

A Comparison of Best Worst and Hedonic Scaling for the Measurement of Consumers' Wine Preferences

Simone Mueller^a, Leigh Francis^b, Larry Lockshin^a

^a Ehrenberg-Bass Institute for Marketing Science,
University of South Australia, Adelaide

^b Australian Wine Research Institute, Adelaide

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Objective

- **Marketing Research:**
 - Best-Worst Preference Scaling (BW) and choice methods have shown to have advantages over Scaling (Marley & Louviere 2005)
 - BW and other choice methods have less scale usage bias than HR (Cohen & Neira 2003)
- **Sensory consumer preference measurement**
 - Hedonic Rating (HR) most widely used instrument
 - There is no published empirical evidence how BW performs compared to HR
- Do hedonic rating and best-worst produce comparable results when measuring sensory preferences for wine?

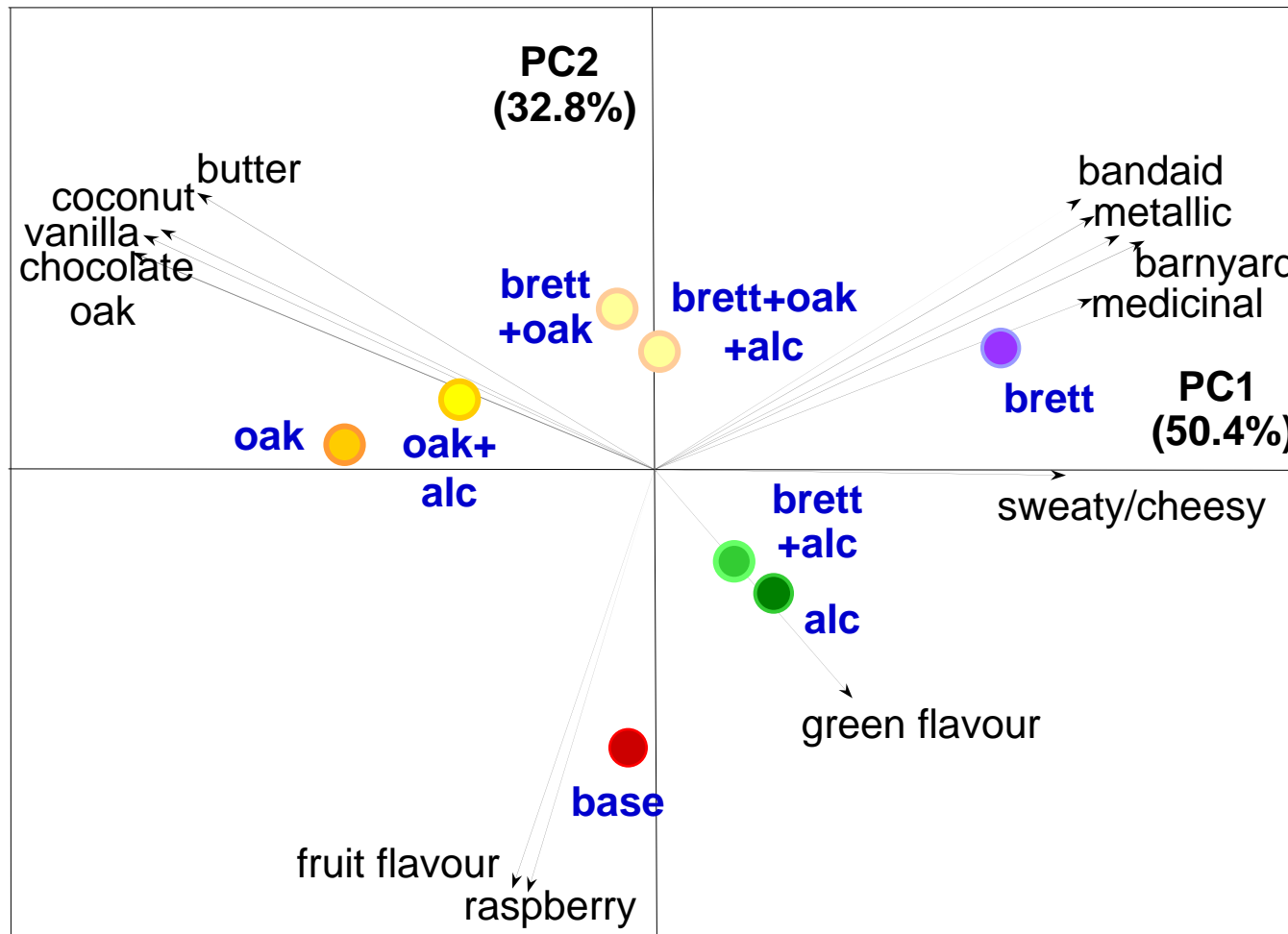
Wines used in Experiment

- 8 wines prepared from 2006 Cabernet Sauvignon fruity base wine with 14% Alc. by adding three components
 - Oak flavour (oak lactone, vanillin, guaiacol)
 - Brettanomyces (4EP/4EG 9:1)
 - Alcohol (+ 2% ethanol)

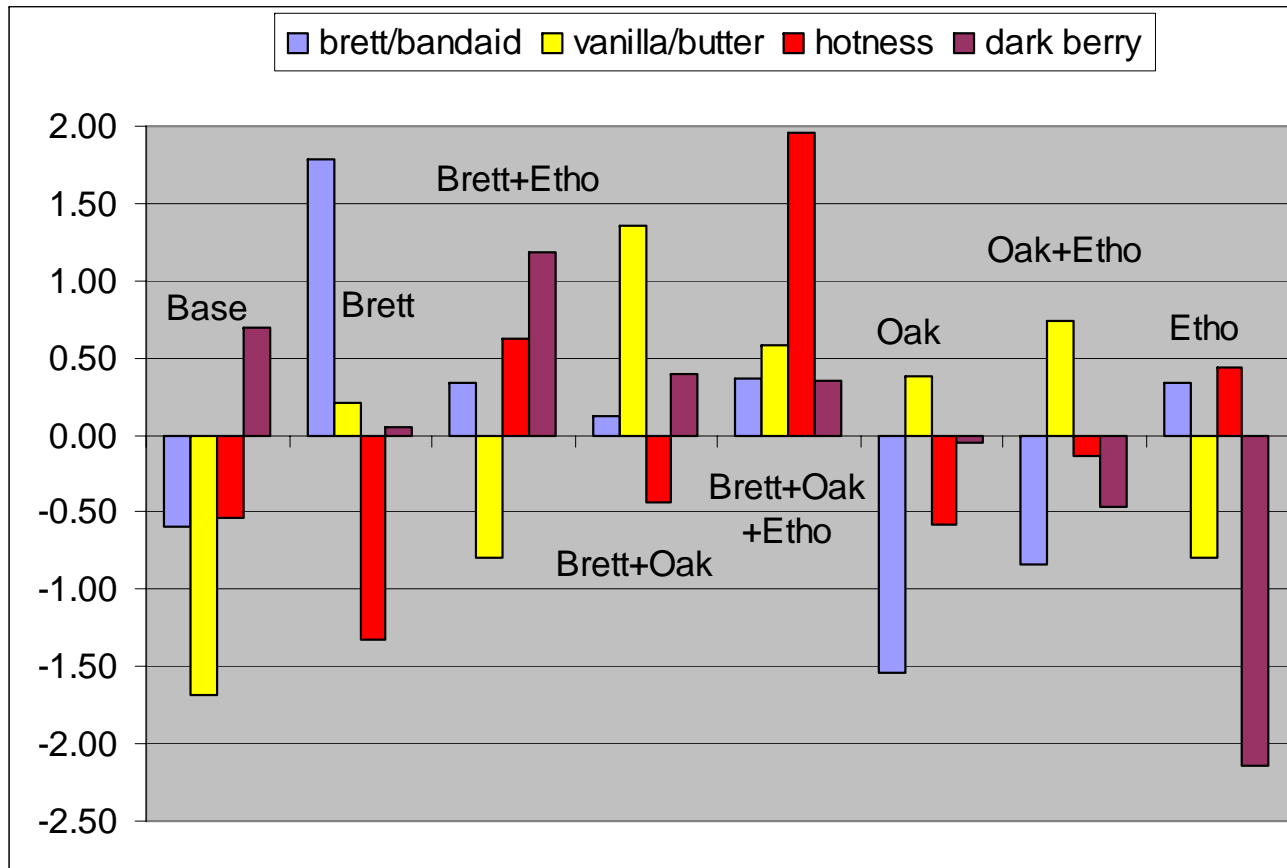
- Full factorial design

wine	Oak	Brett	Alc
1	low	low	low
2	low	high	low
3	low	high	high
4	high	high	low
5	high	high	high
6	high	low	low
7	high	low	high
8	low	low	high

Descriptive Analysis of the 8 Wines



Factor Loadings of the 8 Wines



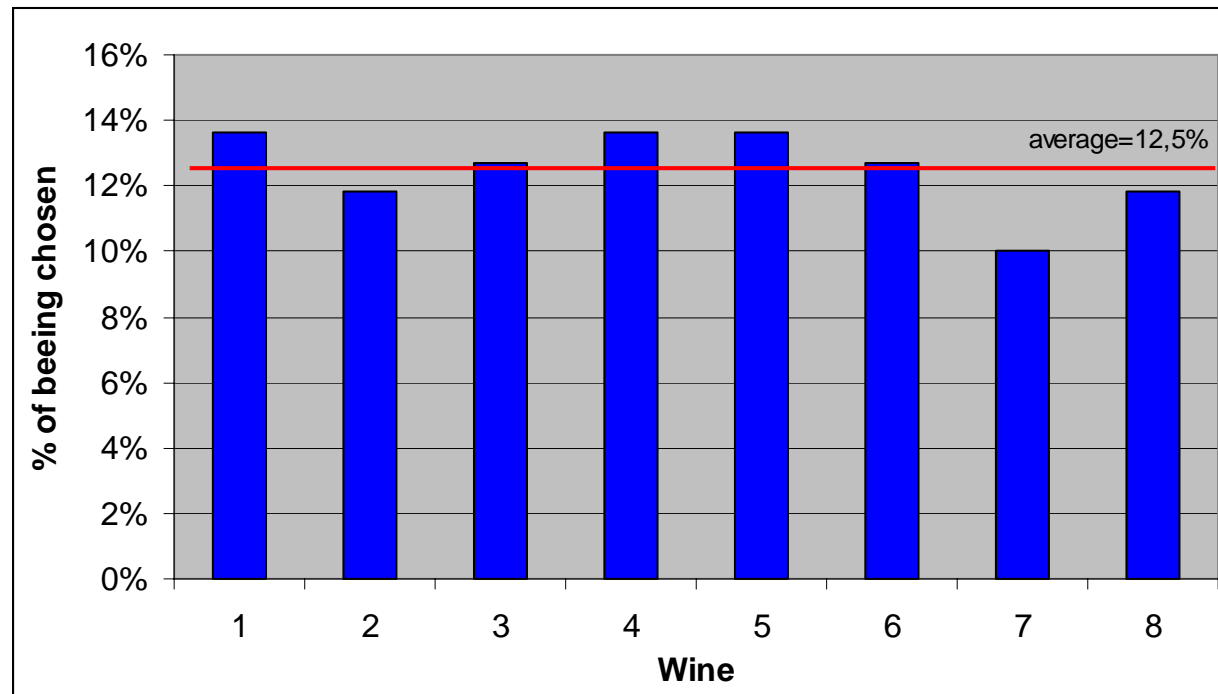
Analysis of Variance
Adj. $R^2=0.84$
$F(4,7)=10.03, p=0.04$

➔ 8 wines are sufficiently different in their sensory properties

Consumer Preference Measurement

- n=112 regular wine drinkers
- Tasted 8 wines in two different tasting sessions (split-half order)
- **A) Hedonic Rating** (9 point hedonic scale)
 - sequential monadic presentation
- **B) Best-Worst**
 - BIBD design of 14 choice tasks with choice set size of 4
 - Every respondent received only two design rows (capacity pretest)
 - Complete randomisation of design (MacFie et al. 1989)
 - Choice of Best and Worst for two sets of 4
- n=56 regular wine drinkers
- **C) Choice of Best only**

Results of Choice Experiment



- After n=56 realised very large sample would be required
- Almost equal distribution between all 8 wines

Aggregated Analysis HR and BW

HR (n=112)

Base
Brett + Oak
Brett + Oak + Alc
Oak + Alc
Alc.
Oak
Brett + Alc
Brett

Wine	Mean	Stdev
1	5.85	1.63
4	5.84	1.81
5	5.73	2.10
7	5.64	2.05
8	5.63	1.87
6	5.46	1.98
3	5.46	2.05
2	5.26	2.09

- Analysis of variance: $p=0.07$
- Mean comparison test: two sign. different groups of wines

Correlation of ranks of wines HR and BW: $r=0.14$ (n.s.)

BW (n=112)

Brett + Oak
Alc.
Oak
Brett
Base
Oak + Alc
Brett + Oak + Alc
Brett + Alc

Wine	Best	Worst	B-W	sqrt(B/W)	Stand.
4	32	23	9	1.18	100
8	33	24	9	1.17	99
6	31	27	4	1.07	91
2	29	27	2	1.04	88
1	24	23	1	1.02	87
7	28	32	-4	0.94	79
5	26	33	-7	0.89	75
3	21	32	-11	0.81	69

- General linear model n.s.
- Sensitivity analysis of statistical power: significance for 2-4 times as many data

Reasons for Differences

- 1) Different **amount of data** extracted by BW and HR
 - 8 data points for HR per respondent
 - 4 data points for BW (best and worst per choice task)
 - for n=112: HR sign. ($p=0.07$) vs. BW not sign.
 - more respondents necessary for BW to retrieve same data

- 2) Different **psychological processes**
 - BW: forced trade-off, comparison between sensory impressions which have to be remembered
 - HR: one by one evaluation
 - Limited ability to remember and compare sensory impressions (Issanchou & Sulmont-Rossé 2006)
 - more research necessary

Can HR and BW of the eight wines be explained by their sensory composition?

Linear Regression on aggregated level:

1) Hedonic Rating

$p=0.01$; $R^2=0.04$; out of eight only two sign. independent variables:

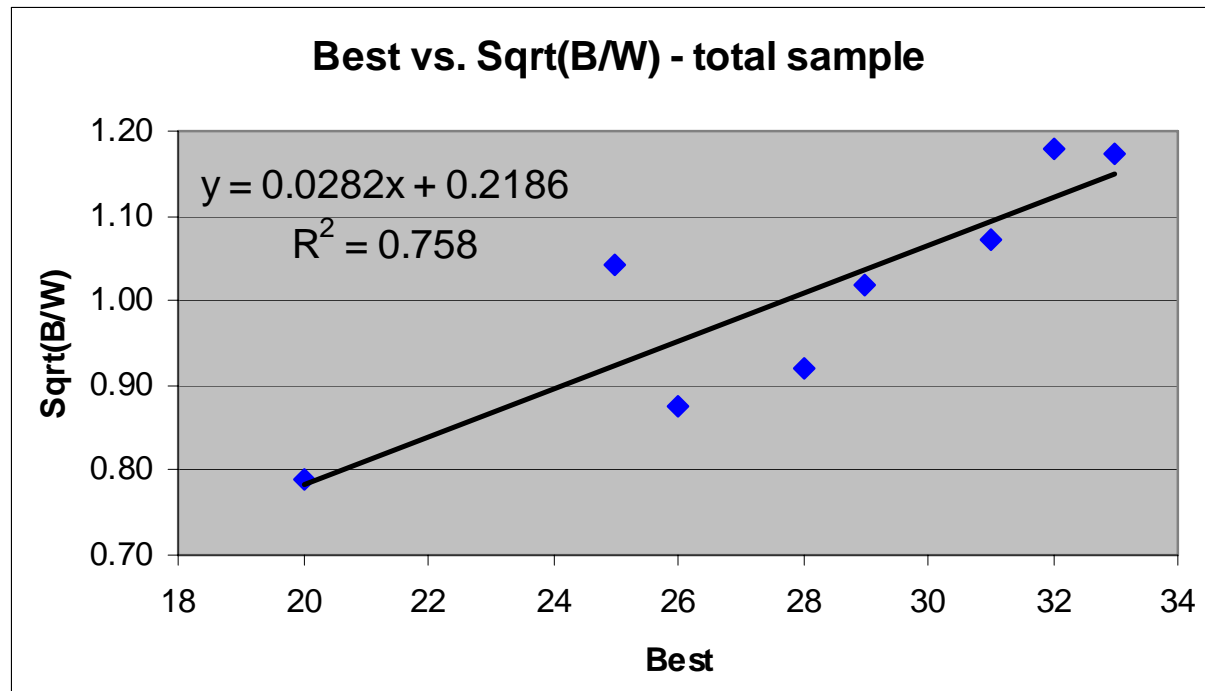
- interaction brett-oak ($p=0.01$)
- order of experiment: sign. lower HR if second experiment

2) Best-Worst

$p=0.55$; no sign. relationship between BW and sensory components

Poor aggregated explanation: caused by inter-individual heterogeneity?

Signal of Existing Heterogeneity



- Comparably weak relationship between Best and Sqrt(B/W) suggests high inter-individual heterogeneity (Bednarz 2006)

Latent Class Regression Analysis for HR

- Latent Class simultaneously determines cluster membership and sensory model (higher statistical efficiency) we used Latent GOLD®

	Class1		Class2	
overall R²	26%			
R²	3%		6%	
size	61%		39%	
	Beta	p	Beta	p
Brett	n.s.		-0.06	0.06
Oak	0.06	0.03	n.s.	
Brett-Alc	0.06	0.05	n.s.	
Brett-Oak	n.s.		0.09	0.02

- Modelling distinct clusters increases explanatory power and ability to find drivers of consumer liking/ disliking

Clustering for BW

- B-W no Latent Clustering possible (B-W has only 3 levels)
- K-means 2 cluster solution
- Higher R²
- No relationship for cluster membership
HR – BW
- Can BW better explain variance within clusters?
- More research necessary

	Class1		Class2	
R²	11%		11%	
size	50%		50%	
	Beta	p	Beta	p
Brett	-0.27	0.00	0.21	0.00
Alc	-0.08	0.08		
Oak	-0.12	0.01	0.12	0.01
bretalc	-0.09	0.06		
bretoak	-0.08	0.08	0.16	0.00
alcoak			-0.10	0.02
bretalcoak	-0.10	0.02	0.14	0.00

Summary

- We could not find same wine preferences measured by HR and BW for choice set size of 4 and 8 designed wines
- Best-Worst appears to
 - give different responses (also when considering inter-individual heterogeneity)and/or
 - more noise because of less available data points at a given sample size compared to HR

Implications for Future Research

Further tests of Best-Worst necessary

- If design has to be split up: choice set size of 3 wines seems preferable
 - results in ranking relationship and
 - provides more information per respondent
 - but limits possible BIBD designs
- Use of commercial and not designed wines
- Other products with less impact of alcohol, tannins and fatigue
- Larger sample size for Best-Worst experiment

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This presentation will be posted on: www.winepreferences.com