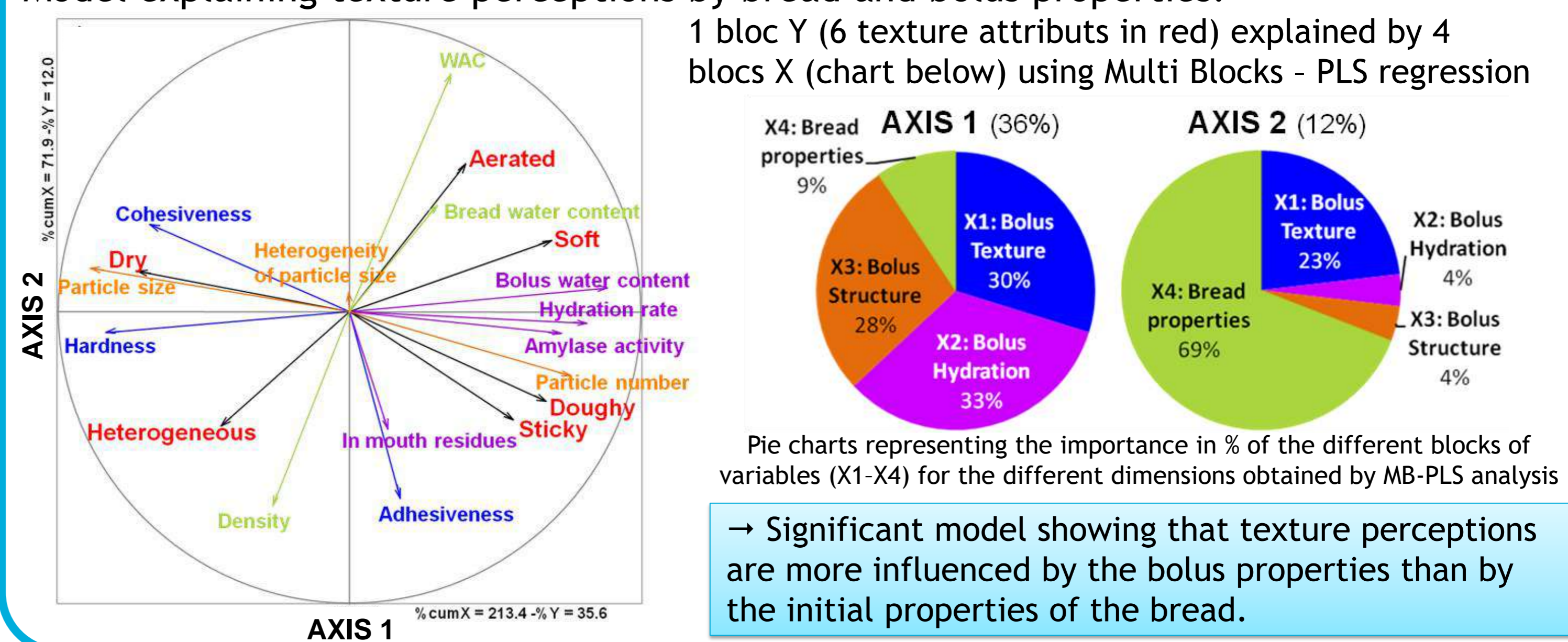
8 trained panellists
3 replicates

Evaluation of attribute intensities on a continuous scale from 0 to 10 at three times of oral processing (T1, T2 or T3)

PP results for the texture of the crumb with crust samples:



Model explaining texture perceptions by bread and bolus properties:



→ Significant model showing that texture perceptions are more influenced by the bolus properties than by the initial properties of the bread.

A multidisciplinary strategy

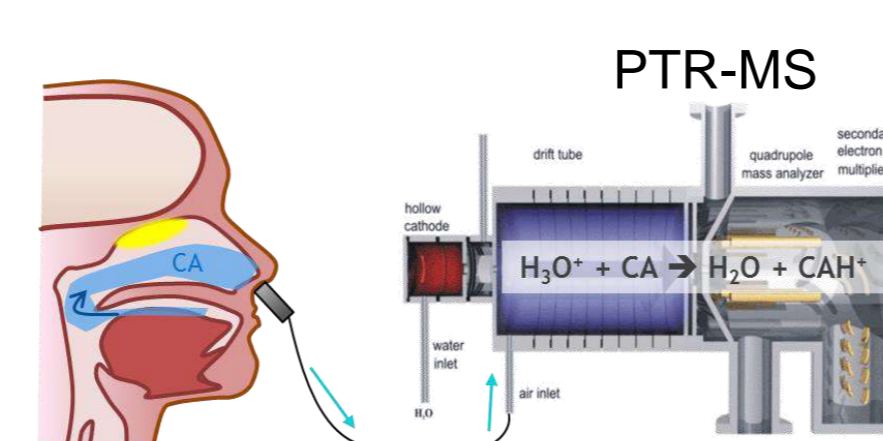
Statistical links between data

Conception and characterizations of breads

Bolus characterizations at 3 key steps of oral processing

Characterization of the subjects' physiology

Bolus structure
Texture perception
Release of aroma compounds
Aroma perceptions



Study of *in vivo* markers

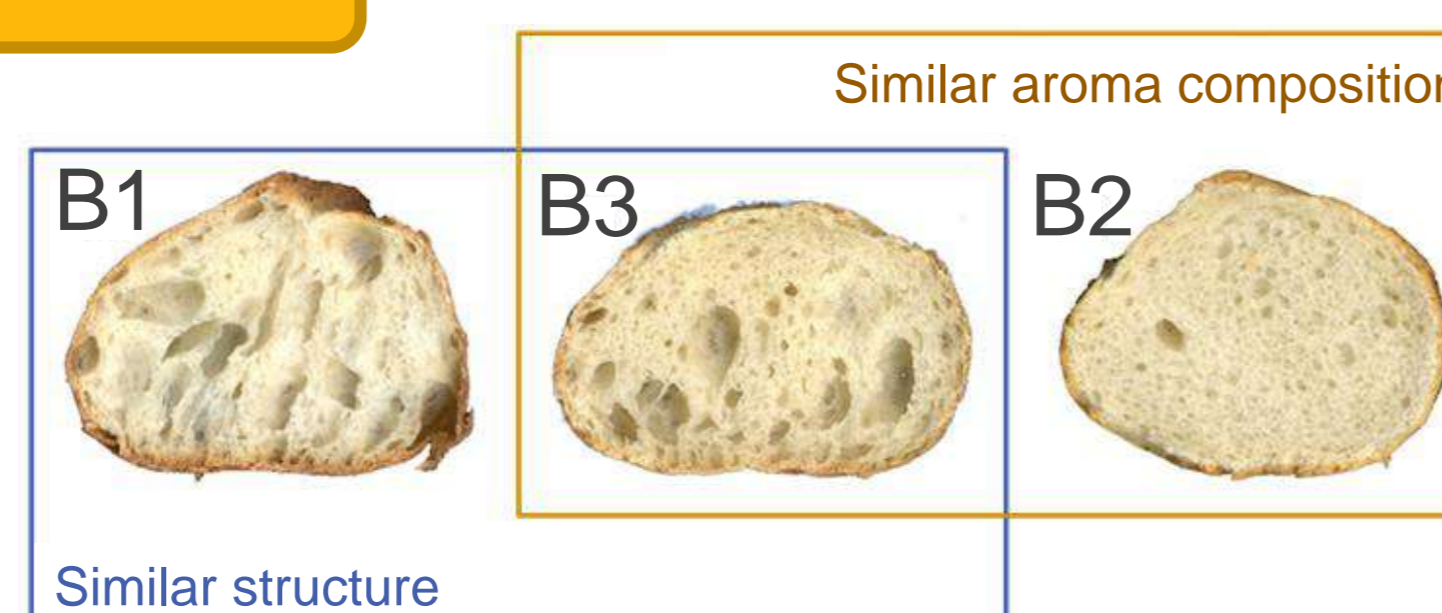
- Aroma release
- Dynamics of perceptions

In-mouth introduction → Swallowing

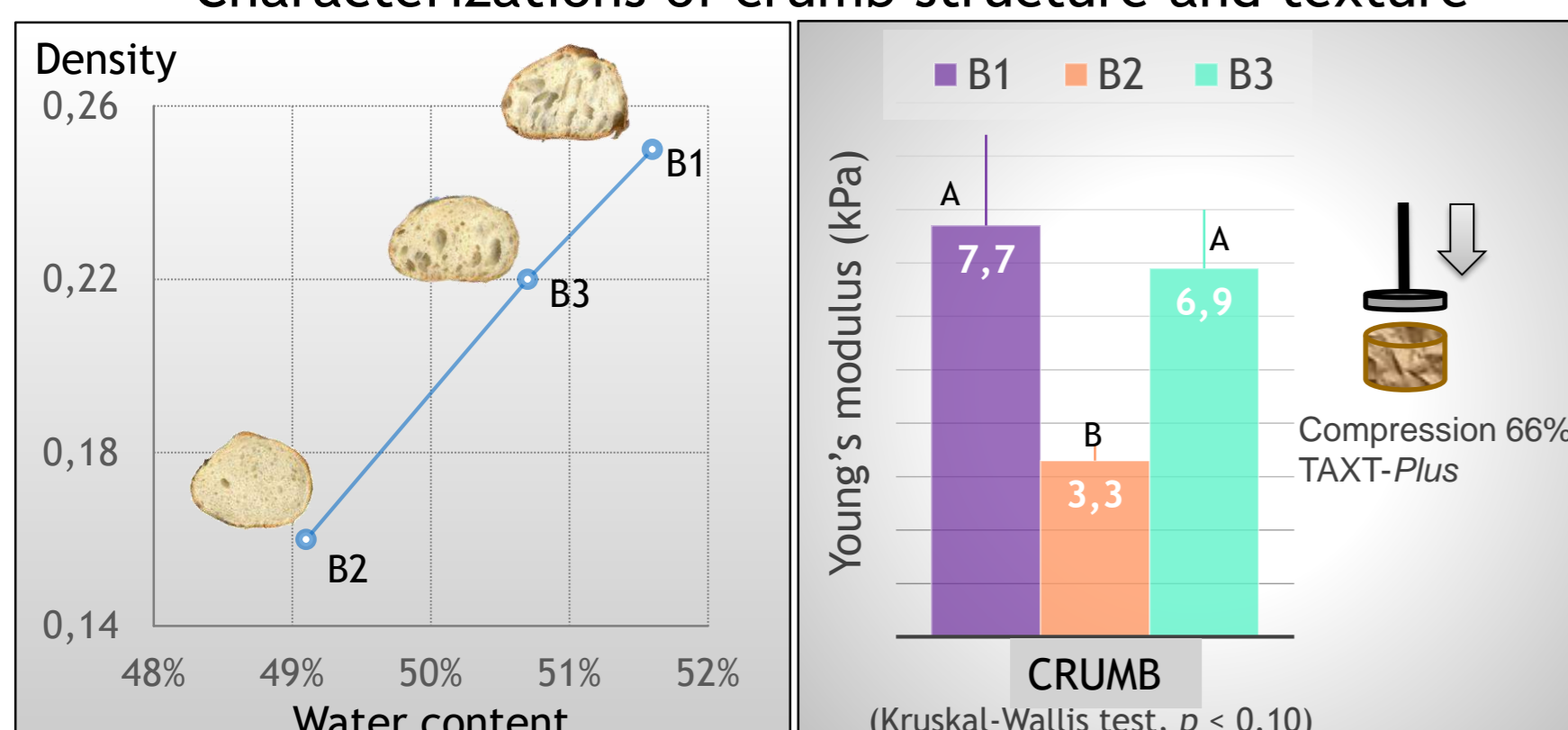
In-mouth introduction → Swallowing

Bread characterizations

3 French baguettes with controlled bread-making processes and same main ingredients.



Characterizations of crumb structure and texture



Multi-instrumental characterizations (structure, texture, aroma) of the products:

- Validation of the product specifications
- Control of the production batch
- Selection of the relevant methods to characterize the bread

Structure of breads and dynamics of aroma perceptions

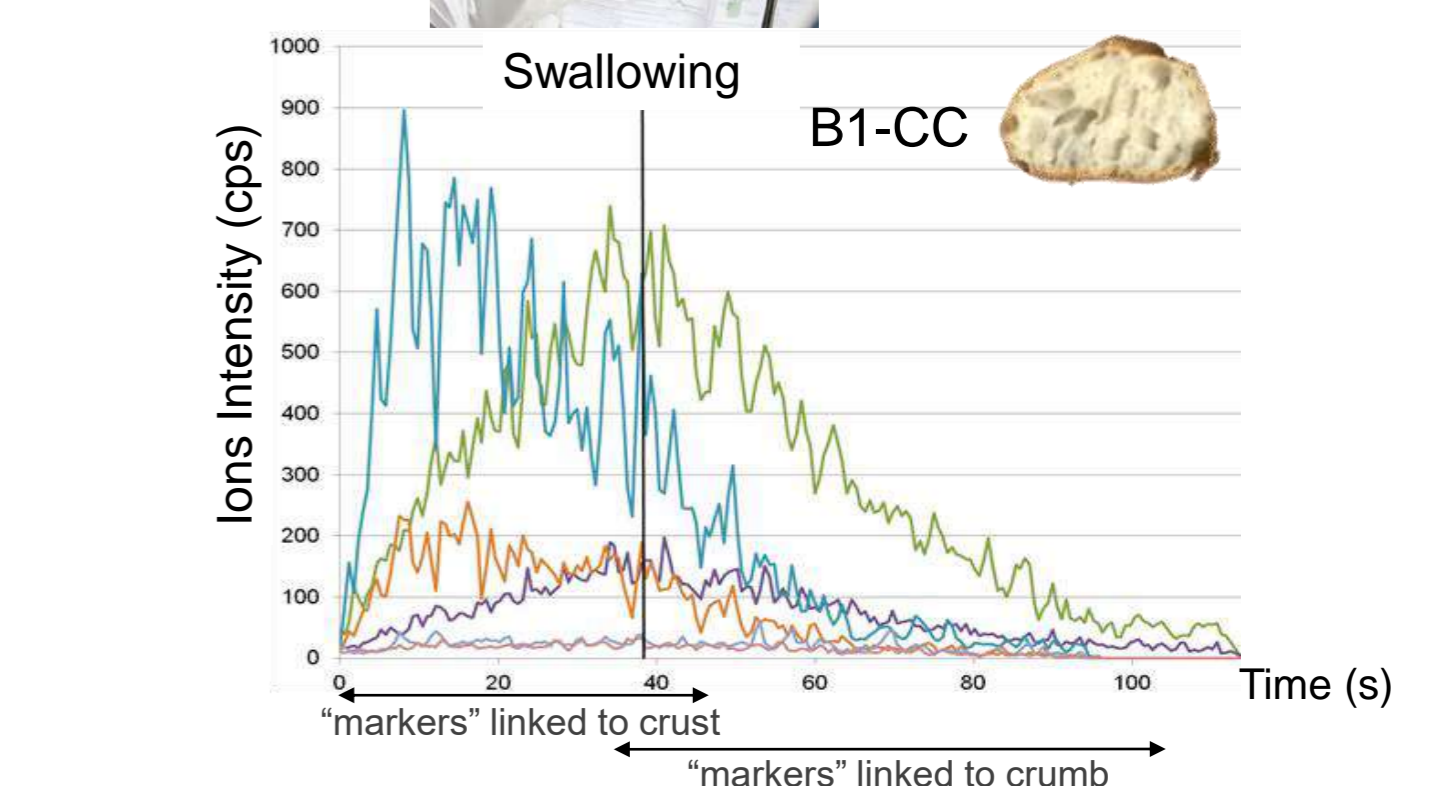
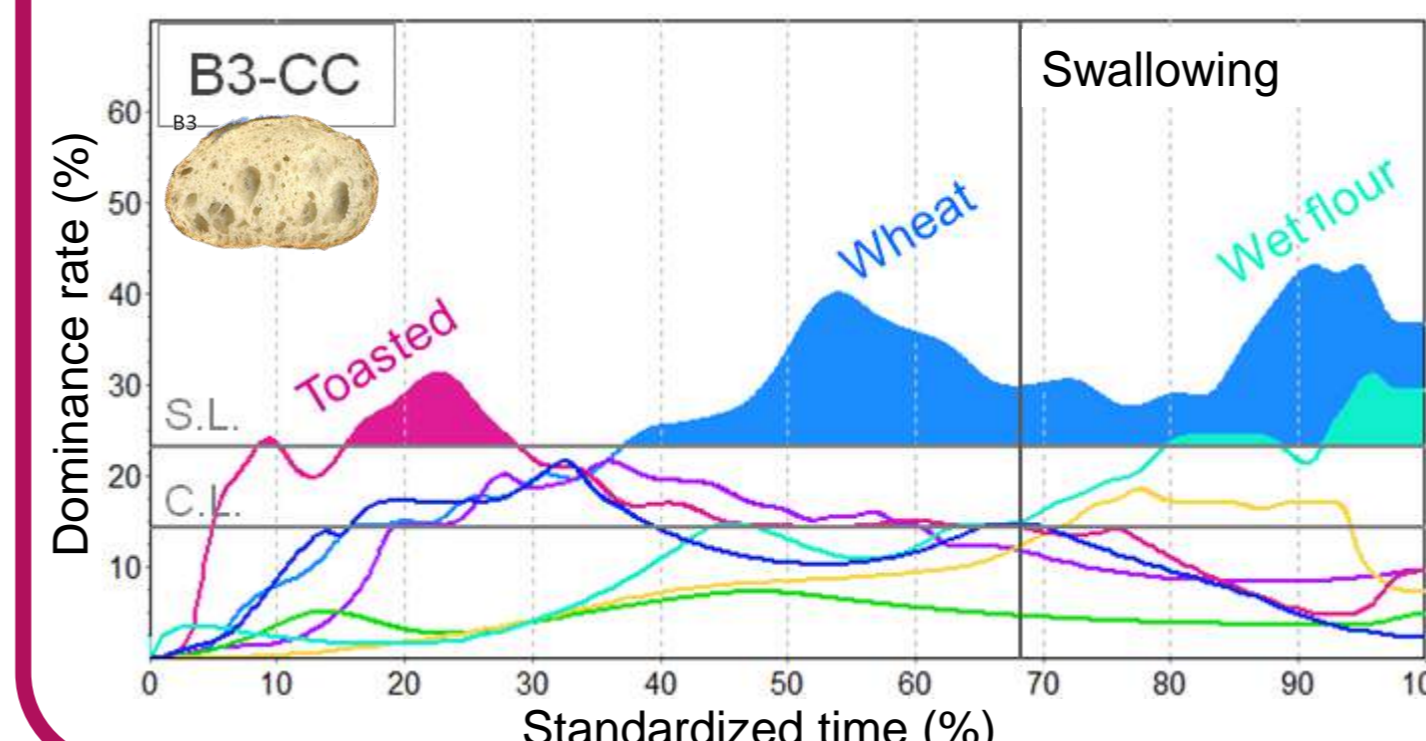
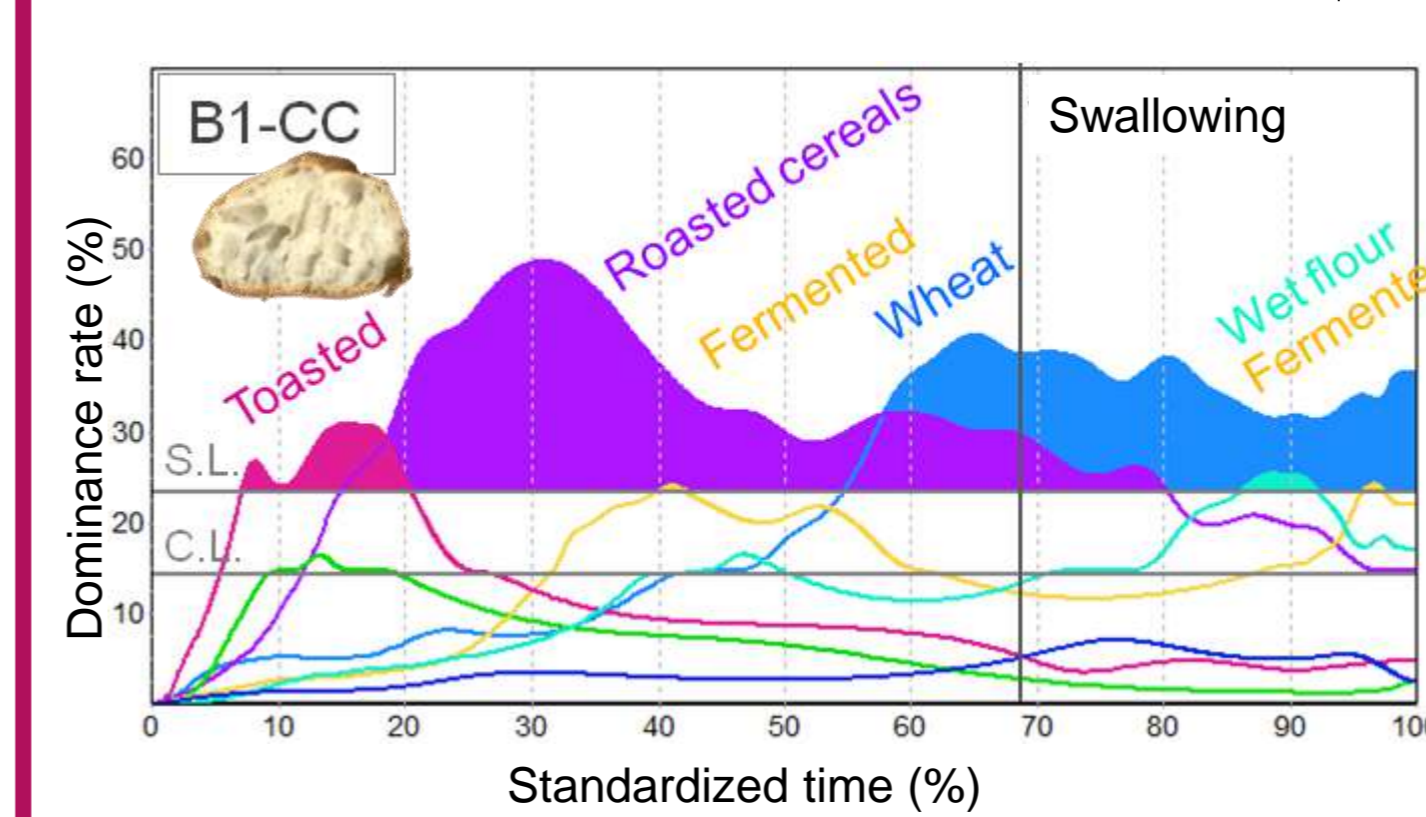
Evaluation of dominances of aroma perceptions during consumption by Temporal Dominance of Sensations - Jourden et al. (2017b)

Attribute dominance = the attribute which triggers the most the attention

14 trained panellists
3 replicates



Monitoring of aroma markers released in oral cavity by PTR-MS *in vivo*



→ The crust strongly influences the perceptions of aroma: the consumption of the crust with the crumb contributes to the perception of "toasted" and "roasted cereal" notes linked to the molecules formed during cooking and released at the first moments of mastication.

→ The crumb structure has an impact on the dynamics of perceived aroma: despite different aroma compositions, similar dominance sequences (DTS) and PP were observed between breads B1 and B3.

Conclusions

- Relevance of the multidisciplinary approach to study the oral processing and better understand aroma and texture perceptions.
- Methodological contribution to scientific community:
 - Statistical analyses for sensory-instrumental dataset.
 - Study of aroma fingerprints at key steps of consumption.
- Industrial applications: Design of breads for specific populations (masticatory difficulties, dry mouth) or by coupling sensory and nutritional properties for new products such as fiber-enriched or gluten-free breads.