

Determining the Impact of Consumer Characteristics to Project Sensory Preferences in Commercial White Wines

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Abstract: The sensory preferences for white wines of three consumer groups selected for their differences in wine consumption habits and attitudes toward wines were investigated. A stepwise screening of the wines was used to ensure an objective selection based solely on perceived sensory characteristics while representing the commercial market. Sensory profiles of the selected wines were then determined by trained sensory descriptive panelists (n = 10). Consumers (n = 120) were recruited, assigned to one of three *a priori* groups, and evaluated 12 white wines. Internal preference mapping was conducted to explain consumer preference data with wine sensory descriptions and consumer characteristics. Results showed that sensory preferences were not significantly different among *a priori* consumer groups. Segmentation of individual liking scores revealed two distinct preference segments, with the largest one accounting for 77%. The majority of consumers preferred sweeter and fruitier wines as opposed to oaky and burning wines, independently of their *a priori* assigned group. Only a few demographics and attitudinal characteristics distinguished the two preference segments; however, they were not related to the initial *a priori* grouping. The primary dimension explaining consumer preferences for white wines confirmed previous research findings on other wine styles and obtained from various groups of consumers, suggesting that the main preference dimension common to many wine styles was driven by sweet and fruity sensory characteristics as opposed to dry, burning, and oaky attributes.

Key words: preference, sensory analysis, consumer segmentation, consumer behavior, white wine

Understanding consumer rationale for a particular purchase decision is critical for implementing successful marketing strategies. The case is especially challenging for hedonic products for which intrinsic properties (or product performance) and extrinsic attributes (or marketing elements) may influence, consciously or subconsciously, the purchaser. To target potential customers, two approaches have prevailed in the wine industry: (1) to conduct usage and attitude surveys leading to consumer segmentation and to deduce which product each segment may like based on past behavior and (2) to conduct actual taste tests, determine sensory preferences, and segment consumers based on the sensory attributes driving their preferences. It is generally accepted that particular wine styles will not appeal to each individual wine consumer, considering the biological, cultural, and genetic variability among individuals (Bisson et al. 2002, Simons and Noble 2003). Researchers and

wine professionals alike are therefore highly motivated to better understand and target consumer wine sensory preferences.

Intrinsic wine quality cues equate to their sensory attributes and are commonly described as “taste,” which is one of the factors most often listed by consumers as a determinant of their choice and wine consumption (Thompson and Vourvachis 1995, Jaeger et al. 2009). Consequently, sensory attributes are frequently used by the wine industry to communicate the type of wine quality consumers will likely experience when consuming the wine. The use of past behavior to predict likelihood of future behavior is part of traditional marketing research practice. The wine marketing literature has investigated the role of individual characteristics such as gender, generation, and lifestyle on consumer purchase and consumption preferences, considering indexes such as past volume consumption of a particular wine type or stated preferences by consumers through interviews or questionnaires. General trends have been reported mainly by American (Bruwer and Johnson 2010) and Australian (Bruwer et al. 2011) studies. For example, it was found that gender differences in wine consumption are likely to be associated more strongly with volume and perhaps wine style and grape variety (Bruwer et al. 2005, Bruwer 2007). Females were found to prefer lighter wine styles (Bruwer et al. 2012) and sweeter wines (Bruwer et al. 2011, Miller and Bruwer 2006). When the millennial generation entered the wine market, several studies implemented qualitative (e.g., focus groups) and quantitative research (e.g., surveys) to summarize what this generation was drinking and what they liked and disliked in order to deduce the wine sensory profile that was most appreciated (Thach and Olsen 2004, 2006). Millennials stated that they drank red wine before they tried other wine styles (Bruwer et al. 2012, Olsen

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et al. 2007) and preferred red wines in general, according to a 2007 Nielsen Company marketing report (Millennials and Beverage Alcohol Study). Another marketing tool is to study sales data over a period of time to predict the growth or decline of a particular wine category and thus determine the taste characteristics that appeal to consumers. The lack of tasting opportunities for consumers forces researchers to rely on stated, rather than behavioral, information and to deduce the sensory attributes to be used for communications or winemaking. These attributes are often generated by marketers or winemakers based on their own experience and have been shown to misrepresent the quality experienced by a less professional consumer (e.g., Solomon 1990). Moreover, the vocabulary used by consumers tends to be more general and could be misleading at times (Lesschaeve 2006).

Rather than relying on experts to predict consumer likes and dislikes, several studies have used sensory data and statistical tools to investigate the sensory attributes that drive consumer preferences for particular wine styles (Yegge and Noble 2001, Lesschaeve et al. 2002, Francis et al. 2005, Lund et al. 2009, Lattey et al. 2010). The main outcome is a preference map, which is used to interpret preferences with sensory attributes or to predict preferences from the sensory attributes. In the first instance, the intent is to fully characterize the sensory landscape defining consumer likes and dislikes. In the second instance, the main purpose is to develop a statistical tool to create new wine styles and check their likeability by submitting them only to sensory descriptive analysis and derive a position on the preference map, without the need to run a formal consumer test (MacFie 2007). These preference maps are based on blind evaluation, without any marketing information. These extrinsic cues, on the one hand, have been shown in the literature to impact overall product acceptability and wine particularly. Brand names (Lange et al. 2002), appellations of origin (Lange 2000) or regions of origin and price (e.g., D’Hauteville et al. 2007, Goldstein et al. 2008), or context of tasting (Mantonakis et al. 2009) were shown to generate cognitive dissonance between visual expectations and sensory perceptions and to alter the actual sensory experience of tasting a glass of wine. Knowledge of blind sensory preferences, on the other hand, enables the assessment of the appropriateness of the wine itself with the marketing attributes or product concept. Tasting wine first in a blind setting and then with packaging options is recommended to ensure that wine sensory properties match the marketing concept.

Based on these two approaches to determine wine sensory preferences, this study purports to determine whether characterizations of consumer stated usage and attitudes align with actual sensory preferences of commercially available white wines, using a case study conducted in response to an Ontario (Canada) grape and wine industry initiative.

Materials and Methods

The study was designed in three steps: (1) a wine screening process based on sensory characteristics, (2) descriptive analysis of the selected white wines, and (3) hedonic assessment by three groups of consumers *a priori* assigned based

on usage and attitudes. The industry participation and inputs were solicited at several occasions in the process to comply with the terms under which this project was conducted.

Tasting conditions. Wine evaluations were conducted in two different facilities where similar tasting parameters were implemented to ensure consistency and integrity of the sensory and hedonic data. The screening and descriptive analysis sessions were conducted in the sensory evaluation laboratory of the Vineland Research and Innovation Centre, which has 10 computerized independent booths. Descriptive panelists recorded their answers on a computer using EyeQuestion software (Logic 8, The Netherlands). The hedonic assessment were conducted in the sensory facility of a contracted service provider (ACCE International, Mississauga, Canada), which had 20 independent booths. The experimental design and questionnaires were provided to the service provider and they recruited the participants, distributed and coded the questionnaires, and administered the sessions.

Wine samples (30 mL) were poured in ISO wineglasses labeled with 3-digit codes and were covered with plastic lids. Samples were presented according to either a sequential monadic presentation or as a set (screening task) following a William’s Latin Square design (MacFie and Bratchell 1989). Serving temperature ranged from 14 to 16°C. Unsalted crackers and filtered water were provided for panelists and consumers to cleanse their palates between samples.

Screening and product selection. Three *Vitis vinifera* grape varieties (Riesling, Chardonnay, and Sauvignon blanc) were chosen after consultation with industry stakeholders as good representatives of the white wine market in Ontario. The price range selected, \$US 15 to 20 per bottle, represented the premium wine price segment in which VQA (Vintners Quality Alliance) stamped wines compete. (The VQA stamp indicates primarily that the wine is made of 100% Ontario grapes grown in a particular geographical region.) The experimental design applied to select the wines and to address the research objective was adapted from a procedure described previously (Lesschaeve et al. 2002). The first step was a systematic screening of candidate wines based solely on sensory characteristics and wine styles to select samples that would represent the sensory variability of Riesling, Chardonnay, and Sauvignon blanc wines available to Ontario consumers. After an extensive review, 91 wines were identified for meeting these criteria: 23 Rieslings, 34 Chardonnays, and 34 Sauvignon blancs.

Two bottles of each of the 91 wines were purchased commercially and screened for sensory similarities in respective wine styles. Nine experienced wine professionals (three enologists, two sommeliers, two wine writers, and two educators) were recruited from the local wine community and participated voluntarily in three 2-hr sessions scheduled two days apart. For each session, participants evaluated 30 to 34 wines from the same grape varietal. They were first asked to group 15 wines based on similar sensory characteristics. After a 5-min break, participants were asked to match each remaining wine to one of the groups they had created. Wine professionals were informed about the nature of the varietal wine to be evaluated within one session, the price range,

and the fact that all samples were commercially available in Ontario.

Sensory descriptive analysis. The trained sensory panel was comprised of 10 employees (part-time tasters) of Vineland Research and Innovation Centre. They attended 12 2-hr sessions to perform a descriptive analysis of the selected wines. In the first six sessions, panelists developed a list of 29 attributes describing the perceptions by smell and 39 attributes describing perceptions in mouth. All these attributes were defined by either a physical reference or a verbal definition as described previously (Lesschaeve et al. 2011). The next six sessions were dedicated to the measurement of these attributes in the wine samples and were performed in duplicate. For evaluating each sample, panelists were instructed to (1) remove the lid from the glass, (2) swirl the glass three times in a clockwise fashion, and (3) smell or taste the sample and evaluate the intensity of all the sensory properties they perceived on a 15-cm linear scale, anchored by weak on the left side and strong on the right side. Intensity measurements were converted into scores from 0 to 100.

Consumer hedonic assessment. One hundred and twenty consumers were recruited from the service provider database (ACCE International) and qualified respondents were assigned to one of three consumer groups determined by the Ontario wine industry, corresponding to their current marketing targets. Group A was labeled “VQA wine drinkers” ($n = 41$): 35–64 years of age, 60/40 male/female split; must drink a minimum of 20% VQA Ontario wine in the past 6 months; household annual \$US 75K+; 52% are wine influencers: they agree to the statement that they are frequently asked for opinions and recommendations on wine. Group B was labeled “imported wine drinkers” ($n = 39$): 35–49 years of age, 65/35 male/female split; must drink a minimum of 3% VQA Ontario wine, $\geq 85\%$ must be imported wines (not from Canada); household annual income \$US 50K–75K; 44% are wine influencers. Group C was labeled “millennials” ($n = 40$): 19–34 years of age, 50/50 male/female split.

To qualify, all respondents had to drink a minimum of one glass of dry white wine at least twice a month, had to sign an informed consent document before taking part in the project, and have a designated driver, take public transit, or take a taxi. Respondents had to declare that no allergies or medical conditions could prevent them to taste wines. Some candidates were excluded for sensitive employment. Selected participants had to show photo identification as proof of legal drinking age (19 years and older in Ontario) when registering upon arrival at the tasting facility.

Consumers tested a total of 12 wines over two 90-min sessions, six wines per session, and rated their overall liking on a 9-point hedonic scale. A 5-min break was imposed between each wine sample. Respondents completed two self-administered questionnaires, one at the end of each session. Additional characteristics were extracted from these questionnaires for subsequent analysis and interpretation of preference patterns. Wine involvement was measured using a previously determined scale (Lockshin et al. 1997), and a wine involvement index was derived from consumer responses to 12 questions.

Self-declared wine knowledge was rated on a 4-point scale: (1) know a little about wine; (2) somewhat knowledgeable; (3) very knowledgeable; (4) expert or professional knowledge. Finally, purchase and consumption habits were recorded.

Data analysis. Data analysis was performed using SPSS (ver. 16.0; SPSS Inc., Chicago, IL) and XLStat 2007.1 (Addinsoft, Paris) statistical software. For sorting and matching data from the wine screening, a similarity matrix was drawn from the occurrence of two products placed in a same group by one participant. An aggregated matrix was compiled from all the individual matrices, transformed in a dissimilarity matrix, and submitted to multidimensional scaling (MDS) (Schiffman et al. 1981). To facilitate the interpretation of the product grouping, a hierarchical cluster analysis (Pearson correlation coefficient; unweighted pair-group average) was conducted on product coordinates on the dimensions representing the best MDS solution.

For the sensory descriptive data, a two-way ANOVA mixed model (wine, panelist, wine \times panelist) was performed to determine which sensory attributes wines were perceived as different ($p \leq 0.05$). Panelist and panel performance were evaluated in terms of discrimination, repeatability, and agreement (Sulmont et al. 1999). Stepwise discriminant analysis was performed to select only discriminant and noncorrelated attributes ($p \leq 0.10$) for the internal preference map interpretation. The resulting product representation was also used to select wines to be assessed by consumers.

For the hedonic data, a three-way ANOVA with a nested effect (wine, group, consumer (Group)) was performed to determine if wines were liked differently by the *a priori* consumer groups. Consumer preferences were further evaluated by performing internal preference mapping, which was preferred over external methods considering the main goal was to understand consumer preferences for white wines and not to predict preferences. A principal component analysis (PCA) was therefore performed on a table comprised of products in rows and consumers in columns. Significant sensory attributes were correlated with the principal components to enable interpretation of the preference dimensions. Hierarchical cluster analysis (Pearson correlation coefficient; unweighted pair-group average) was conducted on the same table to determine the existence of consumer segments with different liking patterns.

For the wine involvement index, a factorial analysis with oblique rotation was conducted to check the dimensionality of the involvement scale proposed by Lockshin et al. (1997). Five items correlated with wine involvement (results not shown). An index was calculated by summing up the five item scores rated on a 7-point Likert scale; the maximum attainable value was 35.

Results and Discussion

Wine screening and sensory characterization. The selection of wines for consumer hedonic assessment was designed to ensure the final wine selection included perceptibly different wines while representing the sensory variability available to consumers on the Ontario market. The sorting/matching task first enabled the selection of different wine

styles. Second, the sensory descriptive data were analyzed to retain the most different wines for consumer assessment.

Data of each varietal wine collected from the sorting/matching task were analyzed with multidimensional analysis; the solutions fitted five or six dimensions, which enabled the clustering of varietal wines based on their sensory similarities. Wines were selected to best represent the clusters with an additional criterion that the wines were available in large quantities for sensory analysis. A selection of 18 wines was used for the sensory descriptive analysis by the trained sensory descriptive panel (Table 1).

Twenty aroma attributes and 27 flavor attributes were significantly different ($p \leq 0.05$) among the 18 wines. Panelist performances in terms of discrimination ability, repeatability, and agreement were assessed using univariate parameters from the two-way ANOVA and were deemed satisfactory. The stepwise discriminant analysis was used to further select 12 aroma and 16 flavor attributes that differentiated the wines significantly ($p \leq 0.10$) and were not correlated or weakly correlated. Aroma attributes included petroleum, oak, canned/tin peas, caramel/butterscotch, lychee, canned green beans/cooked asparagus, grapefruit, rose, melon, butter, orange blossom, and black pepper. Flavor attributes included sweet, oak, green apple, pineapple, lychee, petroleum, smooth/viscous, burnt match, vanilla, canned green beans, pear, dry/astringent, apricot, butterscotch, effervescent, burning/biting, fresh green bell pepper. Working with a smaller set of attributes was preferred to retaining all 47 significant attributes, primarily to obtain a clearer preference map. If the goal of the preference map was to guide new wine development, then retaining all the significant attributes would have brought a richer description of consumer sensory preference to guide the desired sensory profile for the end product. However, that was not the purpose of this study.

Table 1 Description of the *Vitis vinifera* wines selected for the sensory evaluation. All wines were used for the descriptive analysis; indicated wines were used for the consumer analysis.

Varietal	Origin	Vintage
Chardonnay 1 ^a	Australia	2007
Chardonnay 2	Ontario	2007
Chardonnay 3 ^a	USA	2007
Chardonnay 4	Ontario	2007
Chardonnay 5 ^a	Australia	2006
Chardonnay 6 ^a	Ontario	2006
Riesling 1 ^a	Ontario	2008
Riesling 2	Ontario	2008
Riesling 3 ^a	Germany	2007
Riesling 4 ^a	Ontario	2006
Riesling 5 ^a	Ontario	2008
Riesling 6 ^a	France	2007
Sauvignon blanc 1	New Zealand	2008
Sauvignon blanc 2 ^a	Ontario	2007
Sauvignon blanc 3	New Zealand	2008
Sauvignon blanc 4 ^a	New Zealand	2008
Sauvignon blanc 5	Ontario	2006
Sauvignon blanc 6 ^a	South Africa	2008

^aWine also used for consumer analysis.

Wine preferences. To reduce the test costs, only 12 of the 18 wines were evaluated by consumers. Selection of the 12 wines was based on the results of the ANOVA described above and of a stepwise discriminant analysis (data not shown). Consumers evaluated the 12 wines and rated their liking thereof on the 9-point hedonic scale. The three-way ANOVA with nested effect conducted on the individual liking scores indicated that wines were liked differently by consumers ($F_{11,1439} = 22.60$; $p < 0.0001$) and among consumer *a priori* groups ($F_{2,1439} = 6.58$; $p < 0.001$). Although the interaction wine x group was significant ($F_{22,1439} = 1.72$; $p = 0.02$), indicating that liking scores from consumer *a priori* groups were dependent on the wines presented, the multiple comparisons of the interaction means (Tukey HSD, $p < 0.05$) showed that the liking differences only occurred for one wine (Riesling 5).

Sensory attributes driving consumer preferences. Individual liking scores were subjected to an internal preference mapping where the descriptive attributes were projected based on their correlations with the first two preference dimensions. These two dimensions represented 48% of the initial variance and show wine positioning based on consumer preferences (Figure 1A) and the circle of correlation between each individual consumer (Figure 1B) and the preference dimensions. The first preference dimension separated Riesling 1, Riesling 3, and Riesling 5 on the right and Chardonnay 5 on the left. The second dimension separated Sauvignon blanc 4 from Chardonnay 6 (Figure 1A). In the correlation circle (Figure 1B), most consumer preferences were directed on the positive side of dimension 1, thus signaling a preference for Riesling 1, Riesling 3, and Riesling 5. The same dimension correlated with the following attributes: sweetness, pineapple, apricot, and pear flavors. The negative side correlated with burning mouthfeel, vanilla, oak aroma, and oak flavor; these attributes are mainly correlated with Chardonnay 5. The cluster analysis revealed two preference clusters of unequal sizes: cluster 1 ($n = 92$) and cluster 2 ($n = 28$), representing 77% and 23% of the total consumer panel, respectively.

A three-way ANOVA with nested effect showed that the interaction wine x cluster was significant ($F_{(11,1439)} = 20.05$, $p < 0.0001$), indicating that wine liking scores were dependent on the preference cluster. The multiple comparison of the interaction means revealed significance in the case of Riesling 3, Riesling 5, Chardonnay 6, and Chardonnay 5 (Tukey HSD, $p \leq 0.05$). The direction of liking of these two clusters is shown (Figure 1B). The majority of consumer preference directions (cluster 1) was correlated with dimension 1, suggesting that 77% of consumers preferred wines with tropical fruit and tree fruit flavors and some sweetness. The second preference dimension was negatively correlated with black pepper, lychee, and grapefruit aromas describing Sauvignon blanc 4, and positively correlated to a lesser extent with caramel aroma and butterscotch associated with Chardonnay 6. Cluster 2 preference direction points toward the negative side of dimension 1 and positive side of dimension 2, suggesting that 23% of consumers did not like the sweet and fruity style wines as much, but rather liked less sweet wines, with caramel and butterscotch flavors and some petroleum notes.

Not represented here, dimension 3 (9.23%) was positively correlated with green notes and burnt matches, describing Sauvignon blanc 6. Dimension 4 (8.10%) was positively correlated with Riesling 3 and Riesling 4, described by petroleum and pear flavors, and negatively correlated with orange blossom flavor, associated with Riesling 6.

Although the present study was conducted using a specific geographical region in Canada, the results concur with other studies conducted internationally. The latent preference dimension for fruity and sweet attributes as opposed to oak attributes and alcoholic perceptions has been reported repeatedly in the wine literature. It has been identified on Chardonnay wines with American consumers (Yegge and Noble 2001, Lesschaeve et al. 2002), on Sauvignon blanc with New Zea-

landers (Lund et al. 2009), and on Riesling and Chardonnay with Australians (Francis et al. 2005). Even for red wines, an independent study found that the majority of Chinese wine consumers preferred fruity and sweeter red wines with less intense oak flavors (Osidacz and Francis 2009). Latent preference dimensions therefore exist in the wine domain and seem driven by familiar/safe sensory attributes (sweet, fruity, smooth) as opposed to unfamiliar attributes (oak), unsafe attributes innately associated with unpalatable substances (bitter, astringency) (Rozin and Vollmecke 1986).

Characterization of the two preference clusters. The distribution of the three *a priori* group members within each preference cluster is reported (Table 2). Although Group A seems more represented in preference cluster 2 and Group C more represented in preference cluster 1, these differences were not statistically significant (chi-square, $p > 0.05$).

This result challenges common practices in wine marketing research. For example, lifestyle-based segmentations are frequently used in the wine industry to segment wine consumers and better characterize them for targeted marketing strategies (Bruwer et al. 2002). Our findings, along with other wine preference mapping studies, suggest that consumer self-declared behaviors are not related to sensory preferences assessed in a framework such as described here.

Other characteristics than the ones used in the qualification criteria were collected from participating consumers. Differences between the two preference clusters on these individual characteristics were investigated to characterize further the consumers belonging to the two clusters. T-tests and chi-square tests were conducted for continuous and categorical variables, respectively ($p < 0.10$) (Table 3). Cluster 1 counted more consumers from the millennial generation than cluster 2, which included more baby boomers in its constituency. The consumers in cluster 2 were less educated but tended to have higher household income. In terms of wine usage and purchase habits, consumers in cluster 2 drank more red wines than those in cluster 1, who drank more rosé wines and tended to drink more icewine. Consumers participating in this study were screened to be white wine drinkers, which may explain why no differences were observed in the share of white consumption between the two preference clusters. Consumers in cluster 1 tended to state they knew little about wine; however, they were eager to learn since they attended more wine appreciation classes. Consumers in cluster 2 tended to state they were very knowledgeable and that they belonged to a wine club. Although there was no difference in frequency of overall wine consumption between the two preference clusters, the occasion of wine consumption drew different behaviors.

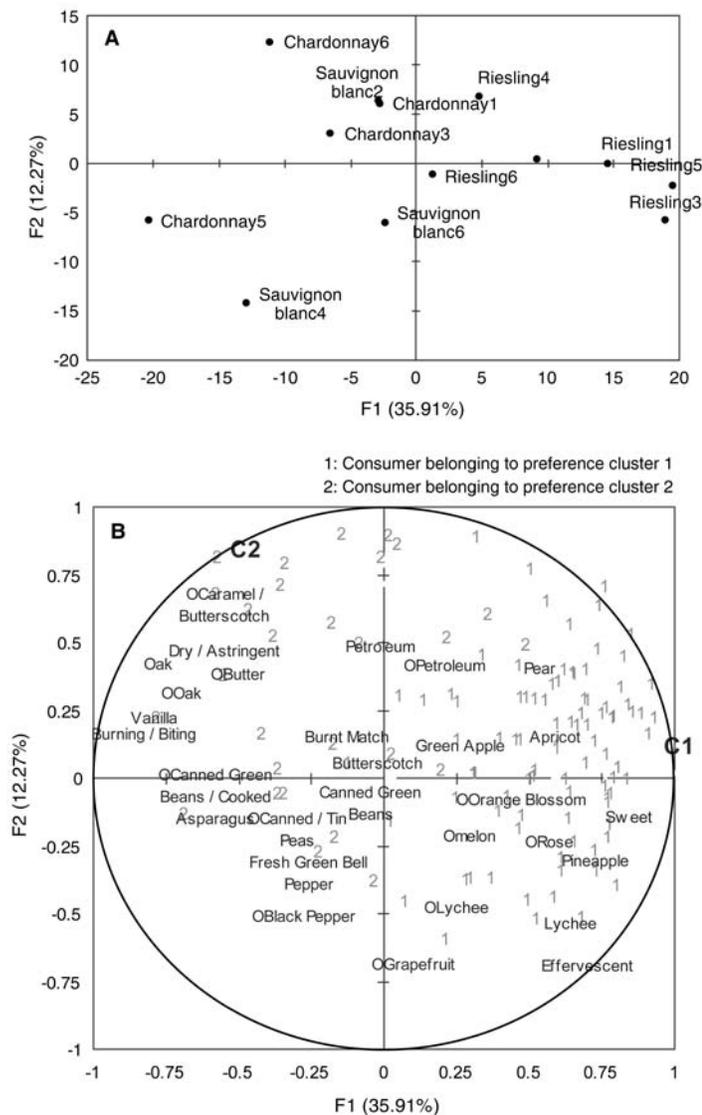


Figure 1 Representation of the first two preference dimensions for the 12 selected wines by 120 consumers: correlations of the wine scores (A) and of the individual consumer liking scores (B) with the preference dimensions. Dots (•) represent individual consumers from cluster 1 (coded 1) and cluster 2 (coded 2). Vectors point toward the sensory attributes projected on the preference dimensions. C1: vector pointing toward the liking direction of cluster 1. C2: vector pointing toward the liking direction of cluster 2.

Table 2 Percent *a priori* consumer group memberships within the two preference cluster and the total consumer sample.

Proportion in:	Cluster 1 (n = 92)	Cluster 2 (n = 28)	Total sample (n = 120)
Total sample	77 %	23%	100%
Group A	32%	43%	34%
Group B	30%	39%	32%
Group C	38%	18%	33%

Table 3 Demographic and attitudinal data between clusters for the consumer analysis of 12 *Vitis vinifera* white wines.

	Cluster 1 ^a (%)	Cluster 2 ^a (%)	Probability ^b (p)
Generation			
19–34 (millennial)	36.67	17.86	0.03
35–45 (generation X)	32.22	28.57	
46–60 (baby boomer)	25.56	53.57	
61+ (senior)	5.56	0.00	
Education (degree)			
High school/post-secondary	41.11	53.57	0.04
Undergraduate	52.22	28.57	
Graduate	6.67	17.86	
Household income			
<\$50,000	13.04	7.14	0.09
\$50,001–\$100,000	58.70	42.86	
>\$100,001+	27.17	50.00	
n/a	1.09	0.00	
Normal consumption of wine over last 12 mo			
White	40.60	36.07	ns
Red	31.93	45.71	0.02
Sparkling	7.72	5.00	ns
Rosé	6.75	3.54	0.05
Icewine	4.90	2.39	0.09
Fortified (sherry, port, etc.)	4.84	4.00	ns
Purchases of wine over the last 12 mo in outlet categories			
Liquor retail store	70.78	73.50	ns
Independent wine store in supermarket	11.01	7.82	ns
Restaurants	11.00	7.04	0.09
Bars or pubs	4.32	5.14	ns
Tasting rooms at wineries	1.97	1.14	ns
Independent specialty liquor store	0.65	0.71	ns
Mail-order/wine club	0.60	0.71	ns
Internet direct	0.33	0.36	ns
How frequently do you drink wine as a relaxing drink at the end of the day at home?			
Less than once per month	8.70	7.14	0.01
1–3 times per month	30.43	28.57	
About once per week	27.17	28.57	
2–5 times per week	29.35	14.29	
Every day/most days	1.09	17.86	
Do not drink wine on this type of occasion	3.26	3.57	
How frequently do you drink wine with an informal meal at home?			
Less than once per month	11.96	3.57	0.07
1–3 times per month	31.52	21.43	
About once per week	28.26	32.14	
2–5 times per week	25.00	25.00	
Every day/most days	3.26	14.29	
Do not drink wine on this type of occasion	0.00	3.57	
Wine involvement index			
Low	21	21	ns
Medium	50	32	
High	29	47	

^aNumbers in each cluster cell are percentage of consumers observed per answer category.

^bns: difference between clusters is not significant.

Consumers in cluster 1 tended to drink wine in a restaurant more often than those in cluster 2. These results suggest that wine consumption tended to be more formal for cluster 1 consumers and is confirmed by the fact that consumers in cluster 2 more often drank wine as a relaxing drink at the end of the day, as well as with an informal meal. Findings also suggest that consumers in cluster 2 included more consumers highly involved in wine, that is, they had more knowledge of and interest in the product. Product involvement has been found to influence consumer purchase behavior and use of extrinsic cues to select a bottle of wine (Lesschaeve and Bruwer 2010); however, the role of involvement in sensory preference has not been previously noted and our findings concur, considering that no significant difference between the two preference clusters was found on the wine involvement index (Table 3).

Limitations of the methodology. The methodology used in the study (preference mapping) does have some limitations, which should be noted. First, the volume per sample was not representative of the usual serving for consumers. Rather, the small volume does allow for assessing more samples per session and corresponds to the volume typically poured at winery tasting rooms or wine bars for consumers to assess whether they like the wine proposed and to trigger a purchase decision. Second, the liking scores are recorded once and are assumed to be consistent over time and repeated exposures. Initial hedonic impressions have been found to be poor predictors of final liking and choice of food products (Köster 2003), typically for 50% of participants and especially for less complex products than wine, which tend to cause boredom and decreased liking after repeated exposures. The fact that similar latent wine preference dimensions were found in other wine studies, with different wine styles, different consumers, and at different dates gives confidence to our findings, however. Third, sensory preferences are determined without any marketing information, and thus the relevance of performing blind tastings to assess sensory preferences is open to question. However, in the presence of extrinsic cues, preferences for red wines by Australian consumers were driven by a similar latent dimension: a preference for fresh fruit aromas and sweet taste (Mueller et al. 2010). These sensory drivers were important for repurchase intent.

Conclusions

The main objective of this study was to compare two approaches used in the wine industry to determine consumer sensory preferences, one considering consumer characteristics, usage, and attitudes versus one examining sensory preferences with the consumer actually tasting wines. Contrary to what is firmly believed in the marketing field, our findings showed no strong correlation among demographics, stated consumption or stated wine preference, and actual sensory preferences for commercial white wines. In addition, these findings bring new evidence for the existence of general latent dimensions for wine sensory preference. The first preference dimension for commercial white wines was driven by fruity aromas and sweetness as opposed to alcoholic perceptions and oak aromas, which was also found in previous white and red

wine preference studies and with consumers from different countries. While extrinsic cues such as packaging and price do moderate the overall sensory experience of wine consumption, sensory drivers should not be neglected, as they play a role in repurchase intent. The second contribution of this study is the description of the wine selection protocol to be included in the sensory preference methodology. The stepwise process is novel and robust in that it combines several nonverbal and verbal sensory techniques and statistical analyses to ensure an objective selection of the wine candidates and the integrity of the sensory data collected.

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