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Common and unique information in liking and willingness-to-pay measures extracted by PO-PCA

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Context: Experimental consumer tests of food often combine three testing conditions: blind (taste only), expectations (product information only) and full information (taste and product information combined). In addition, many studies collect different types of consumer responses, e.g. liking and Willingness To Pay (WTP).
Aim: Investigate to what extent alternative test conditions and consumer responses are complementary or redundant.
Method: Four smoked salmon samples were evaluated by 104 consumers in five types of consumer responses. Parallel and Orthogonalised Principal Component Analysis (PO-PCA) is used to extract the parts of common and unique information present in the five data blocks.
Results reveal up to 60% of common information across liking and WTP scales, while mostly unique information is detected across test conditions.

Objective

Detect, quantify and interpret common and unique information in five different types of consumer responses:

- Blind liking
- Expected liking
- Liking (taste and product information)
- Expected WTP
- WTP

Method: Parallel and Orthogonalised PCA (PO-PCA)

Splits multiple matrices into *common components* (present in two or more matrices) and *unique components* (present in only one matrix) (Figure 1)

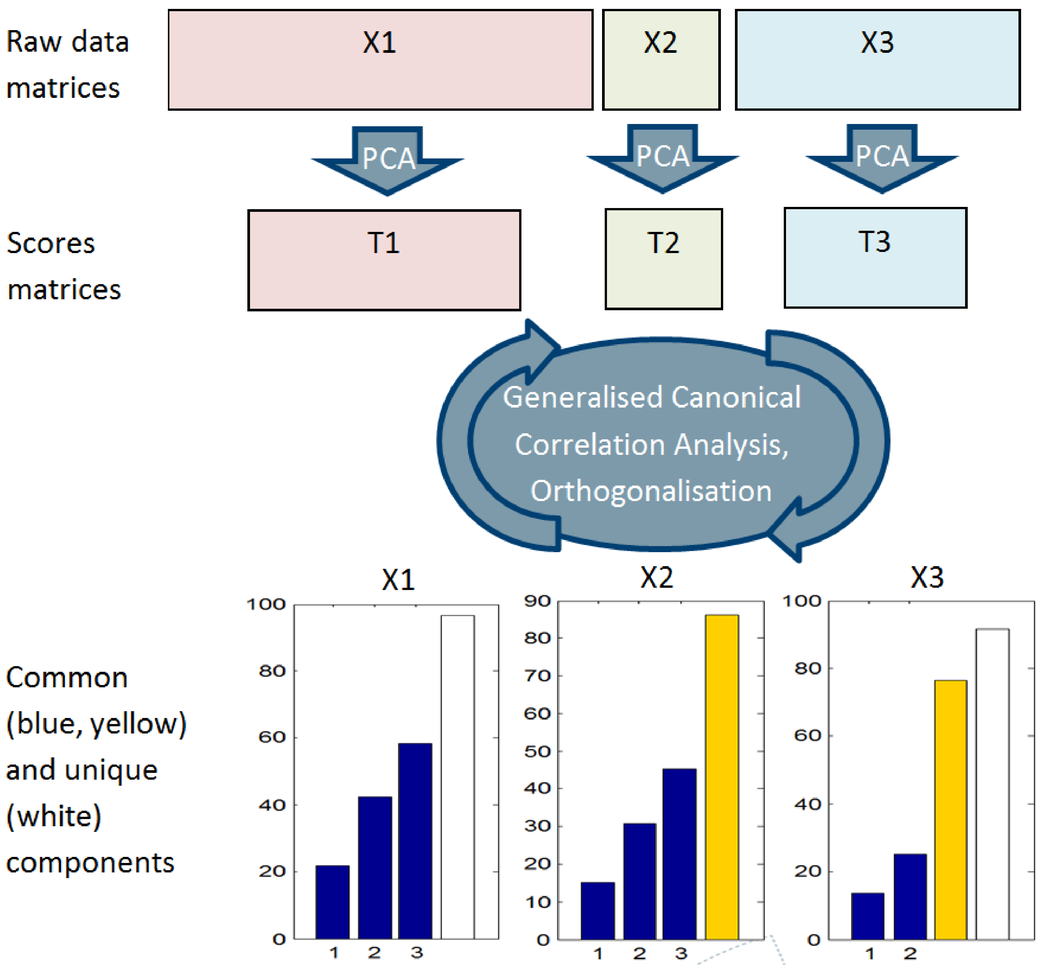

Figure 1. Extraction of common and unique components from multiple matrices by PO-PCA

Case study on smoked salmon

- Four smoked salmon samples (Table 1)
- 104 Norwegian consumers
- Five types of consumer responses

Table 1. Design of the four smoked salmon treatments

Products	Salt type	Salting process
P1	Regular salt	Dry salting
P2	Regular salt	Injection salting
P3	Salt replacer	Dry salting
P4	Salt replacer	Injection salting

PO-PCA strategy

0. Build 5 response matrices of size (consumers x products), run PCA
1. Calculate the canonical correlation coefficient for all combinations of 5,4,3,2 blocks of T-scores
2. Identify the combination with largest correlation
3. Extract these components, orthogonalise and repeat from 1

Results

Common components (Figure 2):

- No common information across all 5 measures
- Highest correlation (>0.90) between **liking** and **WTP**, with three common components (60 and 45% explained variance, resp.)
- **Expected liking** and **expected WTP** (corr. 0.88) share two common components
- **Blind liking** has unique components only

Liking and **WTP** responses range products similarly (Figure 3)

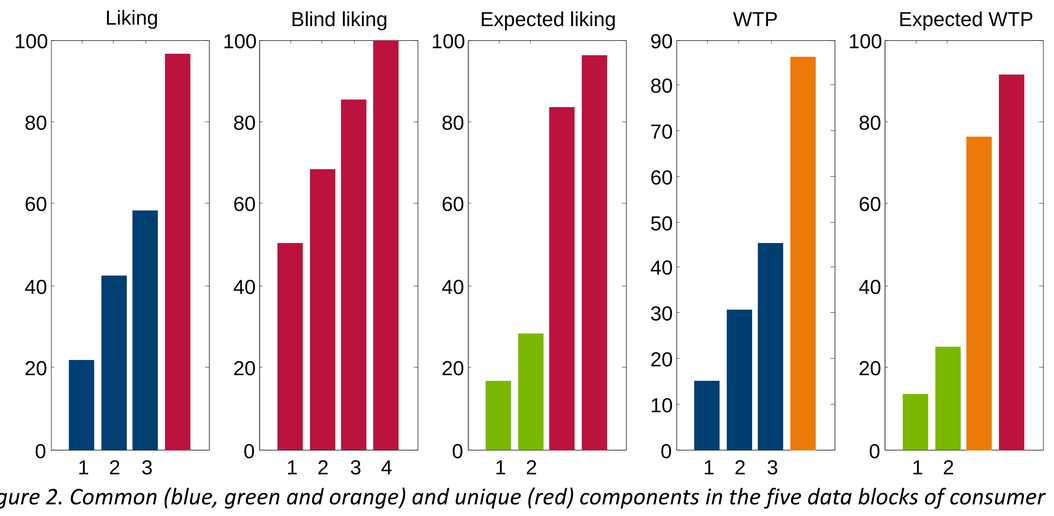

Figure 2. Common (blue, green and orange) and unique (red) components in the five data blocks of consumer responses

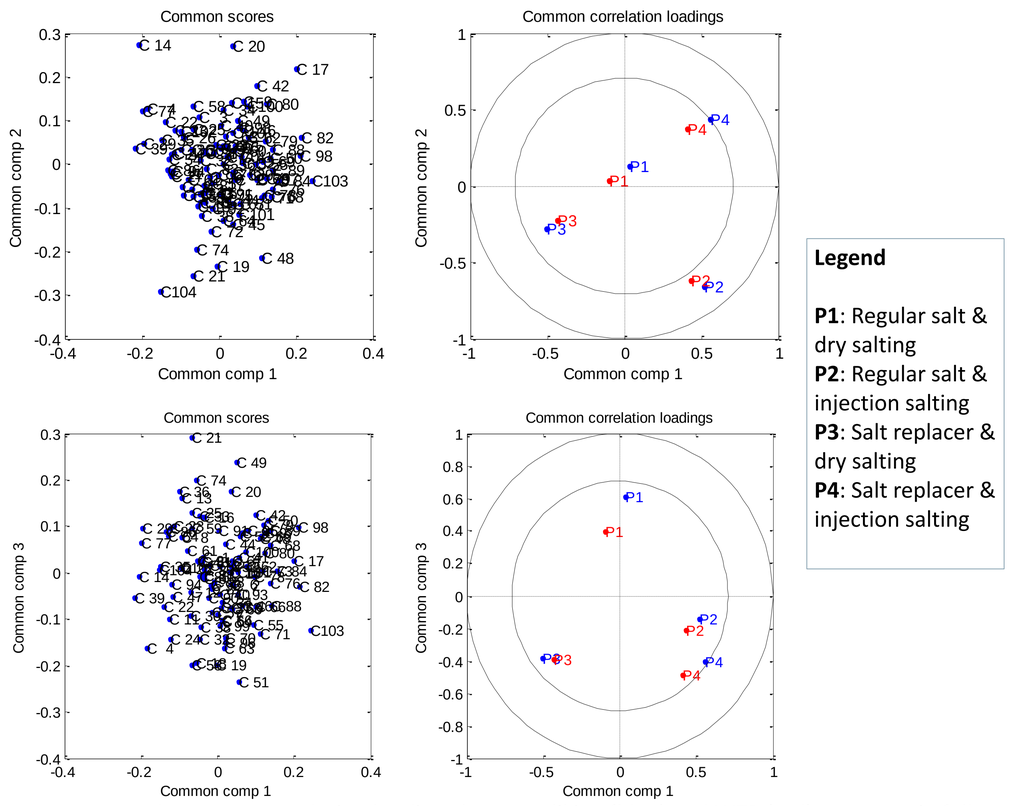

Figure 3. Common scores and common correlation loadings between liking (blue) and WTP (red) measures in full information condition. Common components 1-2 (top) and 1-3 (bottom).

Conclusions

- Consumers score products differently across testing conditions
- Liking and WTP scales share common information and range products similarly
- PO-PCA extracts, quantifies and interprets common and unique information between several data blocks