Designing a consumer liking study using prior sensory information:
Consumer segments and liking drivers from a study using a designed incomplete block design

UNIVERSITY of GUELPH

COMPUSENSE®

Ryan P. Browne[1]; Christopher J. Findlay[2]; Paul D. McNicholas[1];
John Castura[2*] (jcastura@compusense.com)
[1]University of Guelph, [2]Compusense Inc.

NSERC CRSNG

Ontario Centres of Excellence

A Sense of Inspiration
5th European Conference on Sensory and Consumer Research
Bern, Switzerland, 9-12 September 2012

Introduction

Practical considerations often prevent all consumers from evaluating all products in a consumer liking study. A balanced incomplete block design (BIBD) is often used because its desirable properties facilitate statistical analyses. Rather than a BIBD, we propose that prior sensory information be used to guide the experimental design of the consumer liking study. We call the resulting design a **Sensory Informed Incomplete Block Design** (SIIBD).
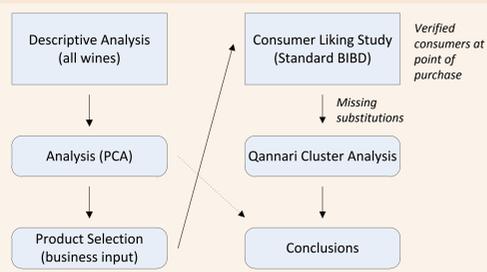
Sensory descriptive analysis provides information that informs the establishment of product subsets. The objective is to maximize sensory contrasts amongst products in the subset, with particular constraints. Products are connected by the underlying sensory properties. Subsets of products are established such that they are connected and estimable. No product will be allowed to be evaluated more than twice as often as any other product. The SIIBD contains nested designs, which can be used to determine the loss that occurs with the decreased subset sizes, and indicate the stability of the solution. Nesting provides a mechanism for determining the impact of decreased subset sizes on the analyses.

BIBD Approach (2008)[(1)]

[1] Findlay, C. J. (2008). Consumer Segmentation of BIB liking data of 12 Cabernet Sauvignon wines: a case study. 8th Sensometric Meeting. St. Catharines, Ontario, Canada. July 21-24.

SIIBD Approach (2012)[(2, 3)]

[2] Browne, R.P. & McNicholas, P.D. (2012). Design and analysis of incomplete block designs. 40th Annual Meeting of the Statistical Society of Canada. Guelph, Ontario, Canada. June 3-6.
[3] Browne, R.P., Findlay, C.J., McNicholas, P.D., Castura, J.C. (2012). Sensory Informed Incomplete Block Design. 11th Sensometric Meeting. Rennes, France. July 11-13.

BIBD Case Study – Chilean Red Wine (2007-2008)

Sensory descriptive analysis was conducted on a range of international commercial red wines selected by a group of Chilean wineries who wanted to identify Cabernet sauvignon styles for export. 12 wines were selected for testing. 614 verified Red wine consumers in Toronto-area LCBO outlets each tested 3 of 12 wines presented by balanced incomplete block design (BIBD). Cluster analysis identified 4 sensory-liking segments. Product sensory profiles provided interpretative context for winemakers to target new products.

Now novel refinements are made to the BIBD testing approach. Sensory descriptive analysis data are analyzed to construct a sensory space. Product sensory properties inform the development of a sensory informed incomplete block design (SIIBD) for consumer testing, rather than using a conventional BIBD. The SIIBD is composed of product subsets emphasizing sensory contrasts, and balancedness in the design kept within specified bounds.

SIIBD Case Study – Bread (2011-2012)

The SIIBD approach was evaluated on 12-present-6 study of commercially available Canadian white breads. Two smaller-sized SIIBDs are nested within the 12-present-6 SIIBD, to evaluate the efficiency and stability of the design. Consumer data was collected in fall 2011 (n=400). Unobserved responses were imputed using a novel maximum likelihood based method.[(3)] Model-based cluster analysis with one latent factor proposed a six-cluster solution.
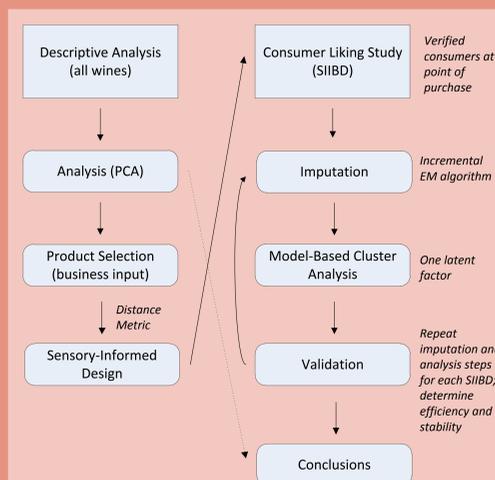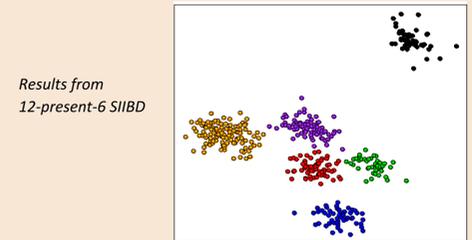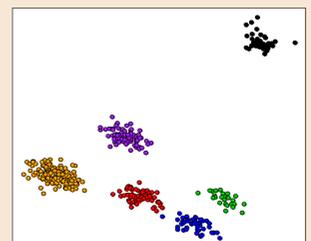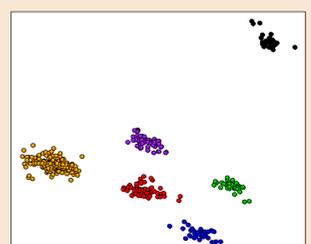

Results from 12-present-6 SIIBD

Results from nested 12-present-4 SIIBD are used to validate the solution

Results from nested 12-present-3 SIIBD are used to validate the solution

Conclusion

SIIBD provides an efficient approach for discovering and validating preference-based consumer clusters. The SIIBD strategy is readily adapted to a wide range of sensory testing contexts.