

# Identifying temporal sensory drivers of liking of biscuit supplemented with brewer's spent grain

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- Brewer's spent grain (BSG), a by-product of the brewing industry, has great potential as food additive.
- Adding BSG to biscuits can lead changes in sensory perception and consumer acceptance.
- Individual differences must be considered when identifying temporal sensory drivers of liking.
- This study explores the temporal sensory profiles and drivers/inhibitors of liking in BSG-enriched biscuits.

## Materials and Methods

- Six biscuit formulations were obtained from a 3x2 factorial design with factors oat flake particle size (0.5 mm, small commercial flakes, large commercial flakes) and baking powder (with, without).
- Consumers (n=104) were asked to evaluate the dynamic properties of biscuits (using Temporal Check-All-That-Apply, TCATA) and rate liking on a 7-point categorical scale.

Tab. 1. Formulation of the biscuits

	With	Without
Large	P1 (LW)	P2 (LO)
Small	P3 (SW)	P4 (SO)
Flour	P5 (FW)	P6 (FO)

## Data analyses

- **CLV with a noise cluster** was performed on *consumer likings* to identify clusters of consumers.
- **Sequential Penalty-lift analysis (PLA)** was applied on TCATA data and ratings of liking to find the drivers of liking for each cluster of consumers.
- For each product and attribute, the Area-under-curve (**AUC**) based on the smoothed curve was calculated.
- **PCA** was applied to the AUC data to summarise the similarities and differences between the temporal sensory profiles

## Results

- Two **clusters of consumers** were determined by CLV
  - ✓ **Cluster G1** (n=36)
  - ✓ **Cluster G2** (n=34)
  - ✓ Noise cluster (n=34)

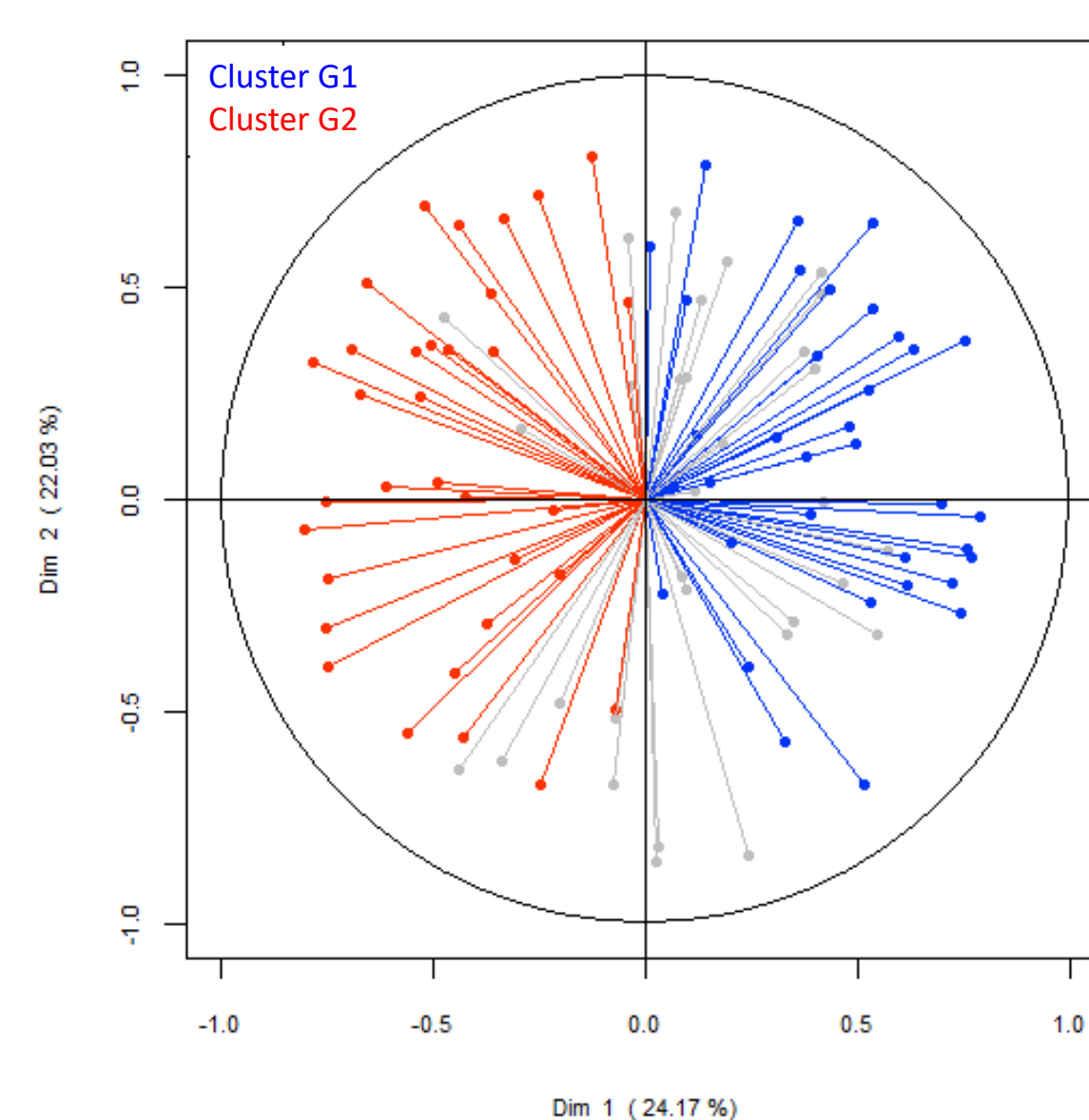


Fig. 1. Consumer clustering based on ratings of liking.

### Likings in each clusters

- ✓ **Cluster G1** preferred the large-flake biscuit (LW) over small-flake (SW) and flour (FW) biscuits
- ✓ **Cluster G2** preferred small-flake (SW) and flour (FW) biscuits over the large-flake (LW) biscuit

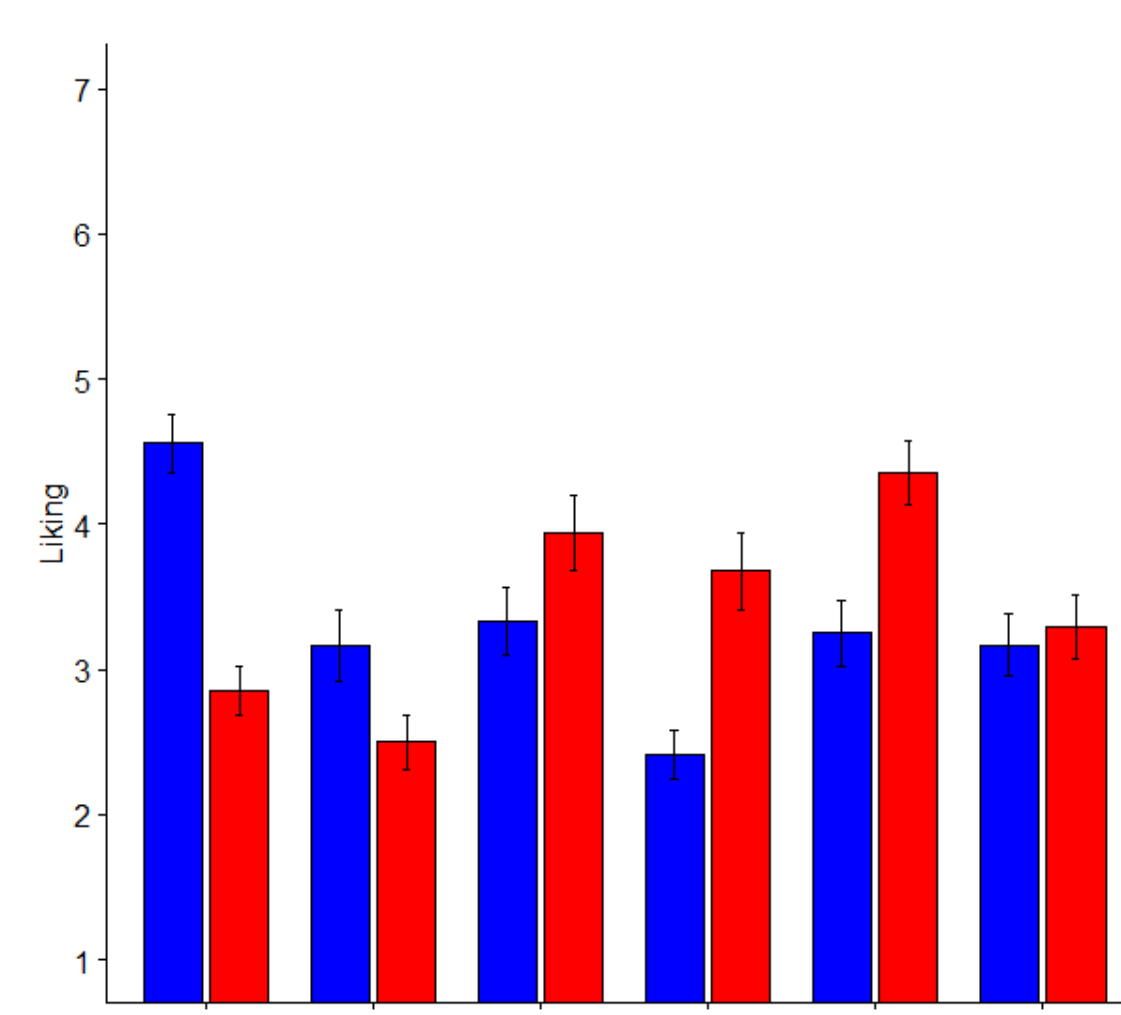


Fig. 2. Overall likings of biscuits.

### Temporal sensory drivers (and inhibitors) of liking

- ✓ **Cluster G1**, *Crumbly* (T10-55), *Foamy* (T10-80), *Easy-to-swallow* (T80-100) were drivers of liking.
- ✓ *Dense* was associated with a significant penalty at T25-50. *Hard-to-swallow* had a penalty at T85-100.
- ✓ **Cluster G2**, *Foamy* (T10-40), *Easy-to-swallow* (T50-100) were drivers.
- ✓ *Chewy* (T0-30, T85-100), *Hard-to-swallow* (T25-100), and *Hard* (T75-100) inhibited liking.

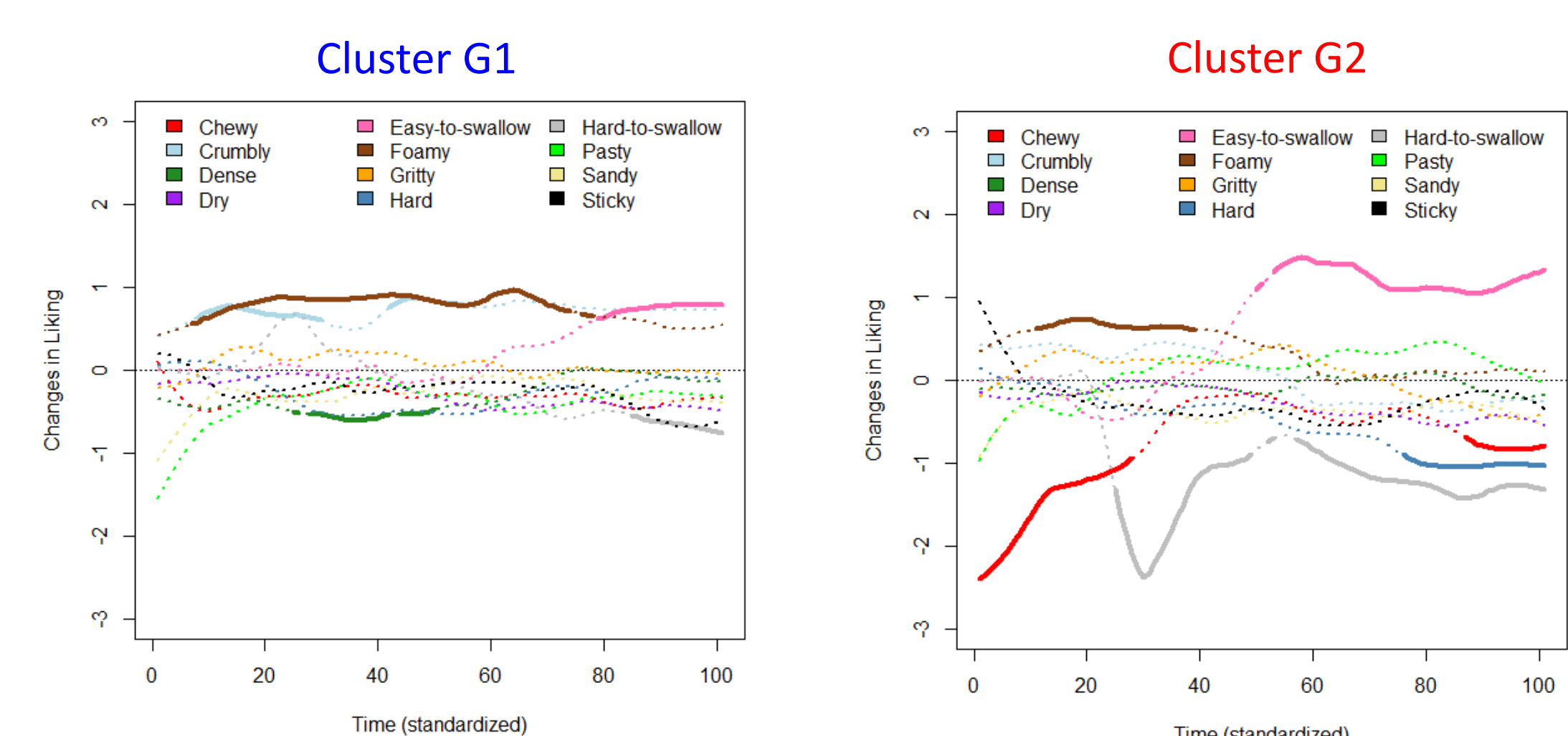
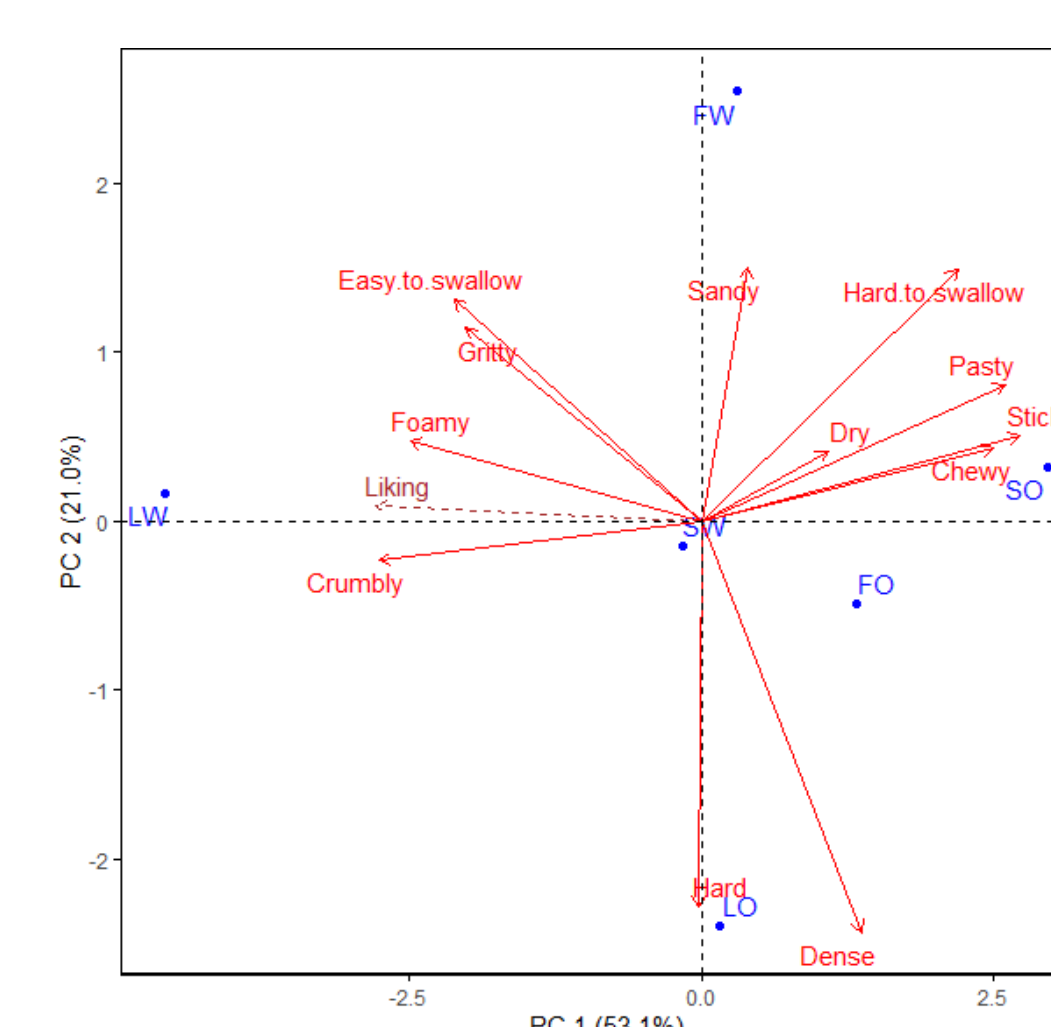


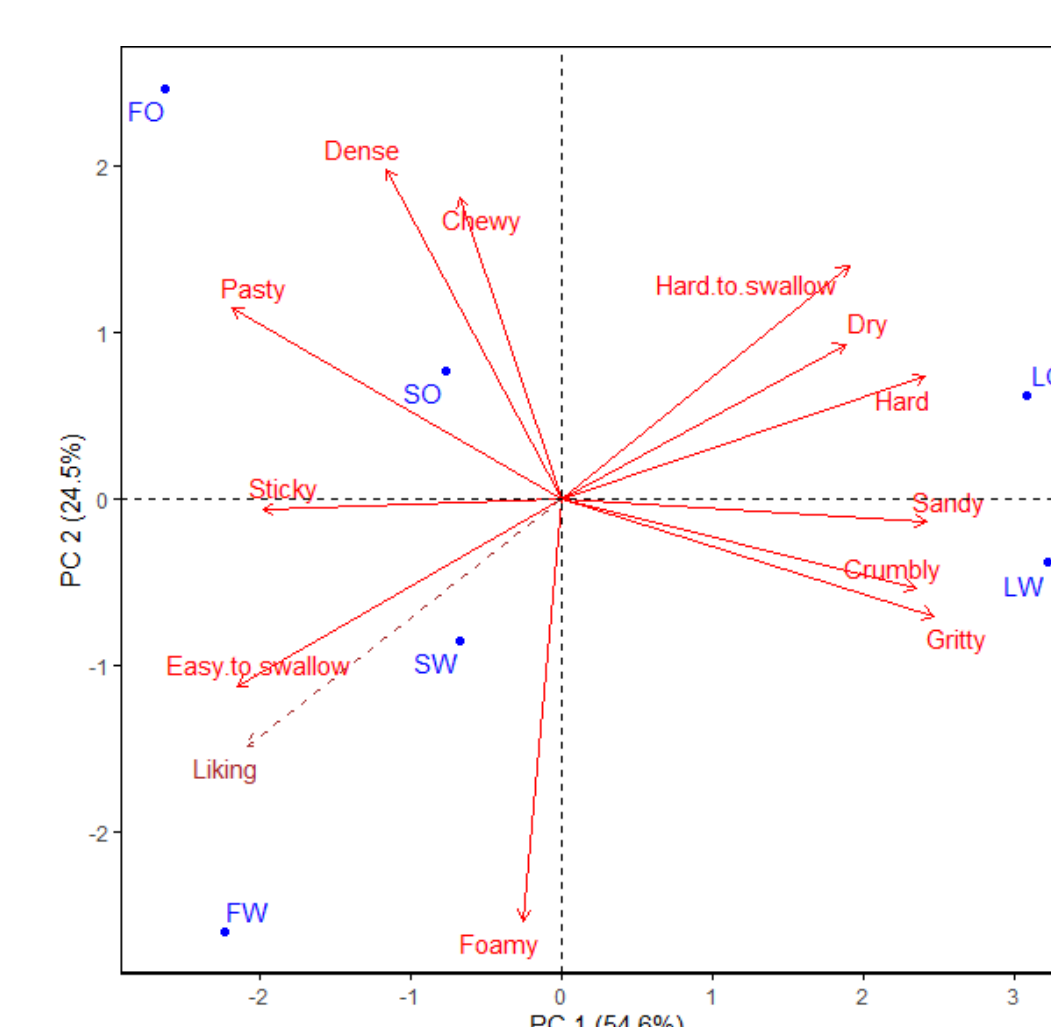
Fig. 3. Temporal drivers (and inhibitors) of liking.

### Product configuration based on AUC



Cluster G1

	With	Without
Large	Crumbly, Foamy	Hard, Dense
Small	-	Chewy
Flour	Sandy	Dense



Cluster G2

	With	Without
Large	Hard, Gritty, Crumbly, Sandy	
Small	Easy-to-swallow	Dense, Chewy
Flour	Foamy	Pasty, Dense

Fig. 4. PCA biplot for area-under-curve results

## Conclusions

1. The addition of BSG in different formats to biscuits produced changes in product texture described and liked differently by consumers;
2. While the two clusters shared drivers of liking, different inhibitors of liking were found, driven by distinct textural characteristics.