TERROIR IN TASTING: A SENSORY APPROACH FOR MARKETING FINE AUSTRALIAN WINES OF PROVENANCE AS MEMORABLE EXPERIENCES

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Abstract

Aims: Establishing an image of fine wine through the Geographical Indication (GI) system is of interest to the Australian wine sector. Beyond provenance, the sensory experience of fine wine is often linked to consumption with appropriate foods. For this purpose, studies were undertaken to understand consumer perceptions of what constitutes a fine wine, which sensory and chemical factors may define fine Australian Chardonnay and Shiraz wines from various regions, the sensory attributes driving appropriate food and wine pairings, and how these relate to consumer perceptions of provenance, the overall consumer experience and memorability.

Methods and Results: An online survey was conducted with Australian wine consumers (n = 349) to generate a consumer driven definition of fine Australian wine (FAW) based on sensory attributes, grape variety, wine region, label information, and food pairing, and to assess how that definition differs as a function of consumer wine involvement. Overall, consumers valued provenance, and highly involved wine Enthusiasts appeared to utilise more information and had broader sensory vocabularies than Aspirant and No Frills consumers. Exploring the regional typicality of commercially available FAW, Chardonnay wines (2015 vintage) from Margaret River (n = 16) and Yarra Valley (n = 16); and Shiraz wines (2014 vintage) from Barossa Valley (n = 16) and McLaren Vale (n = 15), were selected for descriptive sensory analysis and underwent profiling of volatiles by gas chromatography-mass spectrometry. For both grape varieties, there was large variability in wine styles within the same GI, meaning winemaking intervention is important for regional/sub-regional typicality, which therefore cannot be determined solely on geographic origin of the fruit. Nonetheless, a combination of sensory markers and volatile profiles allowed the building of regional typicality models, although consumers may not perceive subtle sub-regional differences in sensory attributes. The food and wine pairing-related gastronomic experiences were explored under blind and informed (wine provenance) conditions. Based on descriptive analyses, specific food and wine pairings (n = 8) were selected for consumer tastings (n = 151), which explored the pre-consumption, core-consumption, and post-consumption experiences in relation to the sensory profiles of the pairings. During core-consumption, information level significantly impacted ratings for sensory complexity and a range of emotions. Appropriate pairings corresponded with increased liking, sensory complexity, and expected prices for wine, and evoked emotions of positive valence. In the post-consumption experience, information level affected the vividness of the tasting, whereas the most appropriate pairings commanded significant vividness, remembered liking, memorability, and loyalty ratings.

Conclusion: Although regional typicality can be modelled using volatile composition and sensory attributes, consumers may not perceive these differences in tasting. The results from this study of sensory profiles and preferred food pairings for FAW from several regions can help the wine production, marketing and hospitality sectors tailor their services and communications to incorporate fine wines in their region-specific marketing. Consequently, appropriate food and wine pairings may be an important marketing strategy to develop and promote provenance and positive gastronomic experiences, and using a Wine:Food strategy, rather than wine alone, could provide wine businesses with higher customer satisfaction and spending.

Keywords: Wine attributes, sensory memory, food pairing, emotion measurement, wine marketing, wine business

Introduction

Wine has been consumed for centuries in Old World wine producing nations of Europe, where its unique characteristics and quality continue to be defined by Geographical Indications (GIs). In turn, consumers learnt to rely on GIs for quality and are willing to pay premium for wines coming from certain regions (Casini *et al.,* 2009; Charters and Pettigrew, 2008; Johnson and Bruwer, 2007). In a similar fashion, Australia implemented a GI system to promote a link between fine wine and its provenance. However, if this is to be successful, it is necessary to first understand consumer perceptions of what constitutes a fine wine.

Furthering GIs, there has been an increasing research interest in intra-regional wine characteristics with the intention to demark smaller sub-regions within established regions (Bekkers, 2012; Robinson and Sandercock, 2014; Werner and Roche, 2016). Most studies used standardised wines made for research purposes, which are typically young, mostly unoaked, and that do not necessarily reflect the wines and styles consumers find in the market. Therefore, the question remains whether consumers can benefit from the research outcomes.

Besides regionality, appropriately paired foods also are associated with the sensory experience of fine wine (Kustos *et al.,* 2019; Pettigrew and Charters, 2006), and could be an innovative and profitable strategy to meet consumers' demands (Kustos *et al.,* 2020b; Wansink *et al.,* 2006). Contrarily, the relationship between food and fine Australian wines of provenance (FAW) and how food-wine matching affect the overall consumer experience and memorability have been rarely studied.

For this purpose, studies were undertaken to understand consumer perceptions of what constitutes a fine wine, which sensory and chemical factors may define fine Australian Chardonnay and Shiraz wines from various regions, the sensory attributes driving appropriate food and wine pairings, and how these relate to consumer perceptions of provenance, the overall consumer experience, and memorability.

Materials and Methods

Study 1

An online survey was conducted with Australian wine consumers (n = 349) to define fine Australian wine (FAW) based on sensory attributes, grape variety, wine region, label information, and food pairing, and to assess how that definition differs as a function of consumer wine involvement (Kustos *et al.,* 2019). The Fine Wine Instrument (FWI) (Johnson and Bastian, 2015) identified three consumer segments, No Frills (NF), Aspirants (ASP), and Enthusiasts (ENT). Participants who consumed wine at least once a week, had consumed Chardonnay and Shiraz wines in the last six months, and on average ate out at restaurants once a month, were recruited for the survey via Qualtrics (Qualtrics, LLC, Seattle, USA). The survey data was also collected using Qualtrics.

Study 2

This study aimed to explore the regional typicality of commercially available FAW, Chardonnay wines (2015 vintage) from Margaret River (n = 16) and Yarra Valley (n = 16); and Shiraz wines (2014 vintage) from Barossa Valley (n = 16) and McLaren Vale (n = 15), were selected for descriptive sensory analysis and underwent profiling of volatiles by gas chromatography-mass spectrometry (Kustos et al., 2020a). The Margaret River wines were sourced from Wilyabrup (MRW, n = 6), Wallcliffe (MRA, n = 5), and blends from across the region (MRR, n = 5) as a control group. Yarra Valley was represented by Dixons Creek (YVD, n = 5), Gladysdale (YVG, n = 5) and regional blends (YVR, n = 6). Barossa Valley Shiraz were sourced from the Northern Grounds (BVN, n = 9) and Southern Grounds (BVS, n = 7), and McLaren Vale wines from the Blewitt Springs (MVB, n = 8) and Willunga (MVW, n = 7) districts. Ten sensory assessors (three males and seven females, aged between 22 and 34 years) with previous descriptive analysis experience were recruited from a trained external sensory panel. Headspace-solid phase micro-extraction-gas chromatography-mass spectrometry (HS-SPME-GC–MS) analysis of wines was carried out on duplicate bottles of wine following the protocol used by Gambetta, Cozzolino, Bastian, and Jeffery (2016). The wine composition measurements included pH and titratable acidity (BRX-242 Erma Inc. Tokyo, Japan and Autotitrator Crison Instruments Barcelona, Spain), percent alcohol by volume (% ABV) (Alcolyzer Wine ME + DMA 4500 M (Anton Paar GmbH, Austria)), residual sugar (glucose + fructose) by an enzymatic test kit (Megazyme, Wicklow, Ireland), and phenolic parameters for the Shiraz wines using the MCP tannin assay and modified Somers assay (Mercurio *et al.,* 2007).

Study 3

The food and wine pairing-related gastronomic experiences were explored under blind and informed (wine provenance) conditions (Kustos *et al.,* unpublished). Based on descriptive analyses, four foods (spicy salami, cheesy pasta, braised beef with potato puree, chocolate mousse) and two Shiraz wines (McLaren Vale = MV; Canberra District = CBR) pairings were selected for consumer tastings (n = 151) that represented a normal consumption experience for consumers: savoury snack, starter, main, and dessert. It was hypothesised that providing wine provenance information pre-consumption would positively influence the consumers' core-consumption experience (liking, perceived sensory complexity, evoked emotions, expected price to pay) and post-consumption experience (vividness, remembered liking, memorability, and loyalty). The hypothesis that positive core-consumption experience would be followed by positive post-consumption experience was also tested. Evoked emotions were recorded with the AWEEL scale (Danner *et al.,* 2016).

All data was analysed using the XLSTAT software (Addinsoft SARL, Paris, France).

Results and Discussion

Study 1

Consumer definition of FAW: In the study by Kustos *et al.* (2019), consumers mostly associated FAW with the terms *high quality, satisfying, clean, balanced, easy-drinking*, expected to be of *good value, affordable, fruit-driven*, and available in *lots of varieties*. The words terroir, oak, young, high alcohol, or heavy did not define FAW in this study. The word regional was considered to be important for FAW, suggesting Australian wine regions are linked to high quality wines in consumers' minds, thus the reputation of a region over terroir might be used as a marketing strategy (Johnson and Bruwer, 2007). The list of the most frequently associated words with FAW prompted a tentative overall definition to be formulated for further testing:

"Australian fine wines are of high quality, good value for money, are easy to drink and consistently show balance, plus diversity, fruity and regional characteristics."

Across the FWI consumer segments, only easy-drinking ($p < 0.05$) and romantic ($p < 0.01$) were significantly different (data not shown). The fine wine definition may therefore be adjusted for both NF and ENT consumers with an emphasis on 'easy-drinking', and further for ENT by linking FAW consumption with 'romantic occasions'.

Grape varieties: Shiraz, Chardonnay, Cabernet Sauvignon, Sauvignon Blanc, Merlot, Pinot Noir, Riesling and Semillon were most associated with FAW (Kustos *et al.,* 2019). These varieties are also the most planted varieties in Australia (Wine Australia, 2020) and tend to receive the highest quality ratings from wine critics (Schamel and Anderson, 2003), indicating that consumer perceptions of FAW are likely to be influenced by the market share of varieties and expert opinions (Charters and Pettigrew, 2008; Goodman *et al.,* 2008). The importance of Shiraz is unquestionable in the Australian market – it accounts for 45% of the red grape crush with an estimated total value of AU$346 billion (Wine Australia, 2020). Contrarily, the FAW image of non-Shiraz varieties largely varied by wine involvement. Therefore, it may be beneficial for hospitality operators to offer diverse wine lists to satisfy customers in all segments.

Label information: The importance of grape variety, brand, region and vintage supports previous studies (Jarvis *et al.,* 2003; Mueller and Szolnoki, 2010).There were significant FWI segment effects for all 13 attributes (grape variety, brand, wine region, alcohol level, wine subregion, medals, vintage, story, recommended food pairing, taste description, vineyard practices, winemaker's name, organic/biodynamic). ENT were interested in information as they scored significantly higher than the other FWI segments for all elements except taste description. NF and ASP were less concerned for regions but more so in taste descriptions. NF tended to place less importance on all categories of label information than the other two segments. Interestingly, the story of the wine received less importance by all segments, contrasting with a recent study (Danner *et al.,* 2017) that found information to positively moderate consumer preferences and emotions for wine. This means that the wine industry may focus on food recommendation and tasting notes on labels and the hospitality sector can extend the wine experience by telling stories behind the label to diners.

Chardonnay in Australia: Consumers defined fine Australian Chardonnay as fresh, fruity, elegant, and delicate with full flavour but medium body (Kustos *et al.,* 2019). Currently preferred styles seem to gravitate towards cooler climate fruit and conservative oak management. Consumers do not expect oak-related flavours nor malolactic fermentation or age-derived flavours such as nougat, popcorn, cheesy and toasty to stand out. Given the extent of Chardonnay plantings, this is important for winemakers looking to meet the market demand. However, ENT appreciated such complexing flavours, as well as minerality, which are both important for premium but lower overall volume wines.

Barossa Valley, Adelaide Hills, Hunter Valley, Margaret River, Yarra Valley, and Tasmania were cited as top Chardonnay producing regions. The association of Barossa Valley and fine wine is highest. Although the region established its reputation with Shiraz (Halliday, 1993; Schamel and Anderson, 2003), regional branding increases consumer confidence in the quality of wine from that region (Bruwer and Johnson, 2010).

Shiraz in Australia: Consumers defined fine Australian Shiraz as full bodied and rich with fragrant dark fruits, complex flavours, balance and elegance (Kustos *et al.,* 2019). Currently preferred styles seem to lean towards fresh and peppery rather than oaky and spicy. Consumers did not expect oak-related or age-derived flavours such as tobacco, liquorice, toasty, chocolate to stand out. However, ENT appreciated such details, as well as fine tannins.

Barossa Valley, Hunter Valley, Adelaide Hills, and McLaren Vale were cited as top Shiraz regions producing diverse style of wines. The recognition of the Adelaide Hills is welcoming for wine makers and marketers wanting to promote quality cool-climate wines (Schamel and Anderson, 2003).

Study 2

Intra-regional typicality of Chardonnay: YVG was characterised by oak, vanilla, dough, citrus, acidity, furfural, and oak-lactone, and low floral and tropical aromas and ethyl and acetate esters. YVD wines were significantly different from YVG as the former grouped together based on high perceived heat, the presence of ethyl esters and acetate esters (associated with alcoholic fermentation at lower temperatures) and lacking oak-derived sensory attributes. YVR wines tended towards an ethyl ester-driven fruity style.

MRR wines were similar to YVG and also contained higher concentrations of vegetal flavour and ethyl hexanoate (green apple, pineapple odours). MRA and MRW sub-regions possessed similar sensory and volatile attributes, albeit with a tendency towards higher oak-derived attributes. Indeed, the MR wines might be the most complex of the studied wines (Kustos *et al.,* 2020a).

Previous research (Niimi *et al.,* 2018) suggested that wide sensory variation in Chardonnay wines may not be as dependent on the starting grape material (and the influence of region) as other varieties like Cabernet Sauvignon. Our results suggest that fine Australian Chardonnay may be better described by flavour styles akin to those described by Saliba *et al.,* (2013) rather than regional and/or sub-regional styles. Chardonnay is a neutral grape variety and from this study it can be implied that winemaking, in particular, seemed to influence the sensory and chemical composition of the wines.

Based on the combination of ten variables (honey, floral and vegetal aromas, TA, pH, α-terpineol, linalool, oak lactone, 3-methylbutanol and ethyl butanoate), 100% of the wine set was correctly classified and complete separation of MR and YV Chardonnay wines was achieved (data not shown). This result is promising for identifying intra-regional Chardonnay markers, although chemical compositional differences may not pair with perceivable sensory differences. In other words, wine consumers may not be capable to taste the nuanced differences between sub-regions.

Intra-regional typicality of Shiraz: BVN wines had a combination of savoury, cooked vegetable and barnyard aromas, moderate astringency and fine tannin texture, and were higher in 1-butanol, β-damascenone, and guaiacol. The higher concentration of guaiacol usually indicates ageing in toasted oak barrels (San Juan *et al.,* 2012); however, in the presence of 1-butanol (associated with balsamic aroma), it might have enhanced the tasting panel's aroma associations with savoury, cooked vegetable, barnyard and earthy odours. BVS wines were described by sweet oak, floral, and confectionery aromas and hexyl acetate, 2-phenylethanol, and ethyl octanoate, as well as moderate astringency and moderately coarse tannin texture. These findings partly align with the Barossa Grounds study (Robinson and Sandercock, 2014) that found BVN wines to be more savoury with astringent, coarse tannins and BVS were more floral with lower astringency and smoother tannins. However, BVN and BVS wines in this study possessed similar astringent qualities, which might have resulted from winemaking techniques pursuing moderate phenolic extraction wine styles (Kustos *et al.,* 2020a).

MVB wines were characterised by higher astringency, coarser tannin texture (with corresponding higher MCP tannin), sweet oak, confectionery, and floral aromas, and 4-ethylphenol. MVW wines were moderate in savoury, floral and oak-related descriptors and had lower astringency with finer tannins. MVW wines had the lowest ethyl ester concentrations, which are known to be affected by lower fermentation temperature, as stated above, or the yeast strain used for alcoholic fermentation.

Based on the combination of eight variables (floral and olive aromas, and α-terpineol, linalool, 2-phenylethyl acetate, 2-phenylethanol, 1-butanol, total anthocyanin), 97% of the wine set was correctly classified. Although the wines of the MVB and the MVW districts were still well separated from BVN and BVS, a complete differentiation of MV and BV was not possible. Predominantly volatile profiles allowed the building of regional authenticity models, but the nuanced differences between sub-regions may not be perceivable for wine consumers.

Study 3

Sensory attributes of appropriate food and wine pairings: Consumers preferred and deemed pairings more appropriate that had high flavour intensity, savoury flavours, umami and were slightly dominated by the wine component (Figure 1). This result broadens the documented literature on consumers' preferences for intensely flavoured wines (Jackson, 2016) to include pairings with food too. Although savoury wines may be less favourable on their own (Johnson *et al.,* 2013; Lattey *et al.,* 2010), interestingly, consumers may enjoy them in a food and wine pairing context (Kustos *et al.,* 2020b). There was an increase in expected price to pay for CBR Shiraz and MV Shiraz in the most appropriate pairings compared to the least appropriate pairings. The findings extend the existing literature on the monetary benefits of pairing wine with food (Bastian *et al.,* 2010; Wansink *et al.,* 2006) by showing that if hospitality operators present appropriate as opposed to average pairings, they may expect further financial gain.

Provenance effect on consumer experience: Surprisingly, provenance information did not impact consumers' scores for liking, appropriateness of pairing, expected price or balance. This contrasted with previous studies where product information (e.g., provenance, production practices, tasting notes) of single item products (e.g., food or wine) significantly influenced liking ratings (Danner *et al.,* 2017; Mueller and Szolnoki, 2010). Food and wine pairings can be defined as basic context effects, in which consumer perceptions of wines and foods change because of the context of dining (Lahne, 2019). Therefore, it is possible that the context of consuming food and wine together had a larger impact on consumer behaviour than the context of wine provenance information.

Informed conditions promoted more intense positive emotions of warm heartedness, optimism, passionate and positive surprise, and blind conditions increased the negatively valanced emotions of panicky, sad, tense, irritated, lonely, and envious (Figure 2), in agreement with recent studies (Danner *et al.,* 2017; Silva *et al.,* 2017). The significant positive valence of emotions has been shown to differentiate warm climate wines from cool climate wines (Coste et al., 2018), which was also the case in this study with the warm climate MV Shiraz being positively distinguished in a food pairing (BeefMV). Extending previous findings that food pairing recommendations can increase wine sales (Wansink *et al.,* 2006), it is possible that wine sensory and producer information presented by hospitality/sales staff may engage customers on an emotional level, raising the opportunity for upselling wine in restaurants/cellar doors.

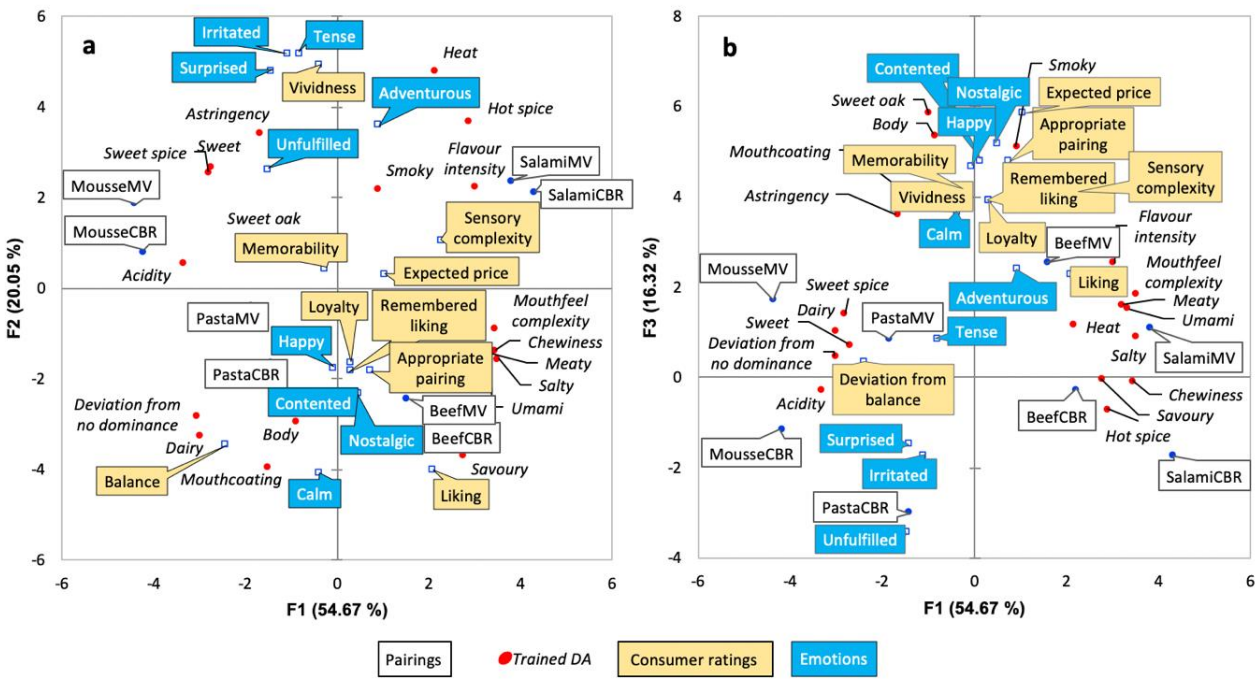

Figure 1: PCA biplots showing F1 vs. F2 (a) and F1 vs. F3 (b) of Shiraz wine and food pairings with significant descriptors arising from descriptive analysis as main variables, and consumer ratings and evoked emotions as supplementary variables.

Consumption effect on memorability: Consumers had a significant retrospective preference and loyalty for BeefMV meaning that it was not only the most liked and appropriate pairing with the highest sensory complexity and expected price for the wine, but also generated positive post-consumption experiences. In particular, remembered liking and loyalty can be important for hospitality operators and wineries as both measures positively correlate with word-of-mouth communication (Coulter and Roggeveen, 2012).

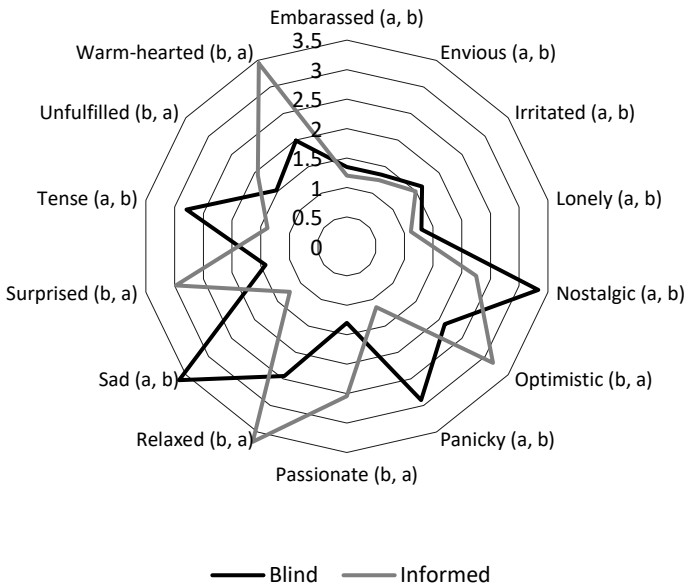

Figure 2: Food and wine pairing experience-evoked emotion profiles for two different information levels (blind or informed about wine provenance information). Emotion intensities were rated on a 9-point scale ranging from 1 = not at all to 9 = extremely. Only emotion terms that discriminate between information conditions ($p < 0.05$) are presented. Lower case letters indicate significant differences in evoked emotion intensities across information levels based on post-hoc comparisons using Fisher's LSD ($p < 0.05$).

Conclusion

All consumers valued provenance, but highly involved wine ENT appeared to utilise more information and had broader sensory vocabulary than ASP and NF consumers. The variation observed among wines from the same region and sub-region demonstrated the sensory and chemical variability within the same GI. Although regional typicality can be modelled using volatile composition and sensory attributes, consumers may not perceive these differences in tasting. The results from this study regarding sensory profiles and preferred food pairings for FAW from several regions could help the wine production, marketing and hospitality sectors tailor their services and communications to incorporate fine wines in their region-specific marketing. Consequently, appropriate food and wine pairings may be an important marketing strategy to develop and promote provenance and positive gastronomic experiences, and using a wine and food pairing strategy, rather than wine alone, could provide wine businesses with higher customer satisfaction and spending.

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