

# UNIVERSITA' DEGLI STUDI DI VERONA

*DEPARTMENT OF*

*HUMAN SCIENCES*

*GRADUATE SCHOOL OF*

*HUMAN SCIENCES*

*DOCTORAL PROGRAM IN*

*HUMAN SCIENCES*

Cycle 33

TITLE OF THE DOCTORAL THESIS

Understanding and describing the sensory experience of wine for Italian, Vietnamese and Australian nonexpert consumers.

S.S.D. M-PSI/01

Coordinator: Prof./ssa Chiara Sità

Signature \_\_\_\_\_

Tutor: Prof./ssa Ivana Bianchi

Signature \_\_\_\_\_

Tutor: Prof. Alex Russell

Signature \_\_\_\_\_

Tutor: Prof. Roberto Burro

Signature \_\_\_\_\_

Tutor: Prof. Ugo Savardi

Signature \_\_\_\_\_

Doctoral Student: Dott./ssa Hang Thuy Truong

Signature \_\_\_\_\_ 

This work is licensed under a Creative Commons Attribution-NonCommercial-NoDerivs 3.0 Unported License, Italy. To read a copy of the licence, visit the web page:

<http://creativecommons.org/licenses/by-nc-nd/3.0/>



**Attribution** — You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.



**NonCommercial** — You may not use the material for commercial purposes.



**NoDerivatives** — If you remix, transform, or build upon the material, you may not distribute the modified material.

*Understanding and describing the sensory experience of wine for Italian, Vietnamese and Australian non-expert consumers* – Hang Thuy Truong

PhD thesis

Verona, 22 February 2022

ISBN –

- **SUMMARY** (in Italian) + **ABSTRACT** (in English)
  
- **TABLE OF CONTENTS**
  
- **INTRODUCTION**
  
- **INTERNAL CHAPTERS**
  
- **CONCLUSION**
  
- **REFERENCES**
  
- **APPENDICES**

*Understanding and describing the sensory experience of wine for Italian, Vietnamese and Australian non-expert consumers* – Hang Thuy Truong

PhD thesis

Verona, 22 February 2022



UNIVERSITY OF VERONA

**Understanding and describing the sensory experience of wine for Italian,  
Vietnamese and Australian non-expert consumers.**

Doctoral thesis submitted for the degree of

**Doctor of Philosophy of Human Sciences**

**HANG THUY TRUONG**

Supervisors:

Prof. Ivana Bianchi, University of Macerata, Italy

Prof. Roberto Burro, University of Verona, Italy

AProf. Alex Russell, Central Queensland University, Australia

Prof. Ugo Savardi, University of Verona, Italy

*Understanding and describing the sensory experience of wine for Italian, Vietnamese and  
Australian non-expert consumers – Hang Thuy Truong*

PhD thesis

Verona, 22 February 2022

## ACKNOWLEDGEMENT

First and foremost, I would like to express my deep and sincere gratitude to my PhD. Supervisors, and to Prof. Ugo Savardi at the University of Verona (Italy) and Prof. Carita Paradis at Lund University (Sweden) for providing invaluable suggestions at the beginning of this PhD research project. I am grateful to the University, which awarded me an International Research Award scholarship, allowing me to do research for 3 years.

I am extremely grateful to Prof. Ivana Bianchi (University of Macerata, Italy). Her dynamism, vision, sincerity and motivation have deeply inspired me. It was a great privilege and honor to work and study under her guidance. I am also very grateful to Prof. Roberto Burro (at the University of Verona, Italy) and AProf. Alex Russell (Central Queensland University, Australia) for their kind support and co-operation throughout my research. They have taught me the methodology needed to carry out research and to present the research work as clearly as possible. I also profusely thank Prof. Robert Boakes from the University of Sydney (Australia) who introduced AProf. Alex Russell to me.

I am extremely grateful to my parents, Truong Van Dai and Tran Thi Thuy, for their love, caring, and sacrifices for my education and preparing me for my future. I am very thankful to my parent-in-law, my husband and my daughter, Nguyen Chi Mai, for their love, understanding, and continuing support to complete this research work. Also, I express my thanks to my sister, and my brother-in-law for their support.

## SOMMARIO

La comprensione e descrizione delle esperienze sensoriali del vino per consumatori standard italiani, vietnamiti e australiani

Sommario tesi Christina Hang Truong (XXXIII ciclo)

È stato più volte riconosciuto, in letteratura, che l'apprezzamento del vino varia a seconda del livello di interesse dei consumatori e del loro grado di competenza. Esperti e non esperti (cioè consumatori standard) si differenziano per la capacità di discriminare le proprietà del vino, per la memoria che hanno di altri vini (cosa molto utile ai fini del confronto), e anche per la ricchezza e varietà del linguaggio che sanno utilizzare per parlare di vino.

La presente tesi si concentra sull'ultimo aspetto, ovvero il linguaggio utilizzato per descrivere le proprietà sensoriali del vino, e in particolare sulla verifica della comprensione, da parte di consumatori non-esperti (“consumatori standard”) di 64 descrittori di vino di uso frequente. Abbiamo affrontato questo argomento in una prospettiva interculturale e assumendo i contrari (es. pesante-leggero, forte-delicato, maturo-immaturo ecc.) come configurazione chiave per descrivere le caratteristiche sensoriali del vino.

Nel primo capitolo si definisce l'inquadramento del problema, in termini di tradizioni culturali, soffermandosi in particolare sul vino italiano (come caso rappresentativo di produttori vitivinicoli di lunga tradizione) sul vino australiano (come caso rappresentativo di produttori vitivinicoli di recente tradizione) e presentando la tradizione culturale vietnamita, centrata su una bevanda nata dalla fermentazione del riso e per la quale il vino d'uva è solo un prodotto d'importazione, utilizzato in particolari occasioni sociali (vedi sezione 1.1). Queste sono le tre cornici culturali su cui ci concentra questa tesi. Sempre nel capitolo 1, si tocca la questione del linguaggio internazionale del vino, dal punto di vista dei descrittori utilizzati dagli esperti per presentare le sue proprietà sensoriali (sezione 1.2),

*Understanding and describing the sensory experience of wine for Italian, Vietnamese and Australian non-expert consumers – Hang Thuy Truong*

PhD thesis

Verona, 22 February 2022

mostrando l'importanza dei contrari nella percezione, nel linguaggio e nella concettualizzazione di tali proprietà da parte dei professionisti del settore (sezione 1.3). Per finire, si riassumono brevemente alcuni studi su aspetti interculturali relativi alla descrizione e consumo del vino, a partire dalla letteratura a disposizione, ma non specificamente centrati sul tema dei contrari (sezione 1.4).

Il secondo capitolo rappresenta il nucleo sperimentale della tesi. Muove dalla descrizione della ricerca-base, svolta con un ampio campione di consumatori italiani (Bianchi et al., 2020; sezione 2.1) che rappresenta il lavoro di partenza per i due studi sviluppati in questa tesi, uno con partecipanti vietnamiti (sezione 2.2) e uno con partecipanti australiani (sezione 2.3). La domanda generale alla base di questi studi è se i contrari possano giocare un ruolo nel modellare le dimensioni evocate dai descrittori comuni del vino, non solo nel lessico di esperti e professionisti ma anche per i consumatori non esperti, e se questo valga a livello interculturale (per i tre campioni di partecipanti analizzati). Perché abbiamo ritenuto rilevante stabilire empiricamente se la concettualizzazione delle proprietà del vino in termini di dimensioni delimitate da due proprietà contrarie funzioni bene anche per consumatori standard e in Paesi con tradizioni vinicole molto diverse? Perché, una volta stabilito questo, allora l'uso di tale "configurazione semantica" (Paradis, 2008) per modellare l'esperienza che consumatori standard hanno delle diverse proprietà del vino potrebbe essere data per acquisita. A quel punto, il problema di colmare il divario di linguaggio tra esperti e non esperti si sposterebbe solo sul piano di verificare se a tali dimensioni vengano attribuiti significati uguali, simili o diversi da esperti e non esperti, ma l'idea di fondo (della dimensione) sarebbe giustificata come invariante. Si tratta di un aspetto interessante non solo in termini di ricerca di base ma anche di ricerca applicata, soprattutto in relazione al marketing e alla pubblicità del prodotto.

Uno dei principali risultati della tesi è che in oltre l'80% dei casi sia i partecipanti australiani che quelli vietnamiti sono stati in grado di trovare quella che consideravano la proprietà sensoriale contraria a quella target presentata; la

percentuale è simile a quella riscontrata nel precedente studio con partecipanti italiani. Ciò indica che i contrari rappresentano un potenziale terreno comune tra modi esperti e non esperti di comunicare sul vino, indipendentemente dal livello di tradizione culturale del vino dei consumatori.

Il punto critico riguarda la misura in cui i consumatori standard sono risultati coerenti nella scelta di quale contrario. È infatti emersa una grande variabilità tra le proprietà studiate in termini di quanti opposti diversi sono stati evocati dai partecipanti. Per i termini più ambigui abbiamo scoperto che sono stati identificati circa 4 diversi contrari ogni 10 partecipanti.

L'ambiguità è leggermente superiore per i partecipanti vietnamiti e gli australiani rispetto ai partecipanti italiani, e in particolare rispetto al vino bianco. L'indicazione che le dimensioni che gli stessi termini fanno venire in mente sono spesso ambigue (non le stesse, non coerenti) rappresenta un'importante potenziale fonte di incomprensione tra produttori e consumatori: da un lato un produttore di vino seleziona con cura le parole per descrivere le caratteristiche precipue dei suoi prodotti, dall'altro i consumatori standard interpretano le parole che usa in modo diverso.

Ovviamente sono necessari molti più studi per raggiungere una approfondita comprensione dei fenomeni qui analizzati. Speriamo però che, nonostante i suoi limiti, questa tesi possa avere almeno il merito di suggerire una direzione ragionevole di ricerca da continuare a perseguire nel futuro.

## ABSTRACT

It has been repeatedly acknowledged that the appreciation of wine depends to some extent on the drinker's level of interest and their degree of expertise. Experts and non-experts (i.e. standard consumers) differ in their ability to identify the properties of wine, both in their memory of other wines they have drunk (which is useful for comparison purposes) and in the language they use to talk about wine (which affects the richness and variety of the description).

The present thesis focuses on this last aspect, that is, the *language used to describe the sensory properties of wine*, and in particular on the understanding that standard consumers have of 64 frequently used descriptors. *We have addressed this topic from a cross-cultural perspective and have worked on the assumption that opposition* (i.e. heavy–light, strong–delicate, mature-immature etc) *is a key configuration in descriptions relating to the sensorial characteristics of wine.*

In the first chapter, the framework of the problem, in terms of the cultural traditions surrounding wine, is set. The study focuses in particular on Italian wine (representing a country with a well-established tradition of producing and drinking wine), Australian wine (representing a country which is relatively new to the production of wine) and finally a part involving participants from Vietnam, a country with long established tradition of rice wine, but a certain degree of familiarity with imported grape wine which is drunk on special social occasions (see section 1.1). These three cultural areas form the basis of this thesis. Chapter 1 deals with the international language of wine from the point of view of the descriptors used by experts for its sensory properties (section 1.2). The importance of opposites in the language used and the conceptualization of wine according to experts is discussed (section 1.3). A number of studies on cross-cultural aspects relating to the description of wine in previous literature are touched upon, but these are not specifically related to opposition (section 1.4).

*Understanding and describing the sensory experience of wine for Italian, Vietnamese and Australian non-expert consumers – Hang Thuy Truong*

PhD thesis

Verona, 22 February 2022



The second chapter represents the core of the thesis from an experimental point of view. The original experiment carried out in Italy is described (Bianchi et al., 2020; section 2.1), followed by the two experiments carried out for the purposes of this thesis with Vietnamese participants (section 2.2) and Australian participants (section 2.3).

The main issue concerns whether opposites can potentially play a role in modelling the dimensions evoked by common descriptors of wine, not only in the lexicon used by experts and professionals, but also with reference to *non-expert* consumers, considering also whether the findings hold from a cross-cultural point of view (that is, for Italy, Australia and Vietnam). We consider that it was relevant to establish empirically whether the conceptualization of the properties of wine in terms of dimensions and opposites as referred to by experts works well for standard consumers and also works equally well in countries with very different wine traditions. The motivation for this is based on the hope that once a “configuration” has been established (Paradis, 2008) it can be used to bridge the gap between experts and non-experts so that the terms and dimensions referred to are attributed *the same or at least similar meanings*. This is an interesting aspect to consider not only in terms of basic research, but also as applied to research relating to the marketing and advertising of wine.

One of the main results of the research presented in this thesis is that in more than *80% of cases*, both the Australian and Vietnamese participants were able to find what they considered to be an opposite for the target properties presented. The percentage is similar to that found in the previous study carried out with Italian participants. This indicates that *opposites represent a potential common ground* between expert and non-expert ways of communicating about wine, independently of people’s knowledge.

The critical question regarded the extent to which the standard consumers who participated in the three studies were *consistent in their choice of opposites*. There

was a great deal of variability between the properties in terms of how many different opposites were chosen by the participants. For the most ambiguous terms, we found that an average of 4 different opposites were identified for every 10 participants. The degree of ambiguity was slightly higher for the Vietnamese and Australian participants than for the Italian participants.

The fact that this result indicates that the dimensions relating to wine are often ambiguous represents a potential source of misunderstanding. Even if wine producers carefully select the words they use to describe the characteristics of their products, standard consumers may still interpret them in a different way. Many more studies are of course needed to investigate further in order to fully understand this phenomenon. We believe that, despite its limitations, this thesis may well suggest a useful direction for future research to follow.

## Cross-cultural research

**Understanding and describing the sensory experience of wine for Italian,  
Vietnamese and Australian non-expert consumers.**

➤ **TABLE OF CONTENTS**

➤ **INTRODUCTION**

### **CHAPTER 1. WINES FROM VARIOUS PARTS OF THE WORLD**

#### **1.1. WINES FROM VARIOUS PARTS OF THE WORLD**

1.1.1 The Old World of Wine: Italian wine

1.1.2 The New World of Wine: Australian wine and the wines of Vietnam

#### **1.2. EXPERT DESCRIPTORS ABOUT WINE**

1.2.1 The international language of wine

1.2.2 The importance of sensory descriptors in defining the identity of  
a wine

1.2.3 Descriptors “in action”: some examples of application of wine  
descriptors to Australian wines

#### **1.3 OPPOSITES IN WINE PERCEPTION, LANGUAGE AND COGNITION**

1.3.1 Opposites in wine perception (Intrinsic properties)

1.3.2 An application of the LOC approach to the analysis of the  
language of wine (LOC)

#### **1.4 CROSS CULTURAL ASPECTS IN WINE DESCRIPTORS**

1.4.1 Wine brand name, label and origin

1.4.2 Wine conceptualization

1.4.3 Consumers’ cultures and attitudes

### **CHAPTER 2. OPPOSITES IN NAIVE DESCRIPTORS ABOUT WINE**

#### **2.1 THE SENSORIAL EXPERIENCE OF WINE FOR ITALIAN NON-EXPERTS**

*Understanding and describing the sensory experience of wine for Italian, Vietnamese and  
Australian non-expert consumers – Hang Thuy Truong*

PhD thesis

Verona, 22 February 2022

## **2.2 STUDY 1 - THE SENSORIAL EXPERIENCE OF WINE FOR VIETNAMESE (AS COMPARED TO ITALIAN) NON-EXPERTS**

2.2.1 Method

2.2.2 Results

2.2.3 Discussion

## **2.3 STUDY 2 – THE SENSORIAL EXPERIENCE OF WINE FOR AUSTRALIAN (AS COMPARED TO ITALIAN) NON-EXPERTS**

2.3.1 Method

2.3.3 Results

2.3.3 Discussion

- **CONCLUSION**
- **REFERENCES**
- **APPENDICES**

## INTRODUCTION

Wine is the one of the most interesting consumable subjects in the world (Wagner, 2013). People from different geographical areas and wine cultures have developed different wine varieties, wine making practice, wine tasting, wine consumption patterns, and wine preferences.

The world of wine is fascinating. Franklin states “*The discovery of a wine is of greater moment than the discovery of a constellation (...). The universe is too full of stars*” (Franklin, 2012, as cited in Wagner, 2013). Recently, the study of food sciences has drawn much attention to cross-cultural relations in wine appreciation, wine perception, wine tasting and wine descriptions (Saenz-Navajas, 2014; Yoo, 2013; Rodrigues, 2019) used by marketers on an international level. Cross-cultural research has contributed to the comprehensive understanding *of wine appreciation and wine descriptors*.

In this wider framework, the aim of my thesis is to use a cross-cultural comparison to examine the understanding that non-expert consumers have of a set of 64 terms frequently used in Italian language as descriptors of wine sensory properties. This thesis will extend a previous study carried out with Italian language and Italian participants (Bianchi, et al. 2021), by exploring the understanding of the same set of terms (using the same methodology) in two populations which are very different to the Italian one in terms of wine culture: Vietnamese participants were recruited in the first study, and Australian participants in the second study. Since Italian grape wine is well known around the world, and due to the diffuse international market of Italian wines, the topic of communication about the properties of different varieties of wines beyond Italian language is critical for marketing and advertising. The research project developed for this thesis therefore had objectives related to basic research in the areas of Cognitive Linguistics and Psychology (in continuity with the initial study in Italian, we will explore whether opposites are useful to investigate non-expert understanding of wine) as well as applied research since the

results of the study may suggest which terms are more ambiguous in cross-cultural understanding and which one have a better chance to convey a similar meaning. Therefore, the study may be of interest in an applied perspective in terms of re-evaluation of tasting scales for wine training courses. This cross-cultural research may be relevant also for the areas of Sensory Analysis in Food Sciences in support of understanding of the scales used to establish quality perception, and for providing more effective (i.e. better understood) sensory descriptions of food quality. Wine industry producers can also benefit from these results, particularly when exporting wines. This cross-cultural information may help them to develop marketing strategies related to the sensory perception of wines.

The decision to focus on Vietnamese and Australian population as two comparison samples and languages are based essentially on two considerations. First, I was interested to test how far is Vietnamese understanding on wine terminology and Italian standard consumers understanding of the same terms, for personal reasons relating to my own origin (and thus an interest to research in my own Country), but also for the distance between these Vietnamese and Italian people in terms of familiarity with grape wine. Consumption of grape wine is very familiar in Italy, whereas rice wine is the most common beverage for Vietnamese adults. Grape wine is known and is appreciated by Vietnamese people exposed to an international food market, but it is in any case confined to specific social events.

On the other hand, Australia is one of the extra-European Countries with a well renowned tradition of grape and wine producers, and although wine is not the most popular everyday alcoholic beverage, it is a familiar product and wine culture is high in many sectors of the population. Moreover, an investigation of Australian English is of interest for marketing and advertising, due to the importance of English language in international markets.

The structure of the thesis is the following. In chapter 1, I will briefly present the most relevant characteristics of wines produced in the three Countries of interest

for my research project (Italy, Australia and Vietnam). I will discuss some basic elements of the expert terminology in use to talk about wine sensory experience and discuss the choice, for this thesis, to focus on opposites as a basic paradigm for the following experimental analysis. I will then focus on some cross-cultural aspects known from the literature relating to the subject of wine.

In the second chapter of the thesis the two studies developed as part of this thesis dissertation (in collaboration with Ivana Bianchi, Roberto Burro, Carita Paradis, and Alex Russell – to which I owe my gratitude for their substantial support in every phases of the development of the project) are presented, with Vietnamese participants (2.2) and Australian participants (2.3).

In the final section, the main findings and conclusions that emerge from the results of the two studies in comparison with the previous study with Italian participants are recapitulated and discussed.

## CHAPTER 1

### 1.1. WINES FROM VARIOUS PARTS OF THE WORLD

In this section, I will introduce wines from around the world, namely from Australia, Italy and Vietnam. These are the areas focused on the compared by the experimental project developed in this PhD thesis.

#### 1.1.1 Wines of the Old World (Italy)

In wine language, ‘Old World’ and ‘New World’ indicate the geographical origins where a particular wine comes from. Old World refers to the original winemaking regions of Europe (France, Italy, Spain, Portugal and Germany) while, New World Wines are from the other countries where winemaking came in more recent times (such as the American wines, New Zealand and Australian wines). This part aims to focus on Italian wines (as representatives of the old word wine) since they are the starting point of the experimental design of this thesis.

Italy is the world’s biggest wine producer and exporter (Johnson & Robinson, 2001). In the 1960s, Italy started improving the wine industrial technology to make “*more modern*” white wines with *fresh* and *crisp flavor*. From the late 1990s, Soave, Verdicchio and Pinot Grigio were recognized as *deliciously fruity* but *old paint-stripper* white wines. Italy’s *red* wines continue to be improved (Johnson and Robinson, 2001).

Denominazione di Origine Controllata (DOC) are the high wine-grading regulations associated with bottling, alcohol levels, and aging requirements. For the highest classification in Italian wine, DOCG ensures that the appellation of origin is guaranteed by the national government. This designation achieves the highest wine distinction. There are 13 DOCG wine districts placed in three different wine regions; namely Piedmont, Tuscany and Umbria (Richard Vine, 1997).



Kolpan, Smith, and Weiss (2010) state that Italy's wine areas consist of four main regions, namely Southern Italy and Islands, Central Italy, Northwest Italy, and Northeast Italy.

*a) Southern Italy and Islands*

The coastal and mountain areas of southern Italy are quite cool and produce fine wines. The wines produced in the southern part are high-alcohol, full-bodied, and thinner than those produced in the northern areas. Carlo Hauner in Sicily are made with pasito (sun-dried, raisinated grapes) or liquoroso (sweet and fortified), the standard sweet Malvasia delle Lipari.

Western Sicily is known as the Marsala wine region where the finest Marsala is the dry vergine or soleras made by mixing wines from different vintages. Marsala Vergine is ranked as one of the finest fortified wines in the world with the style varieties including – *secco [dry]*, *semisecco [semi-dry]* and *dolce [sweet]* with its assertive flavor and lack of nuance. Vermentino di Gallura is a well-known white wine and dry wine from the Sardinian area which expresses a more rustic flavor than the more refined and terroir-driven Vermentino di Gallura. Some of the best Sardinia red wines originate from the Cannonau grape. The Cannonau di Sardegna wines include dry, sweet, and fortified styles with both riserva and superiore designations. Calabria's red wine is made from the Gaglioppo grape with high-alcohol, and high-tannin flavors. Citrus whites are also dry, quite fresh and appealing (Richard Vine, 1997).

The Greco di Bianco area produces the finest of Calabria's wines which taste sweet. The wine industry in Basilicata is quite famous for the Aglianico del Vulture wines which are *full-flavored, very deep extract* in color, *simple, light* [refers to the body], *less complicated* but *very pleasant*. Salentino wine from Apulia is based on Negroamaro grape which produces a lovely, balanced wine, medium to full-bodied and fruit-driven. Campania is known as a land rich in wine history – the ancient Romans and Greeks had vineyards in this region. Taurasi red wine extended

throughout Italy's southern areas and becomes full-bodied and tannic during aging, maintains a lovely balance of fruit and earth aromatics and flavors. Also, Falanghina expresses its reputation because of a very good, light- to medium-bodied, dry but refreshing wine, that matches well with seafood; for instances, mussel and clams (Kolpan, Smith, and Weiss, 2010).

*b) Central Italy*

Central Italy is divided by the Apennine mountain range into two wine areas; the west and the east. On the east side we have wines such as Sangiovese di Romagna which are elegant and have a delicate balance between generous fruit and soft tannin. Torgiano Rosso Riserva wine is famous in Umbria, one of the finest wines, made from sun-dried grapes, with a smell of blackberries and a full body (Johnson & Robinson, 2009).

On the east side, Tuscany is Italy's best-known wine area which has seven types of fine, fancy red wines and two kinds of white wines such as the dry Vernaccia di San Gimignano and the luscious, sweet Vin Santo. Chianti is the most well-known wine which is thin, insipid, elegant, rich and age-worthy; or ready to drink when bottled, in this case light and delicate. Some of the best Chianti is exported from the Chianti Classico suburb, with black cherry and raspberry tastes and a bouquet of wildflowers and smoke. Chianti Classico areas include two wine regions in the South near Siena which produce earthier and more full-bodied wines, and another region in the northern of Tuscany, closer to Florence, where the wine tastes lighter and more delicate. Vernaccia di San Gimignano, in the heart of Chianti country includes three styles of wine, namely the Tradizionale, Fiore and Carato styles. The Tradizionale wine is golden in color, and medium to full-bodied. Fiore made from the free-run juice of the grapes results in contrasting flavors with respect to the Tradizionale, light in color and body, a wonderful accompaniment to poached or steamed fish. Carato is produced by a barrel-fermentation process which results in rich, slightly oaky and fruity flavors. The best Vernaccia di San Gimignano is

complex, a bit peppery, with refreshing acidity and a slight bitterness in the finish (Richard Vine, 1997; Kolpan, Smith, and Weiss, 2010).

*c) Northwest Italy*

The Northwest of Italy consists of the four areas of Liguria, Lombardy, Piedmont, and Valle d'Aosta where the wine produced has distinctive varietal differences. Lombardy, which is close to the industrial capital Milan, is famous for the Piedmont in Valtellina which shows a delicate, lighter side, creating a wine with less concentration of tannin.

The red wines of Piedmont, namely Barolo and Barbaresco, are recognized as the “king and queen” of Italian reds (Johnson and Robinson, 2001), and display the ‘traditional’ quality of Italian wine features which are full-bodied and long-lived. Additionally, Dolcetto d’Alba is from the Dolcetto grape which is known as “little sweet thing”, a dry red wine, medium-bodied and fruity. The wine can be mouth-filling and complex during the aging period. After one-year of aging, Dolcetto tannin is very light to moderate which results in a wine that is a wonderful accompaniment with lighter meats, oily fish and pastas. A dry, light- to medium-bodied white Gavi is known as the white wine of Piedmont. It is made from Cortese grapes (Hugh & Jancis, 2001).

*d) Northeast Italy*

Northeast Italy comprises three areas; namely Veneto, Friuli-Venezia Giulia and Trentino-Alto Adige. In the Veneto region, people can enjoy Soave Classico which is a medium-bodied, balanced, fresh and fruity white wine. Valpolicella made from the Corvina grapes is light to medium-bodied with a taste of cherries. Molinara, high in acidity, is a grape source of Merlot and Cabernet Sauvignon Valpolicella. Its tannin is quite soft. A fortified dry Amarone which achieves 15 to 16 percent alcohol, is full of fruit and has a pleasantly bitter finish that is wonderful with heavy meat and fine cheese (Jefford, 2008).

Valpolicella has a reputation as Julius Caesar's favorite and is known as one of Italy's "greats". The rare white Verdiso wine originates from Venetia and tastes dry and delicate. A well-known wine, is the sweeter, sparkling wine, Prosecco (Churchill, 1967).

Friuli-Venezia Giulia lies in the top-right corner of Italy, between Austria, Slovenia, the Adriatic Sea, and Veneto. Although the region is relatively small compared to the rest of Italy, it ranks among the best for producers of white wines. Pinot Grigio and Prosecco are typical of Friuli-Grave. The wines are light and moderately zesty with gentle herbaceous notes. White wines of Colli Orientali del Friuli feature scents of white flowers and ripe apples; the most important varieties include Friulano wine (lean and cruncy with delicate notes of thyme, apricot, ripe gooseberry, and a bitter-almond finish), Ribolla Gialla (characterized by a rich structure, and flavour of apricot, tangerine and pear), and Malvasia (often made in an aromatic dry style characterized by crispy floral notes and perfume). The cool Bora wind brings freshness and higher acidity into the grapes is Collio: Sauvignon Blanc, Chardonnay, and Pinot Grigio are concentrated, thicker, and powerful thanks to commonly employed oak and barriques. This section highlights the many different styles of grape wine throughout Italy. It is for this reason that communicating the different styles of wines to consumers is important.

### **1.1.2. The New World of Wine: Australian wine**

From many decades, the "Wine of the New World" has emerged as a prominent wine industry of high-quality wines. The global wine industry has increased the distribution of the wines of the New World. USA and Australia are two countries known to have a true wine culture and are major consumers of wine from all over the world (Creighton, 1967; Banks, 2010; Li, 2018).

Australia, which is proud of its own cultural identity, cuisine, and wine culture, is the world's sixth-biggest producer and exporter of wines (Johnson & Robinson, 2009). Australia's wineries invest considerably in cutting-edge equipment to make

wines with clean flavors, fresh tastes and identifiable varietal features (Johnson & Robinson, 2009). According to Kolpan, Smith and Weiss (2010), New South Wales, Victoria, Tasmania, South Australia and Western Australia are the most relevant geographical areas to be considered.

*a) New South Wales*

The Hunter Valley is the best-known wine area in New South Wales and one of Australia's oldest wine regions. The "Hunter honey" is a fascinating Semillon produced here. The tastes of wine are clean and crisp when young, with bright melon, grapefruit, orange, and citrus features. There is a complexity of lanolin and marmalade, but the wine still maintains a lemon-like freshness. Additionally, Hunter Valley Chardonnay wine has a reputation of big, ripe tastes and lower acidity. Hunter Valley Shiraz wine flavors relate to ripe red berry flavors and are made more complex by rich chocolate aromas; conversely, the Verdelho wines display excitingly fresh and aromatic features.

*b) Victoria*

Swiss immigrants pioneered the wine industry in Victoria in 1875. The climate of warm temperatures in summer and Autumn are wonderful for the production of sweet fortified wines. Glenrowan is the area for dessert wines for muscular, Shiraz and Cabernet with opulent fruit flavors. Fortified Liqueur Muscat which is well-known in the Rutherglen region is a lighter-style white table wine. The Cabernet Sauvignon and Shiraz are impressive, with depth and fleshy, sumptuous fruit, less fine but undoubtedly packing a punch. Additionally, Cabernet and Shiraz from the Bendigo area display great depth and class, with deep purple hues, smooth texture on the palate, and eucalyptus notes when smelling. The Yarra Valley produces fine sparkling wine, in the elegant Pinot Noir and Chardonnay category, and is also renowned for Pinot Noir table wines. The climate of the Mornington Peninsula is like the Yarra Valley. Chardonnay, Pinot Noir, Riesling and Pinot Gris wines have

freshness and long-lasting clean flavors (Jefford, 2008; Johnson & Robinson, 2009).

*c) Tasmania*

Tasmania is one of the coolest viticultural areas in the world. The Champagne from Louis Roederer producer is a wine style of elegance, depth and toasty aromas over fruit features. South Australia's viticultural region produces approximately 45 percent of Australia's wine (Hugh Johnson and Jancis Robinson, 2009). The Shiraz-based Grange is known as one of the best tasting full-bodied and fruit-rich Shiraz wines (Johnson & Robinson, 2009).

*d) South Australia and Western Australia*

Famous regions in Western Australia are Margaret River, which is known for Cabernet-based wines, and was chosen as a wine region due to its similarities with Bordeaux. Other prominent regions include Geographe, Great Southern, Pemberton and Swan District.

There are several significant wine areas in South Australia which include the Adelaide Hills, Clare Valley, Barossa Valley, Eden Valley, McLaren Vale, Langhorne Creek, Padthaway, Coonawarra, and Wrattenbully. The climate and geographical conditions of each area are slightly different which results in the different varieties of grape types and wine styles.

The northern region of the Adelaide Hills is warmer and it is suitable for full-bodied red wines such as Cabernet Sauvignon and Shiraz while the crisper Chardonnays are popular in the southern areas of the Adelaide Hills. Moreover, Cabernet Sauvignon from the Clare Valley has a *robust, fruity, and concentrated* taste when young while they develop *graceful, silky elegance* with age. The Clare Valley is one of the well-known viticultural areas where Riesling wines express fine, full-favored taste with abundant tropical, passion-fruit tastes (Johnson & Robinson, 2009).

The Eden Valley is in the eastern area of the Barossa region where Riesling wines are leaner, finer with higher acid content and more citrus flavors. Coonawarra known as “Bordeaux of Australia” has soil conditions that are well-suited to Australia’s finest Cabernet Sauvignon grapes with the varieties of red Bordeaux (Kolpan, Smith, and Weiss, 2010). The Connawarra Cabernet shows dense blackcurrant fruit with cigar box flavor, and develops complexity and nuances with aging (Kolpan, Smith, and Weiss, 2010). Australia offers a wide range of wines that require description to differentiate them (hence, it’s important to know how they are described). At least some of the words used are different to those of Italian wines, not least because they’re made from different grapes and come from quite different climates; this makes the cross-cultural comparison between Australian and Italian wine lexicon interesting.

### **1.1.3 The wines of Vietnam**

Cultural differences between Western countries and Asian countries result also in differences in agriculture and wine-making processes. The basic technique of wine-making is fermentation from *grape* varieties in Western countries and fermentation from *rice* varieties in Asian countries such as Vietnam. The differences in the raw material from which wine is made and in the technical methods and processes, have led to distinct sensory qualities of the wine produced in the two regions. The *ricy* flavor of all Asian wines derives from varieties of rice, such as *ordinary* rice, *glutinous* rice and *sticky* rice.

There are many kinds of wine on the market in Vietnam today. Some wines come from foreign countries, while others derive from traditional, regional sources and methods. There are several ways to categorize the diverse types of wines. According to professional studies of the Vietnamese wine industry (Nguyen, & Nguyen, 2015), the basic distinction which is made regarding Vietnamese wines is white wines, violet glutinous rice wine, and grape wines. The special wine which symbolizes the Vietnamese culture is white wine.

a) *White wine*

White wine is alcohol which is fermented by yeasts from diverse types of starchy raw materials such as ordinary rice, glutinous rice, sticky rice, corn or cassava. The alcohol level of white wine varies from 29 to 45 percent. The property that should distinguish white wine is a transparent or colorless appearance. However, the color of aged white wine is yellow-green or yellow-straw or golden. Also, white wines originating from the fermentation of rice or corn are usually colorless or transparent, while others fermented with the addition of herbal medicine or the body of a snake are golden. When describing the different wine colors; transparent, colorless and yellow make up a group of positive terms; in contrast, golden and brown are negative descriptors, expressing that the white wine has been aged too long (Nguyen & Nguyen, 2015).

In Vietnam, herbal medicines like ginseng, ginger or jujube have the bodies of animals such as snakes, seahorses or termites added in the white wines for fermentation over an extended period. This is to increase the wine's healthful properties such as nutrition or medicinal effects, but also for flavor improvement. The herbs or animals are placed into a big jar and kept a long time to dissolve in the liquor. As a result, the alcoholic strength of white wine with soaked herbal medicines or animal bodies is *very powerful*, with an alcohol concentration of more than 45% (Ly, Cung, 1969; Nguyen, 1990).

b) *Violet glutinous rice wine*

The other special Vietnamese wine is violet glutinous rice wine, which derives from the ethnic Muong people in Thanh Hoa province. Regarding the sensory properties of this type of wine, the product is a liquid emulsion mixture. The color of this wine is purple or red violet, coming from glutinous rice fermentation. The aroma is like sticky rice, with sweet-smelling flavors (Gia, 2000; Nguyen, 2001).



### *c) Grape wine*

Vietnamese grape wine is similar to Western grape wine in terms of raw material, wine making process, fermentation process and wine sensory evaluation.

## **1.2. EXPERT DESCRIPTORS ABOUT WINE**

### **1. 2.1. The international glossary of wine terms**

This section focuses on wine-tasting including observing the wine, smelling it, and the sensations relating to wine in the mouth. Moreover, it covers the descriptive terminology associated with visual (clarity and color), olfactory and gustatory sensations.

Morrot, Brochet, and Dubor (2001) carried out a comprehensive research of the language that professional evaluators use for sensory wine descriptions. Wine experts mix together sight (*yellow, red*), smell (*citrus, berry*), taste (*dry, sweet*), trigeminal (*tannic, cool*), hedonistic (*wonderful, good*), and idealistic (*honest, personality*) aspects to create the wine descriptive terms (Shepherd, 2017). There are three fundamental stages to tasting wine: appearance, smell and taste.

#### *a) Appearance*

Alan Young (1986) states the three major attributes of wine-sight consist of color, clarity and lighting, whilst Patrick Iland (1995) indicates clarity, intensity (the depth), hue (the shade), and viscosity in the description of wine-sight. The wine clarity ranges from *brilliant, star-bright, bright, clear, dull* and *cloudy*. The higher quality of wine is expected to be *bright* and *clean* (Alan Young, 1986).

Kolpan, Smith, and Weiss (2010) state the glass needs to be at about a 45-degree angle to allow identifying the true color of wine. Determining the types of wines at first sight, means first of all determining whether a wine is *white, rosé* or *red*. A *cooler* wine region results in a *pale* or *green* visual appearance of wine. *Younger*

white wines have tendency to be *paler*; for instance, a *golden* color wine chardonnay is for sure *oak-aged*. A *straw yellow* wine predicts a moderate flavor intensity and average age. The hue of *buttercup yellow* indicates the *powerful* flavors of an *aged* wine. Warmer climates produce the *deep yellow* color of certain white wine such as Gewurztraminer.

The *red* wine hue is associated with the grape skins and a *darker* grape skin results in a *deeper* wine color. The *red* wine hue varies from *purple, garnet, black* and *cherry*. *Young red* wines are more likely to be *mahogany, orange-red, and brownish*. Rosé wine colors range from *salmon* to *light pink* to *pale red* (Vine, 1997).

#### *b) Smell*

The smell of wine is related to the primary and the secondary smell, namely aroma and bouquet. Aroma originates from the grape type, whereas the fermentation process determines the wine's bouquet (Patrick & Gago, 2002). The UC Davis Aroma Wheel identifies the smell terms associated with twelve main groups: *floral, spicy, fruity, vegetative, nutty, caramelized, woody, earthy, chemical, pungent, oxidized, and microbiological* smells. We will go back on this later on (Patrick & Gago, 2002).

#### *c) Taste*

*Balance* is a characteristic of taste, which refers to a *harmonious* condition where no specific feature of a wine becomes predominant. *Body*, conversely, is related to *consistency*. *Thickness* refers to the content of alcohol. Patrick and Gago (2002) list typical descriptors of taste used when tasting wines: *sweetness, acidity, freshness, astringency, hotness, tactile, weight, attack, length, finish* and *aftertaste*.

Talking about wine tasting, Patrick and Gago (2002) introduce the category of “wine in the mouth” or mouth-feel sensations to refer to the impact of wine in the mouth, tongue and lips during wine tasting. There are several terms to describe the

varieties of mouth-feel sensations including *body* or *weight*, *hotness*, *peppery*, *smoothness/softness*, *roundness*, *viscous*, *creamy* and *astringency*. In-mouth sensations are not independent of other characteristics of taste such as *attack*, *freshness*, *balance*, *richness*, *tightness*, *finesse*, *elegance*, *complexity*, *length*, *structure*, *finish*, and *aftertaste* (Kolpan, Smith, and Weiss, 2010).

According to the perspectives of oenology (Price, 1976; Peterson, 2002), sweetness, acidity, body and aromas in the mouth are cornerstones in wine tasting evaluation. Fructose and glucose play a key role in producing sweetness. Other compounds producing a sweet taste are alcohol and glycerol. Therefore, wine sweetness evaluation is based on the level of *sugar* and *alcohol* (Price, 1976; Peterson, 2002).

Wine bitterness is the outcome of oxidation and bacterial growth in red wines due to the phenolic compound. Bitter differs from tannin, sour and sweetness. Astringency is caused by tannin interacting with protein in the mucous membranes in the mouth following puckering of the membrane (Armerine & Rossler, 1976; Vine, 2000; Henderson, 2002). Astringency is used to describe the *dry* effect.

Tartaric acid is a major acid in wine; it is higher in grape wine than other fruit drinks. The level of acidity in wine tasting is measured as being *excessive*, *balanced* or *insufficient*. Malic acid has a role to play in *green apple* wine taste, while gluconic acid is responsible for *rotten grape* wine and *citric acid* gives a *citrus* wine taste (Peynaud, 1987; Koplán, Smith, Weiss, 2002; Jackson, 2002). During fermentation, lactic acid produces a *sour cream* taste, while succinic acid evokes a *fruity* taste.

Acidity preserves wine *freshness* and is responsible for balancing the fruit and alcohol substances.

Body is the other term for defining the wine flavour and sensation. Body is based on the *alcoholic strength*, *flesh* and *tannin*. *Body* refers to the weight of wine in the mouth which may be also seen in alcohol degrees (Henderson & Rex, 2005; Peynaud, 1984). Additionally, body is known as an actual taste feeling connected

with the amount of “*power*” of the wine (such as “*tannin*”) for the evaluation of wine flavour sensation. Tannin is produced from the barrel in white wines and from grape skins, seeds and barrel in red wine. *Wood tannin* is identified by the roof and the back of the mouth, *grape skin tannin* is felt at the front of the mouth (Murphy, 1977). The power of wines aromas is related to the level of identification of the varieties of aromas in the mouth – *woody, caramel, nutty, herbaceous, fruity, spicy, floral, microbiological, oxidized, pungent, chemical or earthy*. This level of identification is categorised in terms of intensity, quality and nature (Murphy, 1977; Kolan, Smith, Weiss, 2002).

Sweetness is another element in consideration. The *sweeter* the wine is, the *fuller* and *richer* the taste is, yet an extreme level of sweetness could result in *unpleasant* feelings of taste. Dryness has a negative correlation with sweetness. It can reach a point of *harshness*; feeling too intense. Various sensations of wine stem from the combination of the above factors. For example, very *severe* and *austere* impressions are the result of a combination of low sweetness and high tannin, while a sharp and tart taste of wine is associated with low sweetness and high acidity. Increased sweetness will create an experience of flatness, with no uplifting freshness (Broadbent, 1979; Rankine, 1971).

Murphy and Withee (1986) also propose a model of *pleasure* and desirable and undesirable rating of sucrose. Von Sydow (1974) suggested that the ratings of *unpleasant* odours decreased in relation to an increasing amount of sugar. Additionally, McBride and Johnson (1987) found that the level of acidity is associated with lower ratings of flavour (Perng and McDaniel, 1989).

The extraordinary feature of odour/taste integration is that for a noticeable improvement to occur, the odour and taste components must be perceptually congruent (Frank, 1991). Therefore, the improvement created by an odor for a typical taste was determined by similar ratings of odour and taste (Frank, 1991). The importance of this congruence emerged from behavioural studies on the

interaction between odour and taste (Dalton, 2000). The importance of associative and memory processes in the interaction between odour and taste emerge from numerous studies (Frank, 1991; Stevenson, 1995; Schifferstein & Verledgh, 1996).

However, multi-sensory integration of odours and taste seem also to exist independently of experience. North (2011), for instance studied the influence of background music on the taste of wine. Participants tasted white wine and red wine while listening to background music of different types, i.e. *powerful* and *heavy*, *subtle* and *refined*, *zingy* and *refreshing*, *mellow* and *soft*, with no music, before rating their preference for wine. A considerable influence of the background music was found. Similarly, Spence and Shakar (2010) found that visual cues can impact in estimates of the intensity of flavour (see also Zampini, Sanabria, Phillips, & Spence, 2007; Zampini, Wantling, Phillips, & Spence, 2008).

Additionally, Spence and Shankar also studied the impact of auditory functions on gustatory responses to wine. The perception of sounds that people make when drinking wine and the sound of packaging is also mentioned. North and Hargeaves (2003), report that background music can affect a customer's behaviour of purchasing. People show a higher inclination to select more expensive wines when listening to pop music and classical music during their purchase as compared to a no-music background. Similarly, customers tend to spend more in a restaurant when classical music is in the background (North, Shilcock, and Hargreaves, 2003).

### **1.2.2 The importance of sensory descriptors in defining the identity of a wine**

*“Each wine tells its own story. A wine's color starts that story by setting the scene. Summers in Northern Europe are fresh which reflects the color of the young wine Riesling like green and silver highlighting a watery gold. Because of California's generous sunshine, the Chardonnay is golden; and a Tokaji in Hungary is made in autumn which enables its color to become orange. Madeira displays walnut and oak hues, while the African sundried wine from the Pedro Ximenez grape promises a syrupy sherry wine. The geography of Provençal is related to the height and the*

*wind-ruffled hill regions which produce pink rosé wines with silver delicacy. The unfettered warmth of Australia results in plum-pink wine with the exuberance of tastes; meanwhile, the stormy summer promises a light and pomegranate red burgundy wine. The fine young Bordeaux is associated with the crushed blackcurrant and elderberry. The glowing heat of Australian summers indicate a purple-red Shiraz; Madiran in the south of France produces a textural tannin and leather-jacket hue wine which is originated from the Tannat grape. The old Portuguese Dao has a reputation for its dark red colors like brick” (Jefford, 2008, pp. 38).*

The wine smell transforms with time. From the *exuberant, lively, crisp, tingling acidity* of youth, the wines will become increasingly *honeyed* and *soft* before displaying a decrease in flavor quality, like the *fruit sweetness* begins to disappear and the wine gradually dries out. A *young 1975 Bordeaux* could be *austere, tough, raw* and *aggressive*; however, it needs to be basically in *balance* at the outset and *completely satisfying*. If the tastes are associated with *tannin, astringency* of youth, *balanced* by the intensity of the *fundamental berry fruity*, wines will *gradually soften*. The *dry* flavors will be *sharp* and *aggressive* if the bottle has ullaged (Halliday & Johnson, 2006).

Microbiological spoilage aromas are produced during wine-making and ageing as wine faults. *Oxidized* wine is a *spoiled* wine that is caused by over-exposure to air. Chemicals also produce *undesirable* odors because of failures in the wine-making processes, while an *earthy* aroma can refer to mold evoking the smell of a  *moldy cellar basement* and have an odour related to the typical compound of mushroom, namely 3-cisooctenol (Ough, Baker, 1961; Ough, & Winton, 1976; Jackson, 2000; cited by Jefford, 2008). On the other hand, the *pleasant* smells are associated with high quality sources of varieties of grape, good fermentation processes, and stabilization and maturation processes related to bottle age. While all the above-mentioned aromas are classified as either *pleasant* or *unpleasant*, *spice* is a

particular case: for instance, the aroma of *clove buds* is associated with both *pleasantness* and *unpleasantness*.

The bottle ageing stage plays an important role in the growth of a wine aroma and bouquet. The aroma will gradually be more *honeyed*, *nutty*, *smoky*, or *toasty*, based on the various kinds of wines. During time, Riesling may become *toasty*; meanwhile, Semillon bouquet becomes strong *honeyed/nutty*; Chardonnay *intensely honeyed* related to its quality (Halliday & Johnson, 2006; Jefford, 2008). Additionally, the bouquet of a young Bordeaux wine will be *powerful*, still maintained by the aroma of its *fruit*. For *older wine*, *fully mature*, will increase an *intense bouquet* which is a *balance of fruity* and a *complex* matrix of *cedary*, *spirit*, and *earthy* esters that display a *fine* wine. Also, a *very aged* wine is *extremely fragile*. Wine's color with its aroma, flavor, taste and texture contribute to a wine's character. (Clarke, 2012).

### **1.2.3. Australian wine tasting and description**

The section introduces the Australian wine sensory experience descriptions based on the main sensory experiences in terms of color, aromas and taste. Additionally, this section gives an overview of the different kinds of Australian styles and wines and their descriptive terms.

The section introduces some examples of wine sensory descriptions based on Hartley (2011). This will be referred to different kinds of Australian wines and will therefore at the same time provide an idea of the sensorial features of some typical wines from this Country.

#### *a) Color*

According to Hartley (2011), white wine hues are *bright* and *clear*; if some *green* is present during *young age*, *the color can* transform from *lemon* to a *golden* color during *oaked age*. The grape skins result in the color of red wines. Pinot Noir has

thin skins which indicate a *lighter* color (e.g. a *ruby red* Pinot Noir wine). A Shiraz wine is *dense, dark* and *inky* because of *thick red* grapes. *Purple* predicts a *youthful* wine; whilst *brown* expresses *long ageing* and *deep oxidation*.

Common colour wine descriptors are reported in Table 1.

Table 1 - Common colour wine descriptors according to Hartley (2011).

<b>Common Color Descriptors</b>	
<b>White wines</b>	
<b>Descriptors</b>	<b>Descriptions</b>
Water white	Very young wine, 1-2-year-old, often unoaked and acidic
<i>Lemon- green- with pale, medium or deep intensity</i>	Common in young aromatic wines and sparkling wines
<i>Lemon – with pale, medium or deep intensity</i>	Common in 2 to 3-year-old white wines and may indicate oak treatment
<i>Gold – with pale, medium and deep intensity</i>	Common in older white wines or found in sweet wines
<i>Amber</i>	Well-aged and probably not at its best
<i>Brown</i>	Faulty wine



<b>Common Color Descriptors</b>	
<b>Red wines</b>	
Descriptors	Descriptions
<i>Pink, Salmon and Orange – with pale, medium, or deep intensity</i>	May indicate a <i>light red</i> Rose or sparkling wine
<i>Onion skin</i>	Pinot Gris or a Rose

<b>Common Color Descriptors</b>	
<b>Red table and Fortified wines</b>	
Descriptors	Descriptions
<i>Purple</i>	Common in young red wine, 1-2 years old
<i>Ruby – with pale, medium. Or deep intensity</i>	The most common terms in red wines
<i>Garnet</i>	The first sign of age in red predicted by orange
<i>Tawny</i>	Common in fortified wines and very old reds, 15+ years
<i>Brown</i>	Faulty wines, or the natural color of an old fortified.
Other descriptors for the color of red wines	
<i>Strawberry</i>	Pinot Noir
<i>Crimson red</i>	Young red wines
<i>Inky</i>	Shiraz

<i>Brick red</i>	The older red wines, 7-15 years old.
------------------	--------------------------------------

*b) Aromas*

There are three groups of aromas consisting of primary, secondary and tertiary aromas. Primary aromas originating from wine grape types are encouraged in Australian wines. The smells of *lemon, lime, apple, blackcurrant, pepper* and *nuts* are familiar in Australian wines; for instance, Pinot Noir is characterized by aromas of *cherries* and *strawberries*; while Sauvignon Blanc has a reputation to smell like *green capsicum* and *asparagus*.

Secondary aromas relate to the wine-making process; for example, American oak results in the smell of *coconut*; whilst *vanilla* is associated with French oak.

The maturation process also causes wine aromas (tertiary aromas). The smells of *bottled aged* white wines such as a ten-year-old Semillon from the Hunter Valley, are *honey* and *toasty-bread*, whereas, for instance, Cabernet Sauvignon and Shiraz wines are characterized by an aroma of *coffee, mocha* and *chocolate*. Common aroma wine descriptors are reported in Table 2.

Table 2 - Common aroma wine descriptors according to Hartley (2011).

<b>Wine styles</b>	<b>Wine types</b>	<b>Descriptive terms of wine aromas</b>
Sparkling wines	Brut	<i>Biscuity, toasty, doughy, citrus, grapefruit</i>
	Rosé	<i>Strawberry, floral, raspberry, redcurrant</i>
	Sparkling Shiraz	<i>Pepper, confectionary, spice</i>
White wines	Gewurztraminer	<i>Lychee, spicy, confectionary, rose water</i>
	Riesling	<i>Citrus, lemon, limes, toasty, kerosene</i>
	Sauvignon Blanc	<i>Gooseberry fruit, herbaceous, grassy, cut</i>

		<i>grass, capsicum, asparagus.</i>
	Semillon	<i>Lanolin, floral, grassy, lemon, lime, citrus, apple</i>
	Pinot	<i>Musk, pear skin, apple, mineral, stone fruit</i>
	Chardonnay	<i>Citrus, mineral, melon, tropical fruit, peach, cashew.</i>
Rosé wines		<i>Strawberry, cherry, perfumed, confectionary, raspberry.</i>
Red wines	Pinot Noir	<i>Strawberry, cherry, perfumed, barnyard</i>
	Merlot	<i>Herbaceous, violets, plum, berry</i>
	Shiraz	<i>Spice, white and black pepper, eucalyptus, plum, blackcurrant</i>
	Cabernet Sauvignon	<i>Blackcurrant, leafy, mint, berry, herbal, eucalyptus, gum leaves.</i>

*c) Taste (palate)*

The five major taste sensations indicated immediately on the palate consist of *sweet, sour, bitter, salt* and *umami*. However, The Palate Scales guidelines for evaluating wine tasting introduced by Hartley (2011) refer to 6 main dimensions: *sweetness, acidity, body, tannin, finish, and aftertaste*. *Sweetness* indicates the sugar level in wine. The *sweeter* wines are usually derived from the warmer climate grape regions such as the Barossa Valley.

Acidity is due to the number of acids the weather can produce in a wine. The scale varies from *low to high acidity: crisp, lively, or tart* are some of the terms used in this scale. Cooler areas of *balanced fruity* wines have more *acidity*, e.g. those produced in the Adelaide Hills. High acidity matches well with fatty food; for

instance, a young Riesling or Semillon is *wonderful* when matched with a deep-fried fish.

Tannin expresses a *drying, astringent, mouth puckering* impact on the palate. A Mornington Peninsula Pinot Noir displays a *light* taste, in contrast with a *rich* Clare Valley Shiraz. The descriptive terms referring to *tannin* are many: *green, ripe, fine, powdery, woody, and grainy* are some examples of them.

*Body* is identified as a combination of *the fruity, sugar, alcohol, acidity* and *tannin*. Australian Shiraz is known as a full-bodied wine; on the other hand, Pinot Noir tends to be a *light* bodied wine; and Sangiovese and Merlot are recognized as medium wines.

Hartley's (2011) Palate Scale dimensions are reported in Table 3.

Table 3 - Common palate wine descriptors according to Hartley (2011).

1. Dryness							
<i>Bone dry flinty</i>	<i>dry</i>	<i>Medium dry Semi dry</i>	<i>Medium sweet</i>	<i>Sweet</i>	<i>Very sweet Syrupy</i>		
2. Acidity							
<i>Non-acidic Flat Flabby soapy</i>	<i>Soft acidity</i>	<i>Medium acidity Lively</i>	<i>Crisp zesty</i>	<i>Assertive Steely</i>	<i>High acidity Tart</i>		
3. Body							
<i>thin</i>	<i>Light bodied</i>	<i>Light to medium bodied</i>	<i>Medium bodied</i>	<i>Medium to full bodied viscous</i>	<i>Full bodied</i>		
4. Tannin							
<i>Soft Mellow light</i>	<i>Velvety silky</i>	<i>chalky</i>	<i>Medium grainy</i>	<i>chewy</i>	<i>heavy</i>	<i>Strong Hard aggressive</i>	<i>Harsh Green unripe</i>

5. Finish		
<i>Short</i> <i>Dull/flat</i> <i>Soft</i>	<i>Medium</i>	<i>Long</i> <i>Acidic</i> <i>Tannic</i>
6. Aftertaste		
<i>Short aftertaste</i> (1-10 seconds)	<i>Medium aftertaste</i> (10-60 seconds)	<i>Long aftertaste</i> (plus 60 seconds)

#### 1.2.4. Descriptors “in action”: some examples of application of wine descriptors to Australian wines

There are many ways to categorize wines in terms of wine composition and wine-making techniques, of wine grape and wine regions. Based on wine composition and wine-making techniques, Patrick & Gago (2002) identifies five kinds of Australian wines: dry white wine, sweet white wine, sparkling wine, dry red wine, and fortified wine. The Royal Adelaide Wine Show Specifications - by the Royal Agricultural and Horticultural Society of South Australia - distinguishes eight categories of wine styles consisting dry white, *fragrant* and *flowery*; *dry white, soft* and *flinty* light to medium bodied; dry white, full bodied table wine; medium dry white, table wine; sweet white, table wine; dry red, fresh young table wine; dry red, medium bodied table wine; and dry red, full bodied table wine (Hartley, 2011).

##### a) *Dry white table wine*

According to Patrick and Gago (1995, 2002), Australian wine technology related to refrigeration, fermentation and yeast choices plays a significant role in the quality of Australian white wines, as well as their distinctive attributes. Australian dry white table wines vary from light to medium to full-bodied styles. For example, Riesling, Gewurztraminer, and Sauvignon Blanc have a reputation for being light to medium bodied style and display *dry, crisp, and refreshing characteristics*. Medium to full-bodied wines (e.g. Chardonnay, Semillon and Marsanne) have *complex* aromas and an *alluring tactile* sensory experience. Riesling originated from Riesling grape is well-known as a light-bodied wine and displays *freshness* and *intensity* of primary

*fruity* attributes *balanced* with a *crisp quality*. The hue of Riesling differs from *straw* to *light yellow*; the aged wine is *deeper yellow*. The primary *fruit* feature of Riesling aromas varies from *floral, fragrant, perfumed, rose-petal, cold tea, pear, lemon, citrus, lime, grapefruit, pineapple, fruity, passion-fruit to tropical fruit*. Due to the wine-making process, the flavor of Riesling can be *toasty or honey*; the bottle-aged Riesling indicates *youthful floral, citrus, and limey* flavors.

The different climate conditions of the wine region in which the Sauvignon Blanc are grown up and its wine varieties results in distinctive wine styles, such as *non-wooded, wooded* and *blended* styles. The varietal attributes of Sauvignon Blanc are described as *vegetal, asparagus, capsicum, tomato bush, freshly cut grass, grassy, gooseberry, passion-fruit, melons* and *tropical fruit*. Generally, Sauvignon Blanc is a light to medium-bodied wine with a *fresh, crisp finish* and *long aftertaste*. Its color varies from *straw* to *yellow* (Wood, 2006).

Semillon wines are from the cooler regions which predict livelier herbaceous, peapod, grassy flavors, harmonized with *lemon* and *citrus* features. The wooded Semillon wines aged in wood indicate a different level of *vanillin* and the other oak attributes. This technique results in *creamy, buttery* and *nutty* wines (Hartley, 2011).

Chardonnay white wines express well the fermentation technique. For instance, barrel fermentation predicts the *creamy, yeasty, vegemite, marmite, cheesy, bready, toasty* Chardonnay wines. The *creamy, buttery, butterscotch, yogurt* and *caramel* wines are derived from the process of the Malo-lactic fermentation, whilst barrel storage results in *vanilla, toasty, sawdust, cedar, olives, spicy, bacon, coconut, pencil shavings, dusty, cashews, smoky, burnt, caramel, raisin* and *charred qualities* (Hartley, 2011).

#### *b) Semi-sweet and sweet white wines*

Some semi-sweet and sweet white wines express a *complex* array of rich flavors mixed with *luscious sweet taste* and *balanced* with *refreshing acidity*. Semi-sweet

wines are produced in many Australian wine regions; however, the semi-sweet wines from Padthaway, Coonawarra and the Barossa Ranges of South Australia are influenced by a mold, namely *Botrytis cinerea* which produces the *murky, golden brown* typical color and *very sweet, rich* and *complex* tastes. There are two main kinds of sweet white table wines including the botrytis-affected sweet white wines and the non-botrytis-affected sweet wine wines (Patrick and Gago, 2002).

The botrytis-affected, known as *Botrytis cinerea* mold, are associated with distinctive flavors such as *apricot, marmalade, caramel, and honey*. The hue of Botrytis-affected Riesling and Semillon wines ranges from *yellow* to *deep golden*. The aromas and flavors are harmonized between *primary fruit* and *developed fruit* character. The descriptive terms of Riesling include *citrus, lime, pineapple, quince, crab-apple jelly, floral, perfume, passion-fruit, mango, tropical fruit, fruit salad, kumquat, apricot, dried apricot, honey, coffee, caramel, golden syrup* and *treacle*. The mixture of aromas, bouquet and flavors of Semillon are described as *herbs, spice, cloves, orange peel, mandarin peel, marmalade, apricot, dried apricot, honey, toffee, butterscotch, nutty, almond* or *marzipan* (Patrick and Gago, 1995).

The non-*Botrytis* affected semi-sweet white wines normally display an *intense floral fragrance* and *fruity taste*; The sweeter ones are more *complex, with honeyed* or *marmalade-like* attributes.

### c) *Sparkling wines*

Sparkling wines, often considered ‘*aperitif*’ style wines, come from different regions such as the Adelaide Hills in South Australian. The aromas and flavors are a mixture of primary fruit character. The primary fruit attributes originate from the grape varieties and include *lemon, citrus, grapefruit, tobacco, apples, melons, figs, floral, fruity, perfumed, strawberry* and confectionery sparkling wines. The features developed during storage are described as *yeasty, doughy, freshly baked bread, crusty bread rolls, bready, toasty, biscuity, meatiness, cold roast lamb,*

*bonox, vegemite, marmite, cashew, hazelnut, nutty, figgy, creamy, coconut, caramel, nougat, honey, honeycomb, almond, mushroom or truffle* (Hartley, 2011).

*d) Dry red table wine*

Australian red wine styles range from rose and light-bodied red to full-bodied red wines. Grenache and Pinot are light to medium-bodied styles. Shiraz is known as a full-bodied red wine; medium-to full-bodied styles are derived from the varieties Cabernet Sauvignon, Shiraz, Merlot, Malbec and Cabernet Franc.

Generally, the hue of red wines ranges from *red, red purple* through *brick red, red brown* and *brown*. Pinot Noir expresses from *cherry red* to *plum red* in color. The primary fruit characters consist of *strawberry, red cherry, raspberry, black cherry, violet, plum, stewed plum, beetroot, blackcurrant* and *prune*. During the wine-making process, fruit characters are developed into *earthy, cowyard, barnyard, gamey, bacon fat, mushroom* and *truffle*. The different wine-making techniques create other distinctive sensory attributes. For instance, the *spicy, coconut, smoky, chocolate* and *mocha* flavors originate from the barrel fermentation; in contrast, carbonic maceration results in *spicy, cinnamon* and *fruity* tastes (Patrick and Gago, 2002).

Cabernet Sauvignon is considered a medium to full-bodied wine. Some of Australia's best Cabernet Sauvignon are from Coonawarra and McLaren Vale in South Australia, the Yarra Valley in Victoria and Margaret River in Western Australia. Wynn's Black Label Cabernet Sauvignon (from Coonawarra) is a true icon, and one of Australia's most collected wines. A nose of pure Cabernet fruit. Fresh and inviting aroma of red and black cherries. Dried mint and fresh violets add floral lift. A seamless line of fruit from our terra rossa vineyards is supported by a fine tannin framework. Flavours of red cherry and plum are complimented by the secondary notes of walnuts and mixed cooking spice. Very intense yet elegant.



Moss Wood Cabernet Sauvignon is another excellent (but this time from Margaret River). It tasted like fortified; mid cherry red; pure fruited with cassis and damson; chewy tannins all tangled up with the sweet dark fruit on the palate. Rounded and generous but still so fresh; some fruit-pastille sweetness on the finish but overall it is elegant and refined. Lightish but persistent.

D'Arenberg Coppermine Road Cabernet Sauvignon is another excellence (but from McLaren Vale); with typical notes of blackcurrant, violets and cedar enhanced by a twist of mint and herb. The palate is streamlined and focused: a beautiful line of fruit, some sweetness, a hint of chocolate and raspberry with a nutty savoury edge. Tannins are chalky and long but the lasting impression you will get is one of fruit. A style of Cabernet from d'Arenberg that one may not expect from McLaren Vale but extremely true to its varietal heritage.

Dry red table wines can be assessed as follows. Three major criteria feature in evaluating the quality of dry red wine in terms of sight, smell and taste. Rosé style should be *light red* without orange tinges; young wines may display *purple* tinges; and aged wines express red/brown and *brown* color. The smell of quality red wines combines the *complexity* and *balance* of primary fruit and developed fruit characters. The assessment of taste for these red wines is based on 9 features: *intensity* and *balance* of characters; *pleasant mouth-feel* sensations; *freshness*; *balanced acidity*; *richness*; *complexity*; *finesse* and *elegance*; *persistent aftertaste* and the attributes of the *tannin* such as *supple*, *soft*, *pleasant*, *furry*, *grainy* or *astringent*.

Table 4 - Descriptive terms of Australian dry red table wines

	Primary fruit characters	Developed fruit characters
<b>Pinot Noir</b>	<i>strawberry, red, cherry, raspberry, black cherry, violet, perfumed, plum,</i>	<i>earthy, cowyard, barnyard, gamey, bacon fat, mushroom, truffle.</i>

	<i>stewed plum, rhubarb, beetroot, sappy, blackcurrant, prune.</i>	
<b>Cabernet Sauvignon</b>	<i>capsicum, herbaceous, cinnamon, menthol, eucalyptus, leafy, sappy, minty, violet, perfumed, dusty, berry, stewed rhubarb, cooked beetroot, blackcurrant, black olive, licorice, inky.</i>	<i>earthy, dusty, cigar-box, licorice, chocolate, coffee, mocha.</i>
<b>Merlot</b>	<i>herbaceous, fruity, aromatic, perfumed, violet, sappy, spice, cherry, plum, blackcurrant, mulberry, pumpkin, fruitcake.</i>	<i>earthy, dusty, cigar-box, licorice, chocolate, coffee, mocha.</i>
<b>Grenache</b>	<i>spice, cherry, raspberry, blackberry, plum, stewed plum, prune.</i>	<i>earthy, barnyard, gamey.</i>
<b>Shiraz</b>	<i>herbs, mint, spice, pepper, menthol, eucalypt, raspberry, dark, cherry, mulberry, blackberry, plum, blackcurrant, black olives, aniseed, licorice, prune, stewed plum, chocolate, jammy, raisin.</i>	<i>chocolate, earthy, barnyard, cowyard, cigar-box, coffee, gamey, meaty, salami, savory, leather.</i>

e) *Fortified wine*

Australia produces some of the finest fortified wines in the world which are *unique, luscious and complex*. Some of the best examples come from the north-eastern region of Victoria, namely Rutherglen. Sherry originated from white grapes, namely Palomino, and Pedro Ximinez consists of three major styles: Fino, Amontillado, and Oloroso. The colors of the three styles are different. Fino Sherry shows *pale straw, straw and pale gold*; on the other hand, *deep golden, golden amber* with *olive green* tinges are the hues of Oloroso Sherry; Amontillado Sherry

is *golden* and *deep golden*. Fino Sherry which is the *lightest in body* and has the *driest finish* shows *nutty* attributes; the taste of the Oloroso Sherry is *full, rich* and has a most *complex, fruity aroma*. The *tawny brown* fortified Port wines express the *harmonious smells* of *aged wine, oak* and spirit in combination with features such as *nutty, walnuts, dried fruit, prune, coffee, caramel or toffee*. Additionally, the young Vintage Port fortified wines are *ruby red* in color with generally *rich, ripe berry-fruit* aromas and flavors of *violet, raspberry, black cherry, spice, blackberry, blackcurrant, plum, anise or licorice* (Patrick & Gago, 2002).

In this section, by describing some representative wines of the Australian region, we have seen some examples of the sensory descriptors commonly used to characterize typical features and emphasize differences between different types of wines. Some of these descriptors will be the subject of the experimental studies developed in this Thesis.

### **1.3. OPPOSITES IN WINE PERCEPTION, LANGUAGE AND COGNITION**

#### **1.3.1 Opposites in wine perception (Intrinsic properties)**

Sensory experience is fundamental to the knowledge of objects in the real world (Cardello, 1992). Moreover, sensory experiences impact on the human mind and on human behavioural responses in different ways. Firstly, sensory experience triggers language descriptive responses and personal preferences. Secondly, sensory experience can relate to perceptual food preferences and therefore it changes behavioural responses. Thirdly, due to the intramodal and cross-modal communication between the senses, many types of sensory experience can transform the qualitative features of other sensory experiences (Cardello, 1992).

The assumption that information accumulated through the human senses and the direct perceptual experience is critical for human cognition, holds for food perception too. Food is normally classified with regards to a dimension of pleasantness-unpleasantness. The knowledge of sensory dimensions supports recognition of quality (e.g. *sourness, sweetness, length, finish, etc.*) (Cardello, 1992). Sensory messages reflect and inform a person about an object's characteristics. With regards to wine, the senses of taste and odour allow recognition of a perceived flavour; the latter combines with the awareness of vision to create a complete experience of wine. Learning and memory concurrently come into play, helping to construct contextual knowledge.

It has been acknowledged that opposites have a special status in the human cognition. They are not only crucial for natural language and comprehension of the world (Jones, 2002; 2007), but they also contribute to cognitive development and to human perceptual experience (Bianchi & Savardi, 2009; Savardi, 2009). This part of the chapter focuses on opposite sensory perceptions of wine and properties in terms of visual, olfactory, and gustatory sensations.

*a) Opposite properties of visual sensation*

Colour, hue, intensity, and clarity are among the characteristics of visual sensation in wine evaluation. Intensity is demonstrated by the amount of colour. Hue refers to the shade of colour. Clarity refers to a suspension of yeast cells in wine, i.e., cloudiness (or lack thereof). Brightness is luminosity associated with the intensity of light. The colour of wine plays an important role for wine sensory evaluation and to identify the age of the wine. White wine is mainly made from white grapes. Substances such as quercetin, flavones, chlorophyll are responsible for the colour of white wine (the colours range from *pale straw* through *pale yellow* to *rich gold* and *brown* and *amber*), while monoglucosides from red grapes influence the redness of red wine (which ranges from *pink* through *red* to finally *brown*) (Bakker, & Trinberlake, 1986; Amerine, & Rossler, 1976).

The role of opposites in vision has been given much attention by many scholars, even though not specifically in relation to food perception. It has been shown that dimensional contrast and oppositions play an important role in one's perception of the world in terms of space (Bianchi, Savardi, Burro, & Martelli, 2014; Borghi, & Cimatti, 2010; Gibbs, 2006). With regards to developmental psychology, some findings indicate that children start to recognize the midpoint of an object at the age of three (Cox & William, 1993; Rohles, 1971). Adults are able to estimate the centre of a mass of asymmetrical two-dimensional shapes and three-dimensional objects (Baud-Bovy & Gentaz, 2004; Cholewiak, Fleming, & Singh, 2015) and consistently identify the intermediate region among two opposites poles when describing spatial dimensions (Bianchi, 2013 et al., 2011a; Bianchi et al., 2013; Bianchi, et al., 2017).

Going back to wine, it is certain that visual perception is one of the key points of the wine tasting experience.

There are at least two dimensions used in the expert lexicon of wine to refer to visual aspects that are based on opposites. The hue of *red* wine (*red* and *brown*) and *white* wine (*pale* and *amber*) are associated with opposite shades of colour. A contrast between the two shades of colour in terms of opposite features can already be noticed here, but it is in relation to *Brightness* and *Clarity* that opposites explicitly come in. Brightness of wine colour (which is improved by *high acidity*) is usually described as ranging between the properties *bright* and *dull*. Clarity (which refers to the amount of suspension of yeast cells per millilitre) is described by the opposites *brilliant* (if the number of cells is from 0 to 10,000) in contrast with *turbid* (if it is more than 10,000) (Barkker & Trinberlake, 1986; Rankine, 1990; Jackson, 2000; Vine, 2000).

#### *b) Opposite properties of Wine Olfactory Perception*

There are various methods to classify the diverse types of wine smells. Rankine (1990) reported that there are four kinds of wine aromas including varietal, fermentation, bouquet, and maturation character. *Varietal* is characteristic of a typical grape when it is planted in the suitable conditions; therefore, the smell of wine originates from the compounds of this varietal aroma of grape. The fermentation bouquet odours come from the process of yeast fermentation as the smell of the wine derives from the maturation processes, like cask maturation or bottle age. The volatile components originate from aldehydes, esters, ketones and alcohols. The aroma of wine comes from the grape type, while the bouquet originates from wine ageing processes such as enzymes, alcohols and esters.

The Davis aroma wheel (Figure 1) is a system which helps to classify wine smells, consisting of a visual graphic of the different categories and aroma components that one can encounter in wine. The terminology used is standardized. The wheel breaks down wine aromas into 12 basic categories and then further subdivides into different aromas that can fall into those main categories

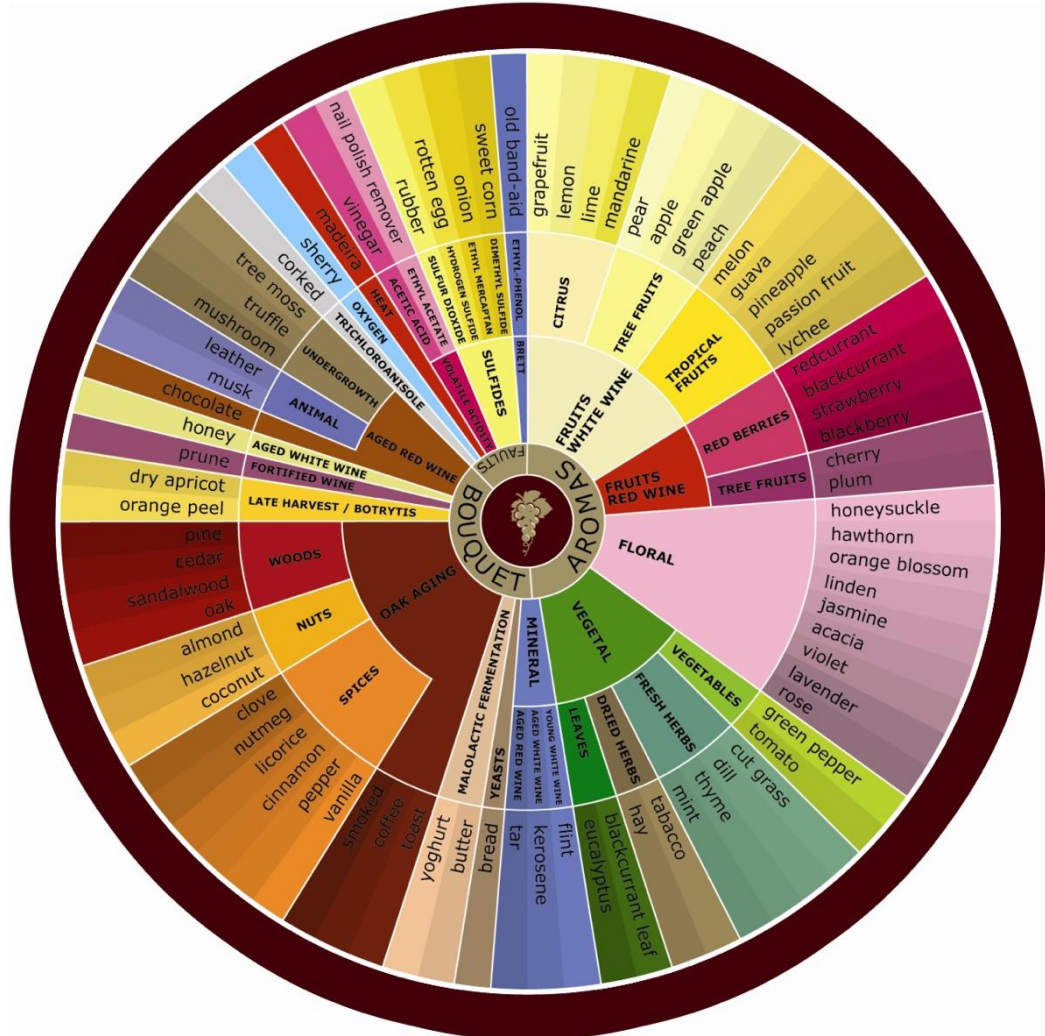


Figure 1 - Wine Aroma wheel [figure taken from Henderson J. P., & Rex, D. (2005). *Tasting wine. About wine.* New York: Thomson Delmar Learning.]

The description of each category suggests information about the origin of the ingredients or important aspects of the wine-making process (Henderson & Rex, 2005; Jackson, 2000). Opposites are not clearly visible here, since the various characteristics of bouquet and aromas are not identified in a bipolar manner, i.e. contrasting opposite features. Before continuing our analysis and discovering how opposites play a role also in the sensory description of wine smells let us linger for a moment on one issue relating to how opposites are conceptualized, in general.

There has been a debate in research methods in Psychology around the assumption of uni-dimensionality in opposite scales. The idea of one continuum in which two opposite properties co-exist has been the basis of various experimental methods in psychology (the Likert scales or the semantic differential, for example). At the same time, it has been shown that participants' responses based on opposite wording or reverse-coded items do not lead to exactly the same results (Billet & McClendon, 2000; Burro, Savardi & Bianchi, 2008; Savardi, Bianchi & Burro, 2009; Harris & Bladen, 1994, McGee et al., 1989; Rodebaugh et al., 2007). There could be several reasons for this, but it could also be the case that the assumption of a continuum is in fact faulty. The reasons to mention this aspect here, is that the terms used in the aroma wheel (which are related to substances and not directly to specific properties), are not directly modelled in terms of oppositional scales. However, they are dealt with as connected to the pleasant-unpleasant dimension. In wine aromas, there are two opposite groups identified by experts as corresponding to *pleasant* smells and *unpleasant* smells. *Woody, caramel, nutty, herbaceous, fruity, floral* are recognised as the *pleasant* smells; in contrast, *microbiological, oxidized, pungent, chemical, earthy* are recognised as *unpleasant* smells (Bedichek, 1960; Blonston, 1985).

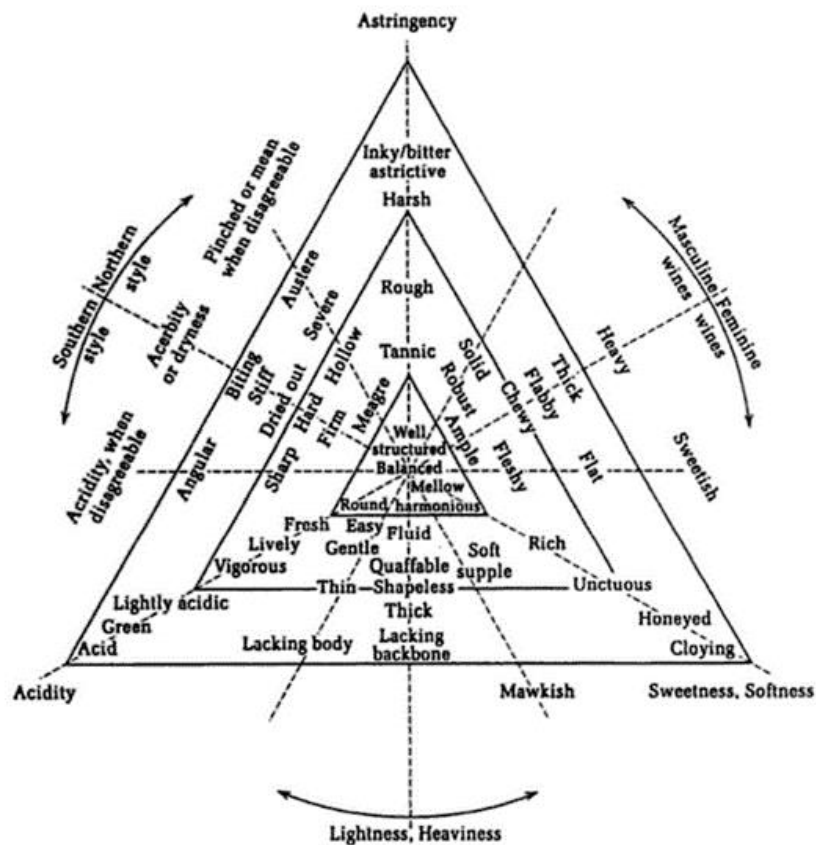
The hypothesis that opposition is a useful approach to wine odour sensation experiences holds beyond this association with the *pleasant – unpleasant* dimension for intensity, quality and length. These are characteristics assessed by experts in wine olfactory examination which are explicitly modelled in terms of oppositional dimensions. Intensity refers to the amount of wine aroma and is described as *powerful* in contrast with *feeble*. In the evaluation of odour quality, experts use a scale that ranges from *very fine* to *unpleasant* while the evaluation of the length of a wine aroma is based on the opposition between *long* length and *short* length (Ough, Baker, 1961; Ough, Winton, 1976).



c) *Opposite properties of Wine Gustatory perception*

Many studies have shown that there are four fundamental wine taste qualities, consisting of saltiness, sweetness, sourness and bitterness (McBurney, 1974; McBurney and Gent, 1979; Ronald Jackson, 2000). Each taste quality is determined by a set of stimuli and mechanisms of molecular intercommunication with the taste receptor cell. In the relationship of gustatory perceptions and wine origins, the sourness of wine comes from the varieties of grape or *citrus fruits* and are related to proton-donating molecules. Many non-nutritive sweeteners such as saccharine are responsible for eliciting the sweet taste (Ganzevles and Kroeze, 1987). Saltiness is based on the stimulation of ions in solution, for instance, the sodium ion (Na<sup>+</sup>) plays a key role in eliciting the salty taste (Bartoshuk, 1980; Murphy, 1981). The bitter taste of wine is caused by alkaloid (Tanimura and Mattes, 1993). This, from a chemical and physiological point of view. What about the perceptual experience of these features? Are opposites somehow involved?

The “triangle de Vedel” defines a red wine structure in terms of balance of the three components to be evaluated, that is *astringency*, *acidity* and *sweetness*. Based on the proposed criteria, the lists of adjective descriptors of each component is associated with the identification of strengths and weaknesses of a red wine (Arroyo, 2015). Opposites are explicitly involved in this model of wine gustatory perception. Indeed, according to the “triangle de Vedel” (see Figure 2) there are three fundamental axes of taste balance, consisting of a right axis (masculine-feminine), a left axis (southern-northern), and a middle axis (lightness-heaviness). Feminine has to do with *sweetness* and *softness*, whereas *masculine* has to do with *astringency* flavors in red wine tasting. Based on the left axis, southern style wine is characterized by a higher level of *acidity*, in contrast with northern style wine which is associated with *astringency*. The middle axis indicates the *lightness* and *heaviness* of red wine. *Heavy* wine is *sweeter*, while *light* wine is associated with more *acidity* in wine-tasting (Bruce, 1999).



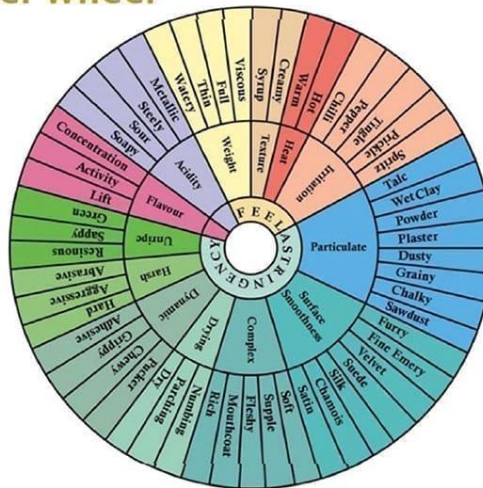
A graphic representation of terms relating to balance (after Vedel).

Figure 2: The figure shows the relationship of *acidity*, *sweetness* and *astringency* based on the axes dimension of wine tasting balance. [figure taken from Broadbent, J. M. (1979). *Wine Tasting-Enjoying and Understanding*. London: Christie's Wine]

In Vedel's triangle, the center of the diagram represents a *perfectly balanced* taste, where the three distinct axes are in equilibrium. It follows that *imbalance* corresponds to a factor that either predominates or subdues in relation to other factors. The layers of the triangles growing in size, moving away from the center, depicts a displacement from fine wine, with the outer triangle symbolizing unacceptable wine (Broadbent, 1979).

Another way of modelling aspect related to the gustatory experience of wines is the wheel of descriptors for mouth-feel perceptions put forward by Gawel (2000, see Figure 3). The mouth-feel wheel assists tasters to indicate the profile of mouth-feel properties and to rate their intensity. The innermost circle subdivides the mouth-feel terminology into two categories, namely *feel* and *astringency*. Things become more specific in the following circles, where *feel* is divided into *weight*, *texture*, *heat*, *irritation*, and even more in the outer layer; for example, *weight* is divided into *viscous*, *full*, *thin*, and *watery*; while *creamy* and *syrup* are descriptors for the texture of wine. The amount of taste (in the domain of weight) can be described as *powerful*, *average*, *weak*. Body is also identified in terms of weight of wine in the mouth and *watery*, *very light*, *light*, *medium* used in this context for wine description. *A very light wine* can cleanse the palate; in contrast with *an oak-aged wine*, which can come close to deadening the palate (Gawel, 1998; Gawel, Olster, & Francis, 2000). Both of these scales (the one referring to the amount of taste and the other to body characteristics) involve oppositional dimensions.

### Mouthfeel Wheel



**UCDAVIS**  
UNIVERSITY OF CALIFORNIA

Gawel, Oberholster, Francis (2000) Austr. J. Grape Wine Res.(6) 203-207

*Understanding and describing the sensory experience of wine for Italian, Vietnamese and Australian non-expert consumers – Hang Thuy Truong*

PhD thesis

Verona, 22 February 2022

Figure 3 – Gawel’s wheel of descriptors for mouth feel perception [figure taken from Gawel, Oberholster & Francis (2000). A ‘mouth-feel Wheel’: terminology for communicating the mouth-feel characteristics of red wine. *Australian Journal of Grape and Wine Research*, 6(3), 203-207].]

### **1.3.2 An application of the LOC approach to the analysis of the language of wine (LOC)**

Cognitive Linguistics tends to consider meanings as entities produced by the mind and reflecting our perception of the world. Based on the framework of Cognitive Linguistics, the model of Lexical meaning as Ontologies and Construal’s (LOC) developed by Paradis (2005) emphasises the fundamental role of conceptual structures and flexibility of language in natural communication to define lexical meanings. The purposes of this section are a) to give an overview of the LOC approach; b) to identify experiences of wine sensory perception in terms of *vision*, *smell*, *taste* and *touch* based on Cognitive Linguistics (Langacker, 1987) and within the model of the LOC approach (Paradis, 2005); c) to describe the construals of meanings in the LOC approach which specifically concern wine sensory descriptions.

Following the framework of Cognitive Semantics (Langacker, 1987; Talmy, 2000; Cruse, 2002), the LOC considers lexical items as a means to tap into the mechanism behind meaning generation. The components of the cognitive semantic framework can be seen in Figure 4.

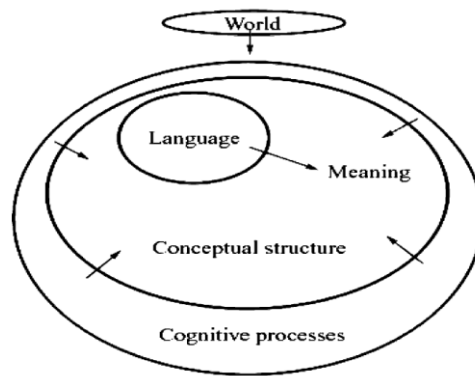


Figure 4. The components of the cognitive semantic framework [figure taken from Paradis, C. (2005). Ontologies and construal's in lexical semantics. *Axiomathes*, 15, 541-573. DOI 10.1007/s10516-004-7680-7]

The figure makes clear that cognitive processes (construals) play an important role in defining conceptual structures. The functioning between conceptual structures and meaning generates understanding and is also responsible for lexical changes by allowing new links to be created (Paradis, 2000, 2001, 2003). There are several factors that have a critical influence on lexical meaning, including encyclopaedic knowledge and conventional modes of thought in different contexts and situational frames.

Ontologies are considered fundamental to how human beings perceive the world with regard to what things are (content structures) and their configurational structure. This is reflected in the conceptual level, which includes two types of structures known as content structures and schematic structures or configurational structures which operate on the meaning level (Cruse and Torgia, 1996; Paradis, 2001). In natural communication, content structures are associated with object properties such as *people*, *artefacts* and *events*; on the other hand, configurational structures relate to schematic structures like *things/relations*, *part/whole*, *scales*, *boundaries*, *degree*, *order*, and *modality*. Table 5 summarises content and configurational structures which are relevant in wine experience, according to the LOC approach. The left column specifies four general content ontologies, in terms

of spatial matters, temporal events, processes and states, of which some examples are *colour, smell, taste, wine, grape variety*. The configurational structures in the middle column are free ontologies that apply to various content ontologies; for examples, *scale* and *part-whole*. The configurational structure is responsible for how human beings perceive the world, and particularly in the case at hand, how people structure sensory perception of wine. The operations shown in the right column refer to the cognitive processes that are actually activated at the time of use (in relation to the sensory perception to be described).

Ontologies (Conceptual Structures)		Cognitive Processes
Content Structures	Configurational Structures	Construals
Pre-meaning associating with concrete spatial matters, to temporal events, processes and states (e.g., <i>color, smell, taste, touch, wine, grape</i> ).	Pre-meaning of an image-schematic kind which combine with the content structures (e.g., <i>scale, part-whole</i> ).	Operations acting on the pre-meanings at the time of use (e.g., Gestalt formation, salience, comparison)

Table 5 - Ontologies and Cognitive Processes in Meaning Construction [figure taken from Paradis, C., & Eeg-Olofsson, M. (2013). Describing Sensory Experience: The Genre of Wine Reviews. *Metaphor and Symbol*, 28, 22-40]

a) *The content structure of Wine Language*

“Ontologies are central to the debate about the putative linguistic in meanings of lexical expressions” (Paradis, 2005, p. 548).

According to Lyons (1977), there are three kinds of content structures, consisting of first-order entities, second-order entities and third-order entities. First-order entities include physical objects such as *plants*; second-order entities refer to

properties of first-order entities, namely *processes* and *states*; and third-order entities are abstract meanings related to *concepts* or *ideas*.

*Objects*, *location*, and *processes* are relevant in wine language identification based on the content structure of the LOC (Paradis 2005; Henderson & Rex, 2005). *Object* is relevant in that *animals*, *people*, *plants* and *artefacts* all play a role in the lexical meaning of Wine Language. There are three main types of wines (white wine, rose wine and red wine) that are based on the colour of wine. For the aromas of red wines, ‘darkish objects’ such as *raspberries*, *black cherry*, and *chocolate* are descriptors to indicated the ‘darkish’ hue of red wines, while ‘lighter objects’ like *honey*, *melon*, *herb*, and *orange* are relevant for the smells of white wine (Lehrer, 1975). *Location* is relevant in that it refers to the origin of wine such as *Bordeaux Wine*, coming from the Bordeaux region of France, or *Mau Son wine*, coming from the Mau Son region of Vietnam.

*Processes* associate a situation profiled as *thing* with specific features such as *dynamicity* and *boundedness*. For example, with regard to wine language, in the fermentation stage of the wine-making process, the way in which fermentation is activated draws the contrast between *natural wines* and *fortified wines*. The amount of carbonate is a standard for discriminating between wine types. In the wine industry, table wine refers to a uncarbonated wines while sparkling wine is recognised as a *carbonated wine*. Particularly, *champagne wine*, one of the favourite wines in the world, is made from natural fermentation and carbonating in the wine-making process. In the wine-making process, slow oxidation results in wine browning, which means that red wines lose vibrant red hues as they become older. In the framework of the Davis color wheel, Patrick and Gago (2002) state that *garnet*, *brick red*, *tite red* and *red-brown* are terms which are usually used for describing the color of the Australian fortified red wines; on the other hand, *walnut*, *bronze*, *dark amber*, *golden amber* and *yellow-gold* refer to colour descriptions of *fortified white wines*.

*Object* descriptors are clearly implied also in descriptions of aroma; i.e. *woody, caramel, nutty, herbaceous, fruity, spicy, floral, microbiological, oxidised, pungent, chemical, earthy*. These objects generally inform about the origin of odours.

The next circle in the Aroma wheel is more specific. At this level, for instance, *fruity* is specified in terms of *citrus, berry, tree fruit, melon, tropical fruit or cooked fruit*. The outer circle is even more specific; for instance, *citrus* is subdivided into *orange, grapefruit, lemon or lime*. The aroma wheels presented here make clear that the descriptors of wine smell are based on *objects* in terms of content structure in the lexical meaning (Merit, 1997; Jackson, 2000).

*Artefacts* are man-made entities. *Natural objects* are parts of living beings and anything or anything produced by human beings” (Paradis, 2005, 2010). Concrete word meanings allow representations to be generated in our minds, relating to sensory experiences that are already integrated in our daily-life experience (Huang, Lee, & Federmeier, 2010). Other adjectives used to describe wine refer to the domains (content structure) of *length, merit, and weight*. For instance, long or short are used to describe the *length* of a wine aroma; descriptors such as *racy, distinguished, fine, ordinary* (which are used in aroma quality evaluation) refer to the domain of *merit*, which has to do with the level of pleasantness of a wine aroma; *adequate, and feeble* are descriptors of aroma intensity in the domain of *weight* which refer to the strength of a wine smell.

In gustatory evaluation, there are four main elements which concern sweetness, acidity, body and aromas in the mouth. Lehrer (1975, 2009) lists more than 238 wine descriptors – many of which refer to the dimension of flavour (e.g. *tannin, body, freshness, astringency*) – and suggest that *too much of a dimension, the right amount of dimension and too little of a dimension* are useful values to define *acidity, sweetness, balance, astringency, age, body and finish*. Herdenstam (2009) introduces the term *Syrupy* to describe both sweetness and balance of sugar. *Sour* is used for acidity and balance of acid description.



The scales of wine descriptors developed by a British organization, the Wine and Spirit Education Trust (WSET), to describe the sensory experience of wine in terms of LOC relate to both content structure and schematic structure, as will be clear in a while, after having referred to configurational aspects.

To sum up, based on the model of Lexical meaning as Ontologies and Construal's (LOC) developed by Paradis (2005), the conceptual structures of langue on the one hand, and the flexibility of language in natural communication, on the other hand, both play a role in modelling the comprehension of people's sensory perception of wine in terms of non-expert dimensions. All the aspects discussed in this section suggest that the language of wine can in effect be analysed in terms of *content* structures foreseen by the LOC approach; but what about the aspects of the LOC that are called configurational aspects?

*b) Configurational structure in wine language*

In terms of LOC, configurational structures involve schematic structures like *boundaries and scales*. This part of the review not only discusses the modification of *degree* based on the LOC model (Paradis, 2005), but also explores the use of *degree* modifiers in English in wine sensory language. Based on the general model of lexical meaning (Paradis 2003b, 2004, 2005) and the framework of Cognitive Semantics (Langacker 1987a, Croft & Cruise, 2004), Paradis (2007) states that the modifiers of *degree* express *degree* in its purest form. *Degree* is a *boundedness* configuration in the conceptual space. *Degree* modifiers operate on the *degree* structure of the meanings they apply to.

TOTALITY MODIFIERS		SCALAR MODIFIERS		
Maximizers	Approximators	Boosters	Moderators	Diminishers
absolutely	almost	extremely	fairly	a bit
perfectly	nearly	highly	pretty	a little

totally	virtually		very	quite	slightly
...	...		...	...	...

Table 6. The paradigms of modifiers of *degree* and examples of lexical items of each type [figure taken from Paradis, C. (2008). Configuration, construal's and change: expression of *degree*. *English Language and Linguistics*, 12(2), 317-343]

Following Table 6, there are two major kinds of *degree* modifiers, totality modifiers and scalar modifiers. Totality modifiers refer to a definite *boundary*, whereas scalar modifiers are *unbounded* and identify a *scale*. Maximizers and approximators are recognised as two kinds of totality modifiers which refer to a maximum (or *boundary*).

On the other side, there are three types of scalar modifiers: boosters, moderators and diminishers. Boosters strengthen the impact on the modified property (e.g. *highly*, *very*); conversely, diminishers weaken the property (e.g. *a bit*, *a little*, *slightly*). Moderators like *fairly*, *quite*, *rather* (Paradis, 2007) refer to evaluations of the middle range.

According to the descriptors developed by the University of Adelaide (Australia), evaluation of wine brightness is based on the descriptors *vivid*, *lively*, *bright*, *dull* and *flat*. *Vivid* means *extremely bright* while *lively* is *very bright*. On the other hand, *flat* means *a little bright*. (Johnson, &, Robinson, 2009; Jackson, 2000)

Based on the model of the grading functions of *degree* modifiers (Paradis, 2007), maximizers and approximators are involved in expressions such as *absolutely sweet*, *totally sweet* and *perfectly sweet* indicate that the degree fall short below that maximum *boundary*. On the other hand, *semi-dry*, *dry* and *brut* are descriptors which attenuate the property of wine sweetness. *Semi-dry* refers to fairly sweet or pretty sweet and locate the experience at the middle range of the dimensions, while *brut* is a descriptor for a little sweet. In terms of the WSET scales, *luscious*, *sweet*, *medium sweet*, *medium dry*, *off-dry* and *dry* are the descriptors for evaluating the

sweetness of wine and they are all based on *degree* modifiers. *Luscious* is recognised as *perfectly sweet* (booster in terms of scalar modifiers) while *medium sweet* and *medium dry* involve moderate modifiers; *flabby* implies a *little acidity* and *balance* (i.e., *pretty acidity*) and therefore refers again to a moderator in terms of degree scalar modifiers (Merrit, 1997; Herdenstam, Hammaren, Ahstrom, & Wiktorsson, 2009; Paradis, 2007). Furthermore, *very fine*, *elegant*, *pleasant*, *common* and *faded* which are used for describing quality of aromas in the mouth all following the paradigms of *degree* modifiers. In particular, *very fine*, and *elegant* are boosters scalar modifiers (they have a reinforcing impact on the modified quality) whereas *faded* is a diminisher degree modifies of the target taste property.

### 3.1.3. Degree, oppositeness and boundedness

The semantic structures that serve as the basis on which modifiers operate is revealed by the various types of modifiers that are possibly used (Paradis, 2000, 2001; see Figure 10).

Configurational Meaning Structures	NON-DEGREE			No one
	DEGREE	Complementarity (NON-SCALE)	BOUNDED (closed)	totally
		Contrariety (SCALE)	UNBOUNDED (deep)	quite
			BOUNDED (dull)	absolutely
	GRADABILITY	OPPOSITENESS	BOUNDEDNESS	DEGREE modifiers

Table 7 - Configurational Meaning Structures [figure taken from Paradis, C. (2007). Configuration, construals and change: expressions of *degree*. *English Language and Linguistics*, 12(2), 317-343]

Different kinds of combination of *bounded*, *unbounded scale* and non-scale may well match most meaning structures representing *things* and *processes* in language communication. According to configurational meaning structures, *degree* structures are subdivided into two kinds of oppositeness, consisting of complementarity that is recognised as *non-scale* and contrariety that is connected with *scale* configuration. Moreover, there are two modes of *boundedness*, namely *bounded* and *unbounded* configurations. *Non-scale* is always *bounded*; for instance, opposites such as close and open may be used to indicate complementariness in the sense that they subdivide a conceptual domain in two opposite parts. *The door is opened* entails that *The door is not closed*, and *The door is closed* entails that *The door is not open*.

On the other hand, *scale* can be both *unbounded* and *bounded*. For example, *clear* and *muddy* presuppose a *bounded scale* that is used to define wine clarity appearance, and in fact modifiers such as almost or absolutely apply to them (e.g. *absolutely clear* or *almost muddy*). Conversely, *very clear* or *terribly muddy* or *very pale* or *highly deep* reveal an *unbounded scale* configuration (Paradis, 2005, 2007; Paradis & Willners, 2006, Bianchi, Savardi, Burro & Torquati, 2011).

#### **1.4 CROSS CULTURAL ASPECTS IN WINE DESCRIPTORS**

Consumers from geographically and socially distinct provenience have different preferences for wines. It is well-known that there are cultural differences between Asian and Western in terms of food preferences, for instance. Also, with regard to wine, the Asian market is quite different from the European market, in terms of both preferences and cultural values (Lee, Zhao, & Ko, 2005).

With extrinsic attributes of wines, we refer to those characteristics associated with wine but that are not physically part of it, and consist of features such as brand name, price, label, awards, wine origin, society, drinking culture, consumers' personalities and attitudes (Rodrigues, 2019).

### **1.4.1 Wine brand name, label and origin**

There are several studies that indicate that extrinsic attributes of wine can have an impact on what people perceive, appreciate and how they behave (Pilar and Navajas, 2014; Parr and Ballester, 2015).

Parr and Ballester (2015) pay much attention to wine description in terms of “minerality”, which is a familiar aspect focused on in this decade. The objectives of their studies are to examine the cultural differences in perception of minerality in wines between France and New Zealand which are known as two distinctive wine regions and have different wine industry history. Thirty-two French and 31 New Zealand wine professionals assessed 16 wines under three attributes relating to orthonasal olfaction, global olfaction, and nose-clip sensation. The results were that both French and New Zealand (NZ) participants reported to identify minerality by means of all three perception modes. This emerged both from quantitative assessments of minerality and descriptors used to refer to the characteristics of the target wines. A cross-cultural similarity was that participants from both cultures employed similar criteria to make such judgements. Participants from both cultures described the New Zealand wines as different because of their being aromatically expressive, with pyrazine, and other herbaceous notes; the difference from the French wines appeared to be driven by perception of distinctive wine features (complex, tropical, faulty, and oxidized). A cross-cultural difference was that the descriptor ‘mineral’ appeared to be more significant in driving sorting behavior for French than for NZ participants. Additionally, “the study demonstrated that NZ participants, and the interaction of participant culture and wine origin, can be interpreted as New Zealanders having more exposure to French wines than French wine professionals have had to NZ wines due to the relatively youthful nature of the NZ wine industry.” (Parr, Ballester, Peyron, Grose, & Valentin, 2015, pp. 131; see also Mouret et al., 2013).

In 2013, a cross-cultural study of wine consumers with regard to health issues of wine was carried out by the National Wine and Grape Industry Center at Charles Sturt University in Australia (Yoo, Saliba, MacDonald, Prenzler, & Ryan, 2013). The aims of the study were to investigate consumer preferences and consumption behavior in relation to a series of health issues. Korean and Australian participants were recruited for a quantitative questionnaire concerning the consumers' attitudes towards wine, alcohol consumption, wine purchasing behaviors, and gender differences in wine consumption. In regard to consumers' attitudes towards wine, participants provided their response on a 7-point agreement scale ranging (I strongly disagree, disagree, somewhat disagree, undecided, somewhat agree, agree, and strongly agree). Taste/flavor was rated more important for Australian participants as compared to Korean participants ( $F(1,667) = 31.84, p < 0.001$ ); conversely, health improvement had a more important role underlying wine choice for the Korean respondents than the Australian ones ( $F(1,667) = 73.79, p < 0.001$ ). Moreover, the Australian respondents tended to agree that red wine has more health boosting attributes than white wine, whereas Korean respondents were undecided on this issue ( $F(1,667) = 73.46, p < 0.001$ ).

The results associated with alcohol consumption indicate that Australian people drank significantly more wine ( $F(1, 667) = 166.44, p < 0.001$ ) than Korean people do. Korean female people drank significantly more red wine than white wine ( $F(1,667) = 32.83, p < 0.001$ ); however, the Australian female people drank significantly more white wine than the Korean ( $F(1,667) = 43.64, p < 0,001$ ).

The results about wine purchase behaviors pointed out that most Australian and Korean people chose wines based on price: preference for wines costing between \$11-\$19 represented 57.5% and 28.7% of choices, respectively. 52,9% of Australian respondents reported that they usually bought wine at a bottle shop, while the most frequent response for Korean respondents was that they visited a supermarket to purchase wine (42.5%).

Finally, some gender differences in wine consumption emerged from the research. There were no gender differences between red and white wine consumption for Korean participants, whereas Australian men resulted to drink significantly more red wine than Australian women did ( $F(1,340) = 18.51, p < 0.001$ ) and, vice versa, Australian women reported to drink more white wine than men did ( $F(1,340) = 6.75, p = 0.01$ ).

The study also demonstrated that health benefits of red wine were higher in the Australian sample than the Korean sample. Australian participants reported more health-related issues and also more wine knowledge than Korean participants. Both Korean and Australian consumers preferred red wines to white wines. Korean consumers paid more attention to the health-oriented wine than Australian consumers. In regards to gender, Korean women liked red wine as much as men; however, Australian women preferred white wine more than men. Those findings may be beneficial for winemakers and wine marketers in terms of suggesting appropriateness of wine production and marketing in relation to consumers' interests and to improving new wine markets.

Another cross-cultural study was coordinated by the University of Oxford (UK) and the Tsinghua University (China), focusing on the impact of the glassware on the perception of alcoholic drinks (Wan, Zhou, Woods, & Spence, 2015). Two studies investigated the influence of the glassware with regard to wine ratings and willingness-to-pay. Chinese participants (study 1) and American participants (study 2) were presented online with photos of red wine, white wine, beer, whiskey, and Chinese baijiu presented in 6 different types of glasses. They were requested to rate them for liking, familiarity, and congruence, and to specify the amount of money they would be willing to pay for the drinks. Three questions were addressed by the study: (1) how does the glassware influence people's liking for alcoholic drinks? (2) Does the glassware influence people's ratings of the congruence between the drink and the glass? (3) Does the glassware influence the consumer's willingness-to-pay for the drink?

There were 120 undergraduate students in mainland China involved in one study (ranging from 18 to 23 years old; 62 women and 58 men). Photographs of alcoholic drinks shown to the participants consisted of beer (Budweiser, Anheuser-Busch InBev), whisky (Chivas Regal 12 Years Old Blended Scotch Whiskey, Chivas Brother Ltd., Paisley, UK), red wine (Apollonia Vin de Pays de l.'Herault Red Wine, Vive S.A., France), white wine (Apollonia Vin de Pays d L'Herault White wine, Vive S.A., France), and Baijiu (Hongxing Erguotou, Beijing Red Star Co. Ltd., Beijing, China). The volume of each drink was 100ml. Each drink was presented in six distinctive kinds of clear glasses consisting a narrow wine glass (195 ml capacity), a wide wine glass (259 ml), a stemless wine glass (266 ml), a highball glass (290 ml), a rocks glass (245 ml) and a beer mug (242 ml). The 30 photographs (5 kinds of drinks x 6 kinds of glass) were presented in a random order. During each trial, one picture was shown in front of the participants and the ratings were asked: (1) liking, (2) familiarity, and (3) drink-glass congruence. They also were asked for how much were they willing to pay for this drink and the frequency with which they drank alcohol (never, occasionally, sometimes, or often).

The results of the study show a major influence of glass types on the liking and congruence scores for all five drinks (all  $F_s > 2.60$ ). The impact of the glass was significant on the familiarity scores only for beer and red wine (both  $F_s > 4.00$ ,  $p < .01$ ), but not for baijiu, whiskey, or white wine (all  $F_s < 1.73$ ,  $p > .12$ ). With regard to ratings associated, precisely, with red and white wine, the data demonstrate that the narrow and wide wine glasses were considered as the most appropriate for serving red or white wine. The stemless wine glass for serving wine was considered as more highly liked (in terms of congruence scores) for both red and white wine than when the same drinks were served by any of the three non-wine glasses. According to the willingness-to-pay data analysis, the participants were willing to pay significantly more for the red wine served in any of the three wine glasses than in any of the three non-wine glasses (all  $t_s > 3.40$ ,  $p < .05$ ). Moreover, the participants



were willing to pay more for white wine which was presented in the narrow or wide wine glass than in the three non-wine glasses (all  $t_s > 4.02$ ,  $p < .01$ ).

This study was replicated with 100 participants from the USA (ranging from 19 to 75 years old; 56 women and 44 men). “The results of univariate ANOVAs also indicated a significant main effect of Glass on all of the three measures for the red wine, white wine and whiskey, all  $F_s > 2.77$ ,  $p < .05$ . By contrast, the main effect of Glass was significant on the liking and congruency scores for baijiu, and on congruency scores for beer, all  $F_s > 4.19$ ,  $p < .01$ .” (Wan, Zhou, Woods, & Spence, 2015, pp. 105).

Following the red and white wine ratings data analysis, when red and white wine were presented in the stemless wine glass received higher congruence scores and liking scores than if they were presented in a highball glass (all  $t_s > 3.03$ ,  $p < .05$ ). The stemless wine glass turned out to be more appropriate for red and white wine than any of the three non-wine glasses. When the narrow wine glass was used to serve white wine, it received the higher familiarity scores, but also the red wine presented in the narrow wine glass received higher liking scores than when it was presented in a beer mug ( $t(99) = 3.03$ ,  $p < .05$ ). In any case, the narrow and wide wine glasses turned out to be the most appropriate for serving red or white wine ( $t_s > 3.51$ ,  $p < .05$ ).

The result indicated that all three of the non-wine glasses were more congruent with beer than any of the three wine glasses, all  $t_s > 3.15$ ,  $p < .05$ ; the beer mug was considered to be more congruent than the rocks glass,  $t(99) = 3.90$ ,  $p < .01$ . The study revealed that the USA participants might consider both the beer mug and the highball glasses to be appropriate to drink beer.

When the baijiu was presented in the beer mug, it received lower congruency scores than when presented in the rocks glass, as well as lower liking scores than when presented in the narrow or stemless glasses, all  $t_s > 3.05$ ,  $p < .05$ . The results

indicated that the USA participants were not sure what might be congruent glassware for baijiu.

With regards to willingness-to-pay, the participants were willing to pay significantly more for red wine and white wine served in the narrow or wide wine glass than in any of the three non-wine glasses ( $t > 4.87$ ,  $p < .01$ ); they also were willing to pay more for the whiskey when it was served in the stemless wine glass ( $t > 3.06$ ,  $p < .05$ ).

Additionally, the percentages of participants who drank alcohol never, occasionally, sometimes, and often were 16%, 50%, 23%, and 11%, respectively.

These findings provide new insights into how contextual factors impact on people's cognition and behavior, with regard to alcoholic drinks (Spence, 2012). In addition to the many similarities found between the two samples of participants (for instance the narrow and wide stem glasses were considered the most appropriate from drinking wine by both samples of participants; the stemless wine glass was considered as more appropriate for serving red and white wine than the non-wine glasses by both Chinese and USA participants) cross-cultural differences emerged in particular in relation to beer and whiskey. Chinese participants were willing to pay more for beer served in a beer mug, which was more appropriate with beer in their mind; on the other hand, both the beer mug and the highball were appropriate for presenting beer according to the USA participants. Moreover, whereas the USA participants in the study were willing to pay more for whiskey served in the rocks glass or stemless wine glass, this difference was not found when analyzing Chinese participants' willingness-to-pay for the whisky.

Another cross-cultural study carried out by the University of Bourgogne (France) and the University of Zaragoza (Spain) examined the extrinsic attributes which play an important role in red wine quality perception (Pilar, Navajas, Ballester, Peyron, & Valentin, 2014). There are different extrinsic cues that impact on wine quality perception, such as: country-of-origin of wine (Veale & Quester, 2009a, 2009b),

bottle weight (Piqueras-Fiszman & Spence, 2012), kind of wine or appellation (Martinez, Molla-Bauza, Gomis, & Povenda, 2006), back label information (Mueller, Lockshin, Saltman, & Blanford, 2010), label aesthetic (Chrea et al., 2011; Rocchi, & Stefani, 2006), and recognized awards (Chrea et al., 2011; Lockshin, Wade, d’Hauteville, & Perrouty, 2006). These factors can be seen as having a significant impact on quality perception through cognitive processes (Van Ittersum et al., 2003). The aim of a study by Pilar et al. (2014) was to evaluate the representations of perceived extrinsic characteristics of wine quality by consumers from two distinctive wine regions in two countries with a long-term wine tradition and wine making history: La Rioja (Spain) and Cotes du Rhone (France). The participants in the study were asked to categorize twenty red wines from two different wine making regions – 10 samples from DOCa Rioja in Spain and 10 samples from Cotes du Rhone in France - according to four levels of quality (from very low to very high quality). The objective of the study was to investigate the influence of country/region-of-origin, consumers’ wine knowledge, and involvement on quality perception of wines. Ninety-three Spanish participant (47 men and 46 women) and ninety-five French participants (46 men and 49 women) ranging from 25 to 64 years old and with high-qualification education level (50% in both samples are graduates) took part in the study. The extrinsic features analyzed and associated with country/region-of-origin were appellation or kind of wine; label information; back label information; label design; and weight of bottles.

There were three Clusters of consumers emerging from the responses of French participants. Cluster 1 (29 participants) categorized Spanish wines higher in quality than French. Cluster 2 (44 participants) identified Spanish wines as being lower in quality than French wines. Cluster 3 (22 participants) again classified French wines as having higher quality than Spanish wines. However, difference emerged between clusters 1 and 3 in terms of the underlying associated features. Consumers in Cluster 1 rated country/region-of-origin of wine as a significant feature affecting wine quality perception. Additionally, lower quality wines were associated with wines

having modern label designs, appellations, light bottles and no information on back labels. On the other hand, recognized awards and classical labels were associated with *high* quality wines. Consumers in Cluster 3, conversely, predicted *low* quality wine based on heavy bottles and classical labels. Classification in Cluster 2 (with Spanish wines receiving best ratings) associated high quality ratings of wine to awarded wines with appellations, classical labels, and heavy bottles.

Two clusters emerged from the analysis of responses provided by the Spanish sample of participants. Cluster 1 (32 participants) had classified Spanish wines as higher quality as compared to French wines. Country/region-of-wine played the most significant role in terms of impact on perceived quality; further relevant cues (but secondary in importance) were wine appellation, heavy bottles, and the kind of information presented on back labels. More than 80% of participants have cited “reserve” as a significant quality criterion suggesting that wine appellation is a primary driver of quality for Spanish participants in Cluster 1. Crinza appellation was known as a significant extrinsic cue related to very high or high-quality samples. Cosecha appellation was an extrinsic cue associated with low quality wines: RJ-058 and RJ-631 are identified as the two lowest quality groups. 60% of participants indicated RJ-381 which belongs to a famous producer in higher quality categories.

Cluster 2 (61 participants) groups Spanish and French wine; that is for these consumers the country/region-of-origin of wines is not a major factor to predict wine quality perception. Reseva wines received by far the higher quality scores “very high”, followed by crianza “high” and cosecha “very low” and “low”. RJ-904 was perceived as a higher quality sample than the other three samples. Crianza wines (2008) was presented in a heavy bottle, which gave rise to a quality perception. Additionally, the presence of awards, classical labels, and heavy bottles were known as other secondary cues that seem to improve quality perception. On the other hand, modern labels, light bottles, and young vintage are cues that predict low quality wines.

To sum up and compare findings from the two samples, most of the clusters emerged based on both the French and Spanish participants' responses, the country/region-of-origin of wine is the most important extrinsic attribute for predicting wine quality perception (this is true for all, except for Cluster 2 in the study with Spanish participants). Participants with a higher knowledge about wine (which was assessed by demographic information), based their perception of wine quality on additional information (this is the case for French participants in Cluster 1 and Spanish participants in Cluster 2); In the other cases (French Cluster 2 and Cluster 3; Spanish Cluster 1) participants have paid much attention to the country/region-of-origin of wine, which is therefore considered a simple extrinsic cue to predict wine quality. This does not mean that no other aspects had an impact: for instance, for French participants in Cluster 2 and Spanish participants in Cluster 1, the weight of the bottle had a positive influence on the assessment of wine quality. French participants in Cluster 2 and Spanish participants in Cluster 2 agreed that the presence of recognized awards was another significant extrinsic factor associated with quality perception.

#### **1.4.2. Wine conceptualization**

Several qualitative and quantitative studies focus on “cognitive” attributes related to wine understanding and appreciation. For instance, some socio-political features which can impact on consumers' *preferences* include wine technical productions, health benefits, obesity concern and knowledge of nutrition (Abraben, Grogan & Gao, 2017; Hidalgo-Baz, Marto-Paral, 2017; Saba & Messina, 2003). In terms of wine *understanding*, socio-cognitive representations, attitudes and opinions about wine (Yoo, 2013), naturality of wine and wine-technical making, and consumers' attitude (Bruwer, Jiranek, Halstead, & Saliba, 2014) have been considered.

One cross-cultural study examined the social representation of wine and culture in France (part of the Old World of Wine) and New Zealand (part of the New World of Wine). The research was promoted by the University of Paris VIII (France), the

University of Aix-Marseille (France) and the University of Lincoln (New Zealand) (Mouret, Monaco, Urdapilleta, & Parr, 2013). The study aimed to investigate social representations of wine. The study involved 390 French participants - 288 wine consumers (164 females and 124 males) and 102 wine experts (46 females and 56 males) – and 177 New Zealand participants - 103 wine consumers (61 females and 42 males) and 74 wine experts (30 females and 44 males). They were invited to respond to a survey investigating socio-demographic information and wine consumption.

The analyses of responses based on a Correspondence factor analysis identified two factors including the two variables (Expertise: expert and non-expert; Culture: French and New Zealander). “Factor 1 receives a contribution from the terms of the variable ‘culture’:  $CF(\text{French}) = .28 + CF(\text{New Zealander}) = .64$ . ie; a contribution of 92% of the formation of the factor. Factor 2 opposes two groups of modalities of the variables ‘status’. Regarding the contribution of these modalities to the formation of the factor, the CFs are as follows:  $CF(\text{expert}) = .28 + CF(\text{non-expert}) = .63$ , ie., a contribution of 91% to the constitution of this factor.” (Mouret, Monaco, Urdapilleta, & Parr, 2013, pp. 105).

Factor 1 displayed French participants contrasting with New Zealanders. For the French participants, wine was related to *vines* and *terroir* which refer to the wine’s origin and identity. Wine was also associated with *cheese* which is representative of the patterns of wine consumption. Moreover, French consumers also shared a social representation of wine in regard to consumption; such as *with a meal*, *conviviality* and *friends*. The results indicated that French participants tended to consume wine not only related to the wine’s origin identity but also for social purposes such as sharing with friends.

Factor 2 indicated expert participants who shared a social representation of wine in relation to the work, the tradition and heritage displayed in their social representation of wine associated with hedonistic elements such as pleasure and

quality. The New Zealand participants categorized wine in terms of *work* and *passion*. *Passion* for wine suggests that these consumers were interested in wine. The New Zealanders who classified wine in terms of work and passion shared a social representation of wine with regard to *leisure, enjoyment, fun* and *relaxation*. Wine was also related to *social* consumption, in terms of being shared with *friends*.

### **1.4.3 Consumers' cultures and attitudes**

Nowadays, the Western culture of wine has much influence on the Asian culture of wine consumption (Jiang 2011). There are several differences between the culture of wine consumption between China and Western countries. "Wine culture is a culture between material and spirit. China has a deep and long source of drinking culture, which has a complete seepage into the different domains of human life. China's drinking culture mainly show the humanistic dimension, with the poetry and literature and a long history of wine; on the other hand, the Western culture of wine consumption shows respect for and appreciation of the wine itself, tasting experiences, sensory perceptions of color, smell, aroma and taste." (Jiang, 2011, p. 251).

From 1986 "Doi Moi" (known as the Renovation Policy for Modernization - Doyert & Treglode, 2004), the global flow of information has been opened up to Vietnamese society so that commercial and social exchanges have started to take place (Dollar, 1998). Imported goods have become popular to Vietnamese people and new consumerist tendency emerged in Vietnamese urban areas (Le, & Jolibert, 2001; Vann, 2003). Many cultural transformations occurred in Vietnam in this period.

Do, Patris, and Valentin (2009) stated that Vietnam wine-drinking motivations are categorized by utilitarian and symbolic perspectives rather than experiential ones; hedonic motivations such as sensory and experiential pleasures are much less present than, for instance, in France. French people consider their motivation for consuming wine as a habit and as a cultural aspect; whereas the motivation of

Vietnamese consumers is a willingness to accept cultural transformation. In Vietnamese life, wine is acknowledged as a product that establishes differences, in relation to both economic and cultural attributes. Wine which symbolizes social “success” is believed to be a “sign of maturity and great culture”.

Additionally, wine is considered to be a healthy drink; it is not perceived as a potential danger as it is in France. Vietnamese people believe that wine is beneficial for digestion and protective against the risk of heart disease. Many Asian countries including Japan, Korea and China, agreed on the health benefits of wine (Health, 1995). On the other hand, French consumers consider wine more related to a “sensory pleasure” than to “health” (Do, 2009). In other words French consumers have an experiential and hedonic motivation underlying their decision to drink wine (Charters, 2006).

French people appreciate wine more for enjoyment and the love of good wines (Thomas, 2005). Meanwhile, drinking a lot of wine is considered as a proud male feature which displays the strength of a man. At the Vietnamese Lunar Year holiday, people celebrate where they invite each other to drink wine. In many cases, people drink too much wine due to peer the pressure, not due to their love and enjoyment of consuming wine. Additionally, there are several “wine-drinking” competitions organized for celebrating the Vietnamese Lunar year festival in the rural areas. A person who drinks the largest amount of wine becomes the winner of the contest and achieves the Champion award with gifts (VDAP, 2009).

Stolz and Schmid (2008) researched the attitudes of consumers from four countries (Switzerland, France, Italy and Germany) about organic wines. The results indicated that they have a general positive attitude about organic wines in terms of grape production and wine processing. Additionally, organic wine is identified as being healthier compared to conventional wine. On the other hand, with regard to the sensorial quality, there are some image difficulties in organic wines in spite of the improved taste image. Participants expect that organic wine is healthy, pure and



naturally produced so that it manifests the original attributes and quality as much as possible.

A cross-cultural study carried out by the Texas Tech University (the USA), the Groupe ESC Dijon-Bourgogne (France), the Lincoln University (New Zealand), the Cardiff Metropolitan University (the UK), and the Swinburne University of Technology (Australia) aimed to investigate the interconnection between cultural values and consumer behaviors by exploring how young wine consumers' describe photos of champagne and sparkling wine (Velikova, Charters, Fountain, Ritchie, Fish, & Dodd, 2016). A comprehension of values as a basic factor of culture has been widely accepted (Luna & Gupta, 2001). This research was particularly focused on comparative dimensions of cultural values and consumption. It takes Luna and Gupta's (2001) study as a focal point for the analysis of cross-cultural attitudes to product images. Luna and Gupta's investigative perspectives are related to the consumers' cultural value system as based on three manifestations - symbols, heroes, and rituals - which form the values of culture.

One hundred and forty-seven participants from four Anglophone countries (the USA, New Zealand, Australia and the UK) were asked to look at six images of champagne and sparkling wine used as stimuli to encourage cognitive views on the topic. 20 focus groups in four countries were conducted, yielding a total sample of 147 participants.

Differences emerged in the frequency and type of wine consumption among participants in the four Countries. Australians mainly consume Australian wine, whereas the USA and New Zealand participants referred to prefer imported wines. A series of images of champagne and sparkling wine was shown. After viewing each image, participants were asked what they thought about the image in terms of cognitive and affective aspects, and probed their thoughts about the situations depicted.

The participants in the study reported consuming wine frequently, with 18 % indicating that they drank wine monthly, and 66% that they drank it once per week, but difference across-samples emerged with the British and Australian participants reporting to consume wine more regularly than the US and the New Zealanders less frequently than all the others.

There are different perceptions regarding a Domaine Chandon advertisement showing three young girls holding glasses, laughing, and posing for a picture. The Australian and New Zealand participants viewed the image as capturing the social, celebratory nature of the product. Most of the Australian and New Zealand participants who were familiar with the brand responded positively to the advertisement, while the US participants who did not know the brand tended to be positive with familiar descriptors being “party, fabulous, and fun”. Emphasis was put on the relationship between wine and socialization.

Some New World participants stated that less expensive wine was more suitable for the less formal kind of party and occasion. However, the UK participants who did not know the brand were negative in their perceptions of the image. They preferred the image of “classy” champagne rather than the “cheap” sparkling wine as appropriate for the occasion. “The UK participants interpreted it as if it was champagne and for many of them it was inappropriate to be drinking champagne in such a disrespectful manner. The issue of “class” was very important to the UK market when considering the image of champagne” (Velikova, Charters, Fountain, Ritchie, Fish, & Dodd, 2016, p. 1967)

The UK consumers had a better knowledge that distinctive wine styles tend to originate from different wine regions, and proved to have a better recognition of traditionally perceived high-quality wine making areas. Without a long-term culture of wine consumption, the rapid spread of new wine brands to young consumers that are not already familiar with the heritage of traditional wine labels is more likely.

The perspectives towards tradition and heritage reflect perceptions of the concepts of classic and modern. The advertisement by Pol Roger presented in white and navy-blue color with some gold highlight, was recognized as “classy” in the UK market. Conversely, in the Australian and New Zealand markets, there was little appeal in the Pol Roger image; many participants indicated it as “dull”, “boring”, and “dated”. The UK consumers indicating the image of Pol Roger as “classic” preferred the wine “classic” image advertisement; whereas the US participants tended to be positive with modern images. Young UK participants focused more on the wine product itself, on the heritage and tradition related to the product to be promoted in this market and where not very much influenced by the advertisement.; in contrast, the New World young participants who associated enjoyment and fun to consumption of champagne and sparkling wines, were more influenced by advertisement aspects.

The above cross-cultural perspectives concerning sparkling wine were confirmed by a study exploring the engagement of young generation consumers with champagne and sparkling wine across four Anglophone countries (Charters, Velikova, Ritchie, Fountain, Thach, Dodd, Fish, Herbst & Terblanche, 2011). The study aimed to test similarities and differences between consumers in the Old World (the UK) and the New World (Australia, New Zealand, and the US), in relation to sparkling wines.

Four main cross-cultural distinctions emerged; (1) the UK consumers who tended to have more awareness of different styles and kinds of wine displayed the widest brand awareness; those in other countries were more knowledgeable on wine-making production and methods. (2) The UK participants had familiarity with consuming champagne while participants from the other countries were more familiar with consuming local sparkling wine. (3) The price which participants were willing to pay for champagne/sparkling wine was different for each country. The Americans all chose fairly cheap sparkling wine such as Andre or Korbel; the Australians were positive about higher priced wines; since the UK sparkling wine

and champagne are social drinks often given as presents, and they did not want to be seen as mean because they bought a less expensive wine bottle. The UK consumers put more emphasis on champagne (reflected in the brand recognition) which probably associates with the country's longstanding role as a main export market for wine. (4) Cross-cultural differences emerged in the champagne advertisements: The Australians and New Zealanders were familiar with a Champagne label where there was a red ribbon to the right and above a champagne bottle in a red, gold and dark background. The image was described as elegant and high-quality. In contrast, the UK participants considered the ribbons as overdone. The Americans agreed with the Australians that it was classic and expressed prestige. Other cross-cultural differences emerged about an advertising image of a Tasmanian sparkling wine with a river cascade through a ravine. The Australian consumers felt it was "boring", too white and too wordy; also the American participants agreed it was boring and bland. By contrast, the British liked it because of its "freshness", and the New Zealanders tended to be less negative, viewing it as natural.

These few examples suffice to make it clear that the image and color of an advertisement for wine varies significantly from country to country (among the young generations) yet across all Anglophone countries.

## CHAPTER 2. OPPOSITES IN NAIVE DESCRIPTORS ABOUT WINE

### 2.1. The sensorial experience of wine for Italian non-experts

Italian wine has one of the best reputations on the international wine trading market because of the quality of it, the number of wine bottles sold, and the long history of Italian wine-making industry (Brentari, Levaggi, & Zuccolotto, 2011). Together with the bottles, also the descriptions wine travel around the world. Therefore, the issue of assessing the understanding of these descriptions in different cultures is of some interest for applicative, in addition to basic research reasons. Moreover, descriptions of wine usually come from professionals who not only have extraordinary perceptual abilities to discern the properties of a wine relating to its aspect, smell, texture and taste (Charters & Pettigrew, 2007; Hopfer & Heymann 2014; Saez-Navajas, Ballester, Pecher, Peyron, & Valentin, 2014; Torri, Dinnella, Recchia, Naes, Tuorila, & Monteleone, 2013), but also have considerable knowledge deriving from standardized wine tasting procedures. There is a common background and lexicon that wine experts share; the descriptions they give are, however, often transformed into advertising and marketing tools, and in this way they also apply to standard consumers. Therefore, the issue concerning whether experts and standard consumers understand the terms used in the same way is important, on the one hand for basic research, but on the other hand, also for applicative research relating, for instance, to wine advertisement and marketing (on the comparison between experts and novices performances, see for instance Ballester et al., 2008; Parr, et al., 2011; Solomon, 1990; Spence & Wang, 2018; Wang, Niaura, & Kantono, 2021).

The studies developed during my PhD project are based on a previous study (Bianchi, Branchini, Torquati, Fermani, Capitani, Barnarba, Savardi & Burro, 2021) carried out with Italian participants (558 non-expert wine consumers, aged from 18 to 60; 321 female persons and 237 male persons). This study involved 64 frequently used descriptors of wine which had been selected during research on a corpus of

terms which can be found in popular Italian wine guidebooks, in the Product Specifications of a number of well-known red and white wines, and in the lexicon used by the Italian Sommelier association to rate wines. These terms were presented to a group of standard consumers of wine with the aim of ascertaining the meaning that they attributed to these terms.

A new type of methodology based on opposites was used. The participants were asked to state what they considered to be the opposite property to each of the 64 target terms listed. “When you think of white wine/red wine, what property is opposite to ...” was the question asked for each of the 64 properties. The researchers were thus able to identify the underlying sensory dimension that the participants were thinking of, and therefore also the meaning that they attributed to each term. In particular they were able to assess ....

The usefulness of opposites in professional descriptions of wine has been discussed in the previous section of this thesis (in particular in section 1.3). In addition to what discussed in that section, Bianchi et al. (2021) highlighted that in the Wine and Spirit Education Trust evaluation scales, a worldwide standard for professional qualifications, most of the terms used to describe sensory properties (except those relating to olfactory aspects, e.g. fruity, spicy) are organized in terms of oppositional scales. For example, in the WSET beginner to intermediate level qualification, the dimension referring to SWEETNESS on the palate is defined by the pair *dry-luscious*; the dimension referring to BODY is defined by the pair *thin-heavy*, the visual dimension referring to CLARITY is defined by the pair *bright-cloudy* and INTENSITY is defined by the opposites *weak-pronounced*. At the more advanced level (level 4), the various dimensions relating to the palate are expressed by scales ranging from *low* to *high* (ALCOHOL), from *light* to *full* (BODY), from *light* to *pronounced* (FLAVOR INTENSITY); from *short* to *long* (FINISH) and from *poor* to *outstanding* (QUALITY ASSESSMENT). Is there evidence of the capacity of *standard consumers* (i.e. people who have neither followed a course on wine or are wine professionals) to think of the sensory properties of wine in terms of opposites? This

is one of the main question that the study with Italian participants addressed and this will be also one of the main questions that inspired the extension of this study in my PhD research project with Vietnamese and Australian participants. We summarize here the main results of the original study carried out in Italian and with Italian participants.

a) The total number of cases in which the dimension was indeterminate included those responses which indicated “I don’t know” and those which consisted of mere negation (e.g. indicating non-tannic as the opposite of tannic). On average, the “I don’t know” responses represent 13% of the total number of responses for red wine and 12% for white wine. If we also include the percentage of responses consisting of mere negation (an average of 2% for red wine and 1% for white wine), this means that in 13-15% of cases for red and white wine respectively, the participants were unable to find the opposite or, to put it another way, they were able to find the opposite in more than 85% of cases. This result supports the claim that most of these properties have a dimensional structure in non-experts’ minds, and that oppositional scales seem to be a suitable way of modelling perceived variation, not only as far as the lexicon used by experts is concerned, but also for the vocabulary used by non-experts. However, there was also a great deal of variation in our data. The Italian participants found it particularly difficult to come up with the opposite of properties such as *avvolgente* (Eng. *embracing*), *astringente* (Eng. *astringent*), *abboccato* (Eng. *slightly sweet*), *tannico* (Eng. *tannic*) and *franco* (Eng. *frank*). Conversely, the participants responded “I don’t know” or by means of mere negation much less frequently with properties such as *vecchio* (Eng. *old*), *immaturo* (Eng. *immature*), *dolce* (Eng. *sweet*), *giovane* (Eng. *young*) and *caldo* (Eng. *warm*) with reference to red wine and *maturo* (Eng. *mature*), *morbido* (Eng. *soft*), *comune* (Eng. *common*), *secco* (Eng. *dry*) and *dolce* (Eng. *sweet*) with reference to white wine.

b) The fact that participants could usually identify an opposite still does not tell us how consistent they were between them in choosing the same opposite. For each of

the 64 target properties, the mode was identified: it indicates the most frequently elicited term (or the strength of the dimension). Another considered measure of uni/multiunivocity is the number of different opposites elicited. Four clusters emerge from the analyses of the 64 target terms based on the proportion of I don't know responses; the proportion of responses consisting of mere negations of the target property; the number of different opposites elicited and the strength of the most frequent opposite. They are represented in Figure 5. Cluster 3 includes the properties that were more uncertain in terms of how they were interpreted. This is manifested by the fact that the properties in this cluster elicited a) the higher number of "I don't know" responses, as compared to all other clusters; b) a number of responses consisting in mere negation of the target property which was higher than the properties in clusters 1 and 4 (no significant difference emerged with cluster 2) and c) a greater number of different opposites (i.e. more than the properties in clusters 1 and 4, and similar to those in cluster 2). Conversely, the dimension turned out to be more easily identifiable for the properties in clusters 4 and 1. They elicited (with no difference between the two clusters) the lowest number of "I don't know" and negative responses and also the lowest number of different opposites indicating low multivocity. However, out of the two clusters, it is cluster 4 that is associated with more consistent interpretations since in this case the proportion of participants who agreed on the same opposite (the mode) is significantly higher than for cluster 1.



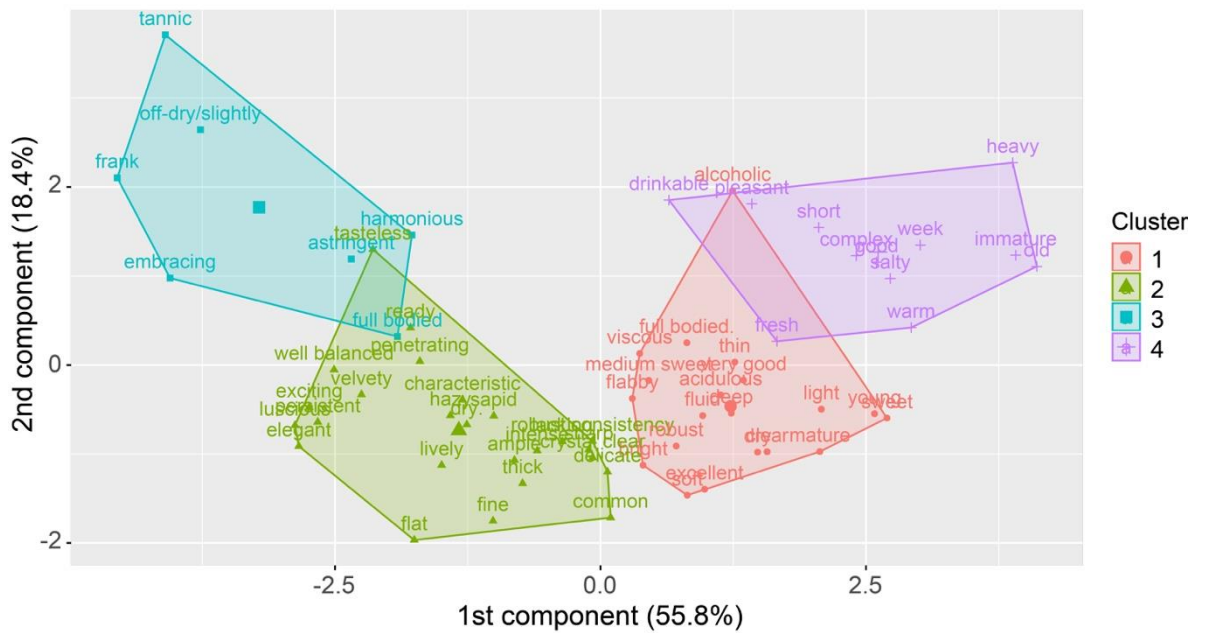


Figure 5 - The four clusters which emerged from the Cluster analysis (Study 1) - for further details see main text. [Image taken from Bianchi, I., et al (2021). Non experts' understanding of terms frequently used by experts to describe the sensory properties of wine: an investigation based on opposites. *Food Quality and Preference*, 92. <https://doi.org/10.1016/j.foodqual.2021.104215>]

## **2.2. Study 1 – The sensorial experience of wine for Vietnamese (as compared to Italians) non-experts<sup>1</sup>**

Our study addressed a series of questions, inspired by the abovementioned Italian study (Bianchi et al., 2021). The first question concerned how many of the 64 sensory descriptors presented as stimuli were in effect understood by the participants as constituting a dimension, that is, they could be conceived of in relation to an opposite property. This is interesting, not only from an applicative point of view (for example, in order to devise tasting scales for training courses or to use in market research questionnaires that need to be understood by non-expert wine consumers), but also in terms of basic research aims with a view to enriching existing knowledge in the fields of Cognitive linguistics and Psychology with regard to the pervasiveness of opposites in natural languages.

The second question concerned whether the participants agreed on an opposite property for each descriptor (i.e. the meaning of the target item was univocal) or whether the same term elicited a variety of different opposites (multiple meaning). Here the focus is on the canonicity of a dimension. This aspect is also of interest for the purposes of basic research and from an applicative perspective since a lack of univocity implies uncertainty regarding how consumers understand, for instance, the descriptions on wine bottles or in advertising.

The third question referred to whether a specific descriptor evoked the same opposite (and therefore the same dimension) when it was applied to both red and white wine. Given that antonym pairs are also subject to contextual constraints

---

<sup>1</sup> This part of the thesis has been developed in collaboration with professors Ivana Bianchi and Roberto Burro. The is taken from the paper published in 2021: Truong, H., Burro, R., & Bianchi, I. (2021). The sensorial experience of wine for non-experts: how the terms frequently used in Italian guidebooks are understood by standard consumers in Vietnam. *Journal of Sensory Studies*, DOI: [10.1111/joss.12656](https://doi.org/10.1111/joss.12656)

(Murphy & Andrew, 1993; Paradis, Willners, & Jones, 2009), the issue of whether there were significant differences between the dimensions associated with red and white wines and whether the understanding of the target terms was consistent for both types of wines represented another area to investigate.

### **2.2.1 Materials and Methods**

#### ***Materials***

Two online questionnaires based on the two questionnaires designed for the equivalent Italian study were used. An official translation from Italian to Vietnamese was carried out by the Italian Embassy in Hanoi. The questionnaires were created with LimeSurvey CE (stable version: 3.4.2). The responses were automatically registered in a MySQL database. The first page of the questionnaire collected information about the gender, age and level of expertise with respect to wine of the participants (e.g. for the level of expertise: I have no interest in wine; I am interested in wine; I have participated in some low-medium level training courses on wine; I have participated in high-medium level training courses on wine; and I am a sommelier/professional taster/ oenologist). The instructions on the second page of the questionnaire were as follows: “You will be presented with 64 words describing various different sensory properties of grape wine. You will be asked to focus on these properties *specifically* with reference to red wine or white wine. Your task is to type in the empty box that you will see to the side of each word what you considered to be *the opposite* property.” Only one opposite (and one empty box) was foreseen for each descriptor. The complete list of the target properties in Vietnamese is available in Appendix 1 (together with the original Italian terms and their corresponding English translation). For sake of simplicity, the English version of the target descriptors and of the responses will be used throughout the present article in the presentation of the results and the discussion.

### ***Procedure***

The questionnaire was made available online on various public websites for wine drinkers. The recruitment page included the explicit requirement that the person responding had direct experience of drinking grape wine. It was also promoted by one of the experimenters to the lecturers, research fellows and administrative staff at the Vietnam National University and the Supreme People's Court (i.e. to communities that have opportunities to taste wine at social and business events). The participants accessed the online version of the questionnaires by means of smartphones or computers. The order of the 64 properties within each questionnaire was randomized between participants. No time limits were set for compiling the questionnaires. The participants were told they could take a break and the average time needed to fill in both questionnaires was around 40 minutes. Both the instructions and target terms were only in Vietnamese.

### ***Participants***

The participants were three hundred wine drinkers who are native speakers of Vietnamese, ranging in age from 25 to 55 (121 participants in the red wine condition: 58 females and 63 males; 181 participants in the white wine condition: 94 females and 87 males). They volunteered to take part in the study by completing an online questionnaire. All of the participants gave their informed consent prior to completing the questionnaire. The study conforms to the ethical principles of the declaration of Helsinki (World Medical Association, 2013).

### ***Data analysis***

The data analysis focused on four issues. 1) The number of properties for which the participants were able to identify an opposite. Two types of response were considered as cues that the participants had found it difficult to figure out the underlying dimension: a) “I don’t know” (“I don’t know” indicates that the participant has no idea what the corresponding opposite property would be; we

considered both literal expressions of lack of knowledge and also anything meaning the same) and b) Negation, ssthat is, giving “non-tannic” as the opposite to “tannic”; this represents a type of “shortcut” suggesting that the person did not have a clearly-structured opposite in mind. 2) The univocity of the dimensions. This was determined according to two indexes: a) the number of different opposites elicited (this gave an indication of inter-subject consistency, that is, the greater the number of opposites given, the less univocal the dimension was deemed to be) and b) the strength of the dimension in terms of the most frequent response (in statistical terms, the mode), that is to say, the proportion of participants who agreed on the mode offers a measure of the strength of that dimension so the larger the proportion, the stronger the dimension is. 3) Any differences between red and white wine. This was determined both in terms of the dimension which was most frequently chosen and its strength (the mode). 4) Differences relating to gender and age.

The data were analyzed with version 4.0.0 of the R software for statistical computing. The scaling methods that were used to analyze the responses to questions 1 and 2 were conducted on the standardized z-scores. Any differences between red and white wines (question 3) and between gender and age (question 4) were determined by means of Generalized Mixed Effects Models (binomial family, Logit-link functions) (R package: lme4).

### **2.2.3 Results**

*a) The number of properties for which participants were able to identify an opposite.* The “I don’t know” responses represented only 0.4% of the total number of responses for red wine and 0.5% for white wine (with no significant differences between the two: Chi-sq = 0.488, df = 1, p = 0.485). The responses consisting of mere negation constituted on average 14% for red wine and 13% for white wine (Chi-sq = 5.417, df = 1, p = 0.019). We see that negation was used more frequently than “I don’t know” for both red (Chi-sq = 1066, df =1, p < 0.001) and white wine (Chi-sq= 1413.1, df = 1, p < 0.001). Overall, in 85% of the total number of

responses, participants were able to identify the opposite of the target properties. These results suggest that non-expert consumers in Vietnam are comfortable with thinking of the sensorial properties of wine in terms of opposites.

*b) The univocity of the dimensions.* Figure 6 shows a ranking of the 64 target terms based on the number of different opposites elicited. At the extremes of the scale are, respectively, the descriptor that elicited the lowest number of different opposites (namely *heavy* for white wine with 4 different opposites identified by the participants in the study and *fluid* for red wine, again with 4 different opposites) and the term that elicited the greatest number of different opposites (namely *embracing*, with 77 different opposites identified for white wine and 41 for red wine).

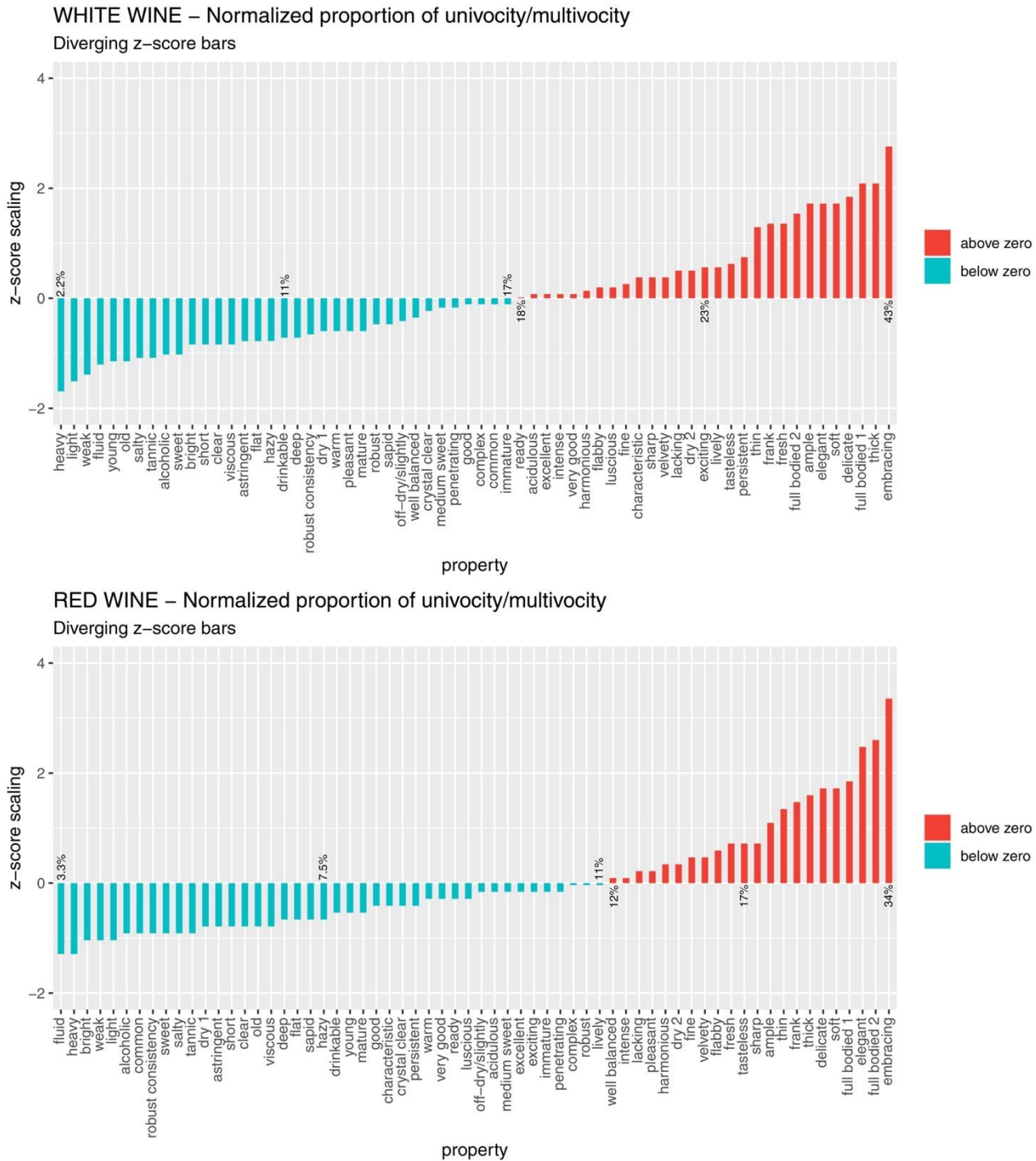
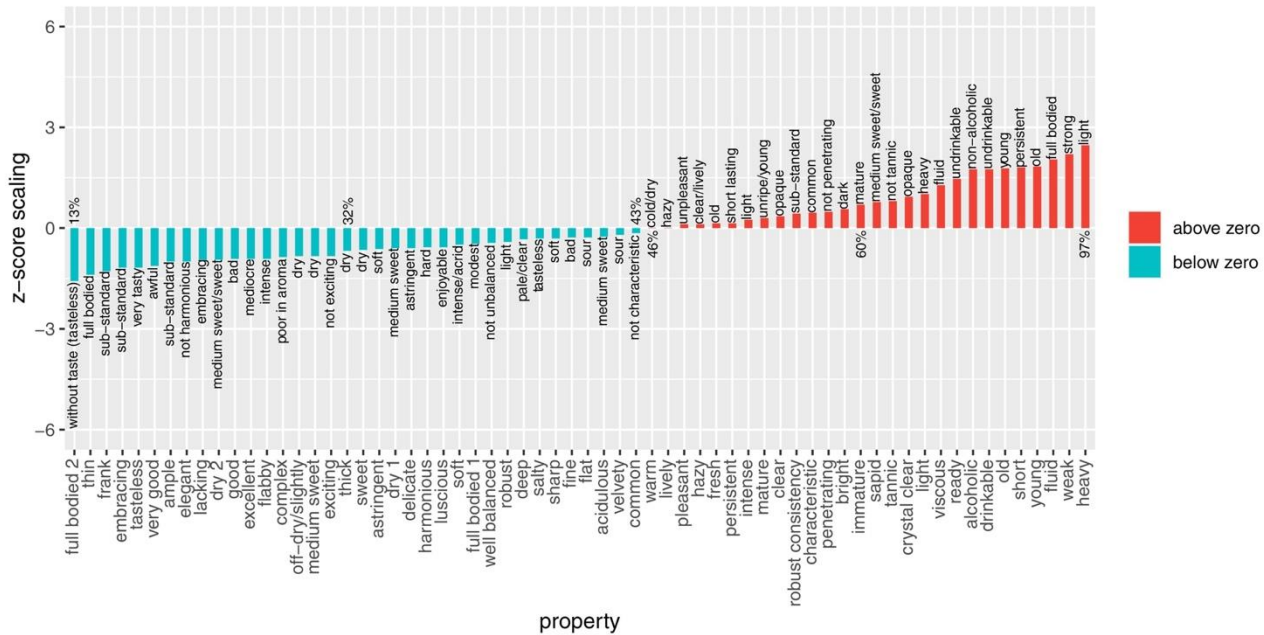


Figure 6 - The scaling (based on z values) of the 64 target properties in relation to white wine (top graph) and red wine (bottom graph) in terms of the number of different opposites given.

Whereas Figure 6 describes the number of different opposites that were elicited by the same descriptors, Figure 7 shows the strength of the most frequently identified opposite (the mode). In the figure, the 64 target terms are ranked based on the mode. Therefore, at one extreme of the scale there are the target terms for which participants were more consistent in identifying the same opposite (e.g. Weak – Strong, Heavy – Light, but also Young – Old, Fluid – Full bodied for white wine and Drinkable – Undrinkable, Alcoholic – Non-alcoholic for red wine), and at the other extreme there are the target terms for which the most frequent opposite represented in any case the one chosen by the lowest proportion of participants (Full bodied – Tasteless, Thin – Full bodied , Frank – Sub-standard for white wine; Embracing – Light, Frank – Complex, Tasteless – Tasty for red wine).



WHITE WINE – Normalized proportion of strength of the most frequent response elicited  
Diverging z-score bars



RED WINE – Normalized proportion of strength of the most frequent response elicited  
Diverging z-score bars

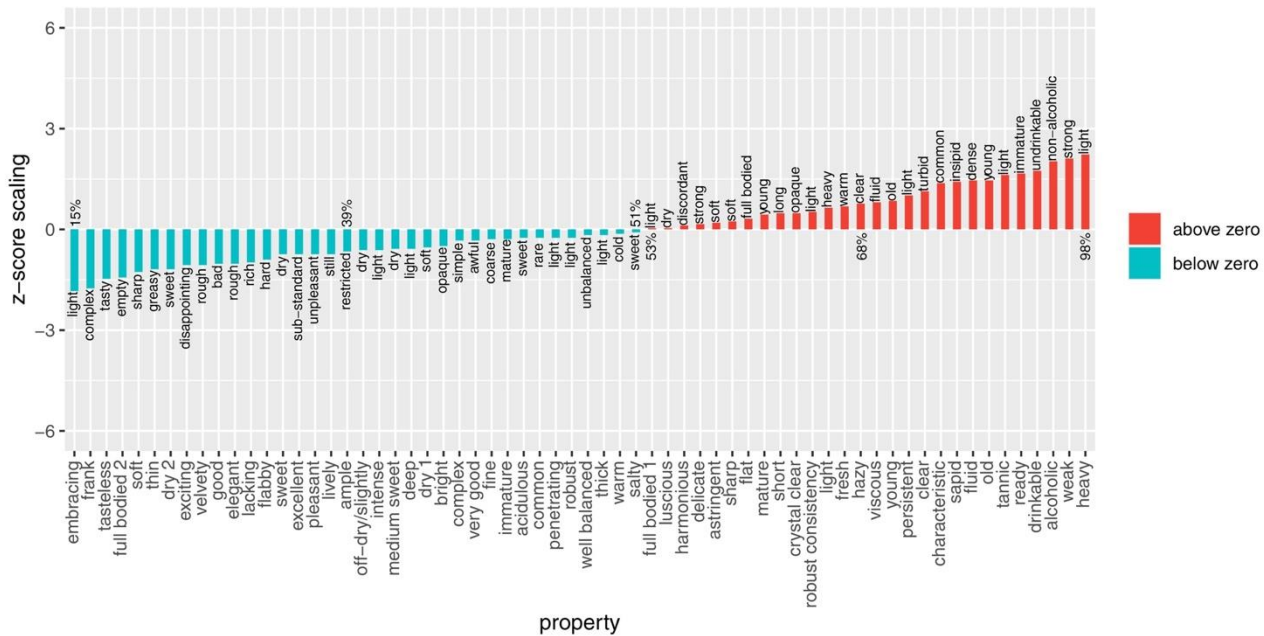


Figure 7 - The scaling (based on z values) of the 64 target properties in terms of the strength of the underlying dimension based on the opposite which represented the most frequent response, in relation to white wine (top graph) and red wine (bottom

graph). In the graph, the strength is expressed as a proportion relating to the mode and the total number of participants.

*c) The differences between red and white wines.* The index of strength for the most frequently chosen opposite (i.e. the mode) was in general stronger for red wines than the index for white wines (Chi-sq = 30.69, df = 1,  $p < 0.001$ ). The interaction between the specific property and the type of wine (i.e. red or white) turned out to be significant (Chi-sq = 90.64, df = 63,  $p = 0.01$ ), but post hoc tests revealed no significant differences between the modes associated with red and white wine for each specific property. These results suggest that the participants tended to agree more on the opposites elicited with respect to red wine as compare to white wine, rather than this effect being related to specific target terms.

*d) Differences relating to gender and age.* Further analyses were carried out to study whether gender or age had any effect on the participants' responses. No significant differences were found between males and females in terms of the frequency of "I don't know" responses, for both white wine (Chi-sq = 0.178, df=1,  $p = 0.672$ ) and red wine (Chi-sq = 0.690, df=1,  $p = 0.213$ ). Similarly, there were no differences in terms of how frequently the responses consisted of simply negating the target property, for both white wine (Chi-sq = 0.008, df=1,  $p = 0.997$ ) and red wine (Chi-sq = 0.220, df=1,  $p = 0.638$ ). Conversely, a difference was found when considering the number of different opposites produced in relation to red wine: the females came up with a larger number of terms than the males (Chi-sq = 28.648, df = 1,  $p < 0.001$ ). This was not found for white wine (Chi-sq = 0.022, df=1,  $p < 0.880$ ).

An analysis relating to age was carried out by splitting the sample into two groups (over 35 years old vs. under and including 35years old; this cut point was determined in order to have a sufficient balance between the two subsamples in terms of number but also in order to distinguish between younger and older adults). For both red and white wine, the younger participants responded less frequently with a negation of the target property (red wine: Chi-sq = 19.214, df = 1,  $p < 0.001$ ;

white wine: Chi-sq = 18.264, df = 1,  $p < 0.001$ ), but they came up with a lower number of different opposites for both red (Chi-sq = 83.160, df = 1,  $p < 0.001$ ) and white wine Chi-sq = 55.904, df = 1,  $p < 0.001$ ). These two results together suggest that the Vietnamese language is more standardized. No differences were found when considering the frequency of “I don’t know” responses (red wine: Chi-sq = 2.916, df = 1,  $p = 0.087$ ; white wine: Chi-sq = 0.840, df = 1,  $p = 0.359$ ).

### **2.2.3. Discussion**

Taken as a whole, the results of the study presented in this paper already offer some hints in terms of basic research questions concerning both the importance of opposites in shaping the cognitive experience of specific domains (the domain of wine in this case) and in relation to the theme of antonym canonicity, that is, relating to the fact that opposites range from pairs with very good matches to pairs with no clearly preferred partners, depending on the experiential context which is mentally activated (see Paradis, Wilners, & Jones, 2009). In this section, we will also discuss the results in relation to the findings which emerged from the twin study carried out previously with Italian participants (Bianchi et al., 2021) as described in the introduction to this paper. The difference between the two populations in terms of wine traditions and their familiarity with drinking grape wines as well as the language used to describe them make a cross-cultural comparison between them particularly interesting.

The first aspect we would like to focus on concerns the aptitude of standard consumers of wine to think of its sensorial properties in terms of opposites. The results of the present research indicate that Vietnamese non-expert consumers find it relatively easy. The responses which indicate that the participants found it difficult to figure out the underlying dimension (i.e. the “I don’t know” responses and those consisting of simply negating the target term) represented only around 14% of the total number of responses, and the percentage was very similar for the Italian participants. The data are, however, internally inverse, with the Italian

participants opting for “I don’t know” responses in around 12-13% of cases and negation in less than 2% of cases, while the Vietnamese participants used negation in 12-13% of responses and “I don’t know” in less than 1% of cases. This might reflect a general difference relating to the familiarity, style and frequency of the use of negation in the two languages (in the absence of precise antonymic terms). However, independently of this difference, if we consider that these two types of responses together constituted around 14% in both samples, this indicates that in the remaining 86% of cases the participants *were able to find an opposite*, which suggests that opposites are useful in the modelling of non-experts’ understanding of wine descriptors in both cultures. This outcome may be of some interest, not only in terms of basic research, but also from an applicative perspective - in advertising, for instance.

Another result that is worth noting regards *the number of different opposites elicited* by the 64 target properties. The Italian participants were able to come up with a richer set of alternative opposites for red wine than the Vietnamese participants. Conversely, the number of opposites elicited by the 64 terms in relation to white wine was similar for both the Italian and Vietnamese samples. This might have something to do with the fact that standard consumers in Vietnam are familiar with rice wine which is similar in color to white wine. While the tradition of wine drinking in Italy is well established for both red and white wines, the majority of Vietnamese people tend to prefer red wine when they drink grape wine (for example at special events such as New Year’s Eve or weddings) since the color red is considered to bring luck (To Viet, 2016; Le Van, 2018). Our data suggest that maybe due to the fact that the consumption of red wine is limited to special occasions, they do not in effect have a rich vocabulary to describe it, whereas the traditional rice wine has many properties in common with white grape wine in terms of color, sweetness and strength (see, for instance, adjectives such as “clear”, “brilliant white”, “acidulous” and “hazy”), and so Vietnamese people tend to describe white grape wine with the same terms (Le Van, 2018; Nguyen Cong Ha,

	White wine				Red wine		
	The most frequent opposite			The most frequent opposite			
Target Property	VIET participants	ITA participants		VIET participants	ITA participants		
(ENG transl)	(ENG transl)	(ENG transl)	R	(ENG transl)	(ENG transl)	R	
Off-Dry/Slightly	Dry	Dry	I	Dry	Dry	I	
Acidulous	Medium sweet	Sweet	S	Medium sweet	Sweet	S	
Alcoholic	Non-alcoholic	Non-alcoholic	I	Non-alcoholic	Non-alcoholic	I	
Medium Sweet	Dry	Dry	I	Dry	Dry	I	
Ample	Sub-standard	Narrow	D	Sub-standard	Restricted	D	
Harmonious	Hard	Not harmonious	D	Hard	Discordant	I	
Dry_1	Medium sweet	Soft	D	Medium sweet	Soft	D	
Astringent	Soft	Sweet	D	Slightly tannic	Soft	S	
Embracing	Sub-standard	Light	D	Sub-standard	Light	D	
Drinkable	Undrinkable	Undrinkable	I	Undrinkable	Undrinkable	I	
Bright	Dark	Opaque	S	Dark	Opaque	S	

Good	Bad	Bad	I	Bad	Bad	I
Warm	Cold/dry	Cold	S	Cold/dry	Cold	S
Characteristic	Common	Common	I	Common	Common	I
Lacking	Embracing	Rich	D	Embracing	Rich	D
Deep	Pale/Clear	Flat	S	Clear	Light	S
Complex	Poor in aroma	Simple	S	Poor in aroma	Simple	S
Common	Not characteristic	Rare	D	Characteristic	Rare	D
Robust						
Consistency	Sub-standard	Light	D	Sub-standard	Light	D
Short	Persistent	Long	S	Persistent	Long	S
Crystal Clear	Opaque	Opaque	I	Opaque	Opaque	I
Weak	Strong	Strong	I	Strong	Strong	I
Delicate	Astringent	Strong	S	Astringent	Strong	D
Full Bodied_1	Modest	Light	S	Light	Light	I
Sweet	Dry	Dry	I	Sour/acidulous	Dry	D
Excellent	Mediocre	Sub-standard	S	Mediocre	Sub-standard	S
Elegant	Not harmonious	Rough	S	Not harmonious	Rough	S

Exciting	Not exciting	Disappointing	D	Common	Disappointing	D
Well Balanced	Unbalanced	Unbalanced	I	Not harmonious	Unbalanced	S
Fine	Bad	Coarse	D	Bad	Coarse	D
Fluid	Full bodied	Dense	S	Full bodied	Dense	S
Frank	Sub-standard	Fake	D	Sub-standard	Complex	D
Fresh	Old	Warm	D	Old	Warm	D
Young	Old	Old	I	Old	Old	I
Pleasant	Unpleasant	Unpleasant	I	Unpleasant	Unpleasant	I
Immature	Mature	Mature	I	Mature	Mature	I
Intense	Light	Light	I	Light	Light	I
Light	Heavy	Heavy	I	Heavy	Heavy	I
Clear	Opaque	Turbid	S	Opaque	Turbid	S
Thin	Full bodied	Greasy	S	Full bodied	Greasy	S
Mature	Unripe/Young	Immature	D	Unripe/Young	Young	S
Flabby	Intense	Hard	D	Full bodied	Hard	D
Soft	Intense/acrid	Hard	D	Intense/acrid	Sharp	S
Very Good	Awful	Awful	I	Awful	Awful	I
Thick	Dry	Fluid	D	Dry	Light	D

Penetrating	Not penetrating	Light	D	Not penetrating	Light	D
Persistent	Short lasting	Light	D	Short lasting	Light	D
Heavy	Light	Light	I	Light	Light	I
Flat	Sour	Sparkling	D	Sour	Full bodied	D
Full Bodied_2	Without taste (Tasteless)	Empty	S	Without taste (Tasteless)	Empty	S
Ready	Undrinkable	Not ready	S	Undrinkable	Immature	S
Robust	Light	Light	I	Light	Light	I
Salty	Tasteless	Sweet	D	Tasteless	Sweet	D
Sapid	Medium sweet/sweet	Inspid	D	Medium sweet/sweet	Inspid	D
Tasteless	Very tasty	Tasty	S	Very tasty	Tasty	S
Dry_2	Medium sweet/sweet	Sweet	S	Medium sweet/sweet	Sweet	S
Sharp	Soft	Soft	I	Soft	Soft	I
Luscious	Enjoyable	Dry	D	Enjoyable	Dry	D
Tannic	Not tannic	Sweet	D	Not tannic	Light	D
Old	Young	Young	I	Young	Young	I
Hazy	Clear/Lively	Clear	S	Clear/Lively	Clear	S



Velvety	Sour	Rough	D	Sour	Rough	D
Viscous	Fluid	Fluid	I	Fluid	Fluid	I
Lively	Hazy	Flat	D	Hazy	Still	I

2014). This may be the reason why in the present study a more extensive set of opposites was used by the participants for white wine as compared to red wine.

A further interesting difference between the responses of the Vietnamese and Italian samples concerns the strength of the opposites which were most frequently elicited (i.e. the mode). When a significant difference between the two samples emerged, it was mostly in the same direction, that is, the mode was stronger in the case of the Vietnamese than for the Italians. In the study with the Vietnamese participants, this was found for 17 out of the 64 target properties for white wine and for 15 target properties for red wine. In contrast, the mode was stronger for the Italian sample for only three of the target properties. It is reasonable to suppose that this can be explained by the fact that since the Vietnamese participants are less familiar with grape wine, we may infer that the relative lexicon is more standardized.

It is also interesting to note the relationship between the most frequently chosen opposites relating to the Vietnamese participants and those relating to the Italians in the twin study (see Table 8).

Table 8 - A comparison between most frequent opposites chosen by the Vietnamese participants in relation to the 64 target properties, for white and red wine (see the study presented in this paper) and the most frequent opposite chosen by the Italian participants in a twin study (Bianchi et al., 2021). The relationship between the properties chosen by the two samples of participants is described in column R (I = Identical property; S = Similar property; D = Different property).

The opposites chosen were in most cases the same or synonyms for 39 of the target descriptors (i.e. 61%) for white wine and for 42 of the target descriptors (i.e. 66%) for red wine. For the remaining properties (25, i.e. 39% for white wine and 22, i.e. 34% for red wine), the opposites selected by the Vietnamese group were often somehow related to the opposites chosen by the Italian group. The classification was done by two of the authors of this paper and the inter-rater agreement was good (Cohen  $k = 0.87$ ). This is a noteworthy finding in terms of the robustness of *some* of the sensory dimensions relating to wine in the lexicon of non-experts. These similarities and differences with regard to the two languages are of interest, not only for basic research but also from a marketing perspective.

### **2.3. Study 2 – The sensorial experience of wine for Australian non-experts**

The main goal of the present study is to further extend testing the usability of opposites in standard consumers' conceptualization of wine sensory properties, this time with Australian participants. Carrying out this test in Australia is interesting from a linguistic point of view since the principal language spoken is English. The fact that it is one of the group of New World countries who have started to produce wine on a larger scale (along with the U.S., New Zealand, Argentina, Chile, and South Africa) makes it possible to compare the results with the so-called Old World countries, that are considered to be the birthplace of wine (i.e. Europe and the Middle East) and with Vietnam, that have no tradition of grape wine production and only recent experience of wine consumption. Australia is also of interest because it has a strong wine industry and is consistently in the top five wine exporters in the world, behind France, Italy and Spain; all Old World countries (OEC, 2020). In addition, Australia has a strong domestic wine market, typically drinking Australian-made wine, with only 16.6% imported (Wine Australia, 2020). Since the study aims to replicate previous work conducted in Italian and Vietnamese, Australia represents an interesting comparison to these previous studies because it is the first time that this research has been conducted in English.

Two are the main goals of the study. The first goal concerned testing whether the non-expert participants in the study were capable of identifying the opposite property of the 64 stimuli properties. In other words, we aimed to learn how many and which of these 64 terms were in effect understood by the participants as constituting a dimension. As for the study with Vietnamese participants, two types of response were considered as cues that participants found it difficult to determine what the underlying dimension was, that is, “*I don’t know*” type responses and simple negation (i.e. giving “*not sweet*” as the opposite to “*sweet*”, or “*not fresh*” as the opposite to “*fresh*”). Both these types of responses suggest that the participants were unable to find the right word, or that they did not have a well-structured dimension in mind.

The second question concerned the univocity/multivocity of the dimensions which were identified. If the meaning of a term is univocal (unambiguous), then the participants should be consistent in identifying the underlying sensory dimension. If a term is not univocal, it would result in a variety of different opposites (i.e. multiple meanings). As in the previous study with Vietnamese participants, we used two indexes to capture the univocity/multivocity of the dimensions which were identified: i) *the number of different opposites elicited* (the greater the number of opposites that were given, the less univocal the dimension was deemed to be) and ii) *the strength of the most frequent response* (the greater the number of participants who converge on the most frequent response – in statistical terms the mode – the more evident the dimension).

## ***Method***

### **Participants**

A total of 339 Australian wine drinkers (230 females and 109 males, ranging in age from 18 to 60) participated in the study (they agreed that they drank wine before taking part in the study). A total of 169 participants completed the online questionnaire in relation to red wine; 170 participants completed the white wine

version of the questionnaire. They were recruited using CloudResearch. They volunteered to take part in the study, were informed that they could withdraw at any time, and all gave their informed consent prior to filling in the questionnaire. The study conforms to the ethical principles of the declaration of Helsinki (World Medical Association, 2013) and was approved by the ethical committees of the university departments involved, both in Italy and Australia.

## **Materials**

There were two identical online questionnaires in English based on the original questionnaires designed for the Italian (Bianchi et al., 2021) and Vietnamese (Truong et al., 2021) studies. One of the questionnaires focused on red wine, the other on white wine. The questionnaires were created using LimeSurvey CE (stable version: 3.4.2) and the responses were automatically registered on a MySQL database and were then administered via CloudResearch 2021.

On the first page of the questionnaire, we collected information about the gender, age and level of expertise of the participants with respect to wine (e.g. I have no interest in wine; I am interested in wine; I have participated in some low/medium level training courses on wine; I have participated in high level training courses on wine; I am a sommelier/professional taster/oenologist). On the second page, the instructions to the task were displayed: “You will be presented with 64 words describing various different sensory properties of wine. You will be asked to focus on these properties specifically with reference to red wine or white wine. Your task is to type in the empty box that you will see to the side of each word what you consider to be the opposite property.” The list of 64 target terms then followed, with the order to the 64 terms randomized between participants.

## **Procedure**

The questionnaire was made available online using CloudResearch. It could be accessed by means of smartphones or computers. No time limits were set for

completing the questionnaires. The participants were allowed to take breaks since there were no time limits. The average time needed to fill in each questionnaire was around 30 minutes.

#### *Data analysis.*

The data analysis was carried out using the same methods and packages described for the study with Vietnamese participants (section 2.2.). The statistical data analyses were conducted after an initial cleaning of the data matrix to eliminate responses consisting of random typing errors or nonsensical responses. In total, 9% of the responses were eliminated for red wine and 11% for white wine.

### **Results**

#### *a) Identifiable opposites (indications of the participants' ability or otherwise to identify an underlying sensory dimension)*

Responses manifesting an incapacity to identify an opposite (i.e. responses such as “I don't know” and mere negations) represented, respectively, 14% and 5% of the total number of responses for red wine and 9% and 7% of the responses for white wine. This means that the participants were able to find an opposite in 81% of cases for red wine and in 84% of cases for white wine.

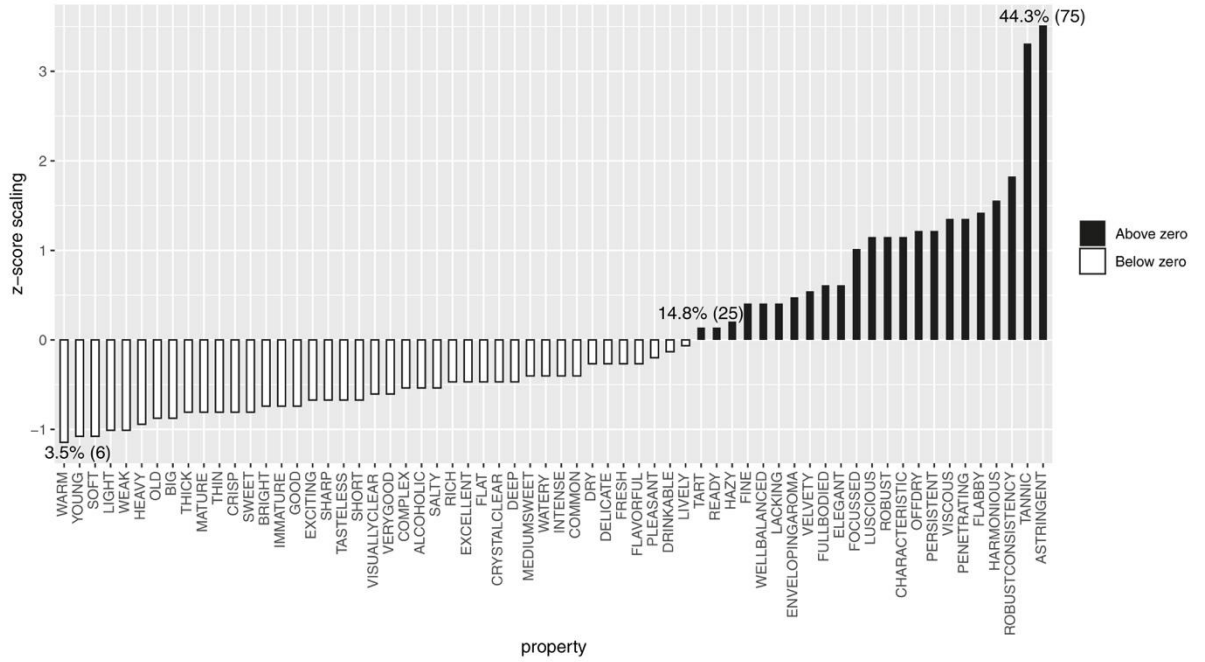
This finding generally supports the idea that opposites are, in effect, a suitable way to model non-experts' understanding of the meanings pertaining to the 64 sensory properties of wine used in the study. We see a more analytical picture, however, if we take into consideration the proportion (of the total number of responses for each target property) of “I don't know” responses and of mere negations as separate categories. Figures 1 and 2 show the outcome of the scaling methods used to rank the 64 target properties based on how frequently the participants responded “I don't know” (Fig. 1) and how frequently they responded by means of mere negation (Fig. 2). On the right of both figures are the properties for which indeterminate responses

were more frequently used. The scaling was performed on the z-scores. A *z-score* measures exactly how many standard deviations *above* or *below* the mean a data point is. To give an idea of how many responses correspond to the bar lengths, we report on the graphs some anchor values, in percentages, corresponding to the central bar and the two bars at the extremes. As shown in Figure 1, in more than 40% of cases, the participants were unable to think of a sensory property that they would consider to be the opposite of *astringent*, either for red or white wine. A similar percentage of “I don’t know” responses was found for *tannic*. The frequency of “I don’t know responses” is within 2 standard deviations for all other terms.

On the left-hand side of the graphs in Figure 8 are the properties for which the task of identifying an opposite was solved with an “I don’t know” response in very few cases (less than 4% for red wine and below 1% for white wine). There is a certain amount of overlap between the two types of wine: *warm, young, soft, light, weak, heavy, mature, immature, thick, dry, sweet, bright, good* and *tasteless* are present for both red and white wine in the first 20 properties listed starting from the extreme left-hand side of the graphs in both figures.

RED WINE – Normalised proportion “I don’t know” responses

Diverging z-score bars



WHITE WINE – Normalised proportion “I don’t know” responses

Diverging z-score bars

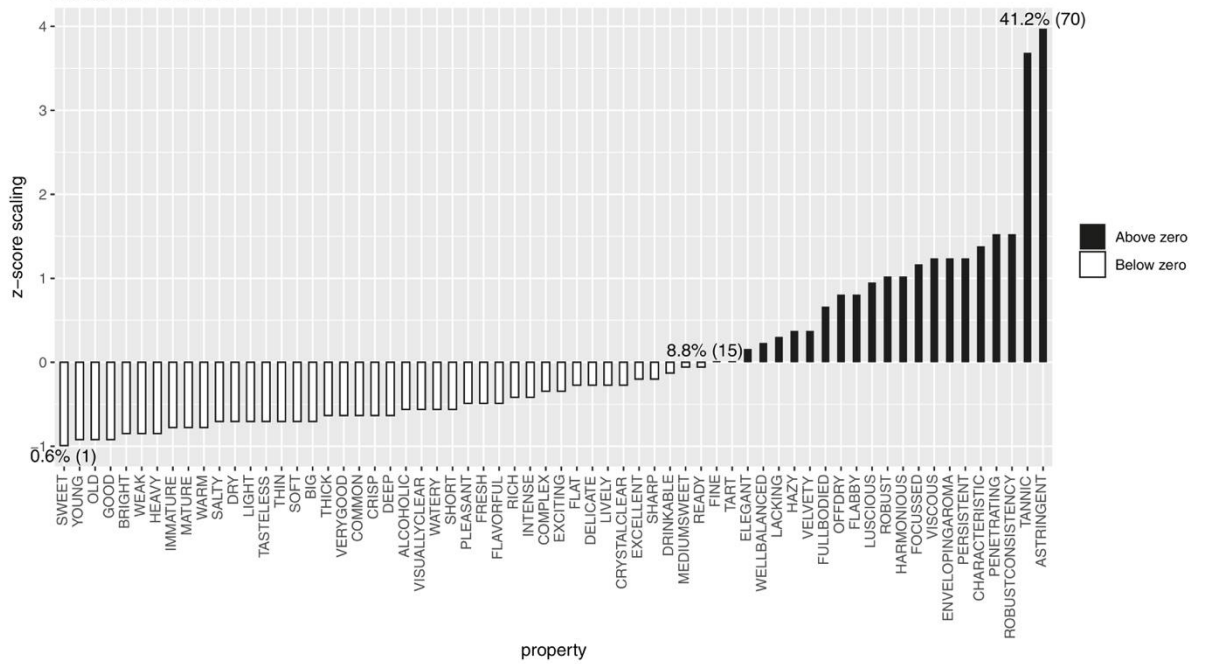
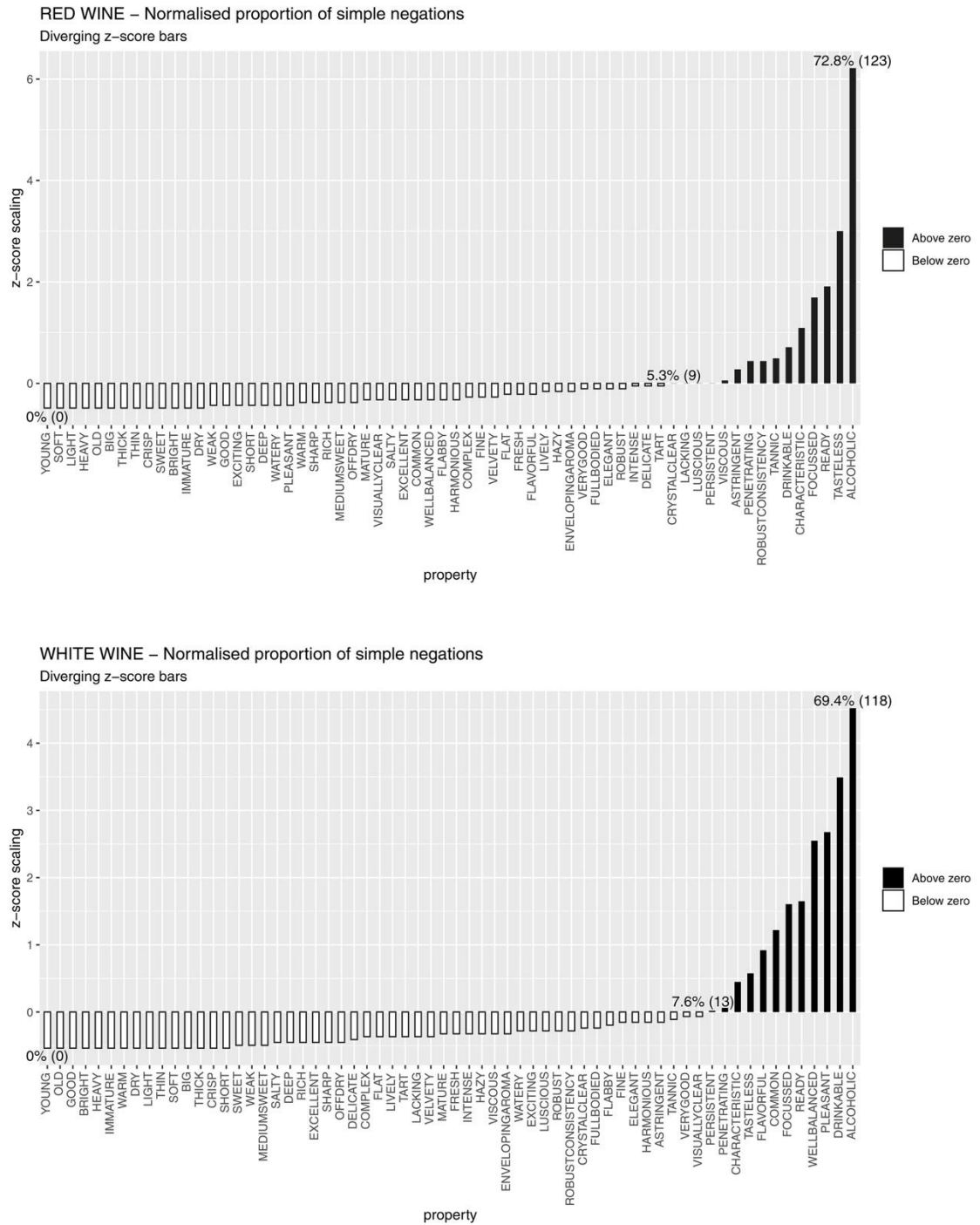


Fig. 8. The scaling (based on z values) of the 64 target properties in terms of the proportion of “I don’t know” responses given by participants for each property in relation to red wine (top graph) and white wine (bottom graph). Values in brackets (e.g., (15)) are the raw number of people who indicated “I don’t know” for that property.





**Fig. 9.** The scaling (based on z values) of the 64 target properties in terms of the proportion of responses consisting of a mere negation (e.g. “not tannic” as the opposite of “tannic”) in relation to red wine (top graph) and white wine (bottom

graph). Values in brackets (e.g., (13)) are the raw number of people who used a simple negation for that property.

Figure 9 shows that the use of negation remains in between 0% and 5.3% for red wine and 0% and 7.6% for white wine for the large majority of properties. Comparatively few properties stimulated a not-X response with a higher frequency than the mean. This was particularly the case (i.e. higher than 2 standard deviations) for *tasteless* and *alcoholic* for red wine, and for *well balanced*, *pleasant*, *drinkable* and *alcoholic* for white wine. In the case of *alcoholic*, the result can be easily explained in terms of the English lexicon since *non-alcoholic* is the expression used most commonly as the opposite of *alcoholic*. For the other terms, the data likely reflects that the participants were effective uncertain about the opposite of the target property, and they thus represent a recourse to a shortcut strategy in order to fill in the response box.

#### *b) Multivocality of the property*

The fact that participants were able to identify an opposite still does not tell us how consistent they were in their choice of an opposite, that is, how often they chose the same opposite as the other participants. Figure 10 shows the ranking of the 64 target properties according to the total sum of opposites which were different from those chosen by the other participants. The variation in the number of different opposites elicited was high: it ranged from 6 to 64 for red wine (e.g. *young* was associated with 6 different opposites while *penetrating* with 64 different opposites) and from 5 to 71 for white wine (e.g. *young* was associated with 5 different opposites while *elegant* with 71 different opposites).

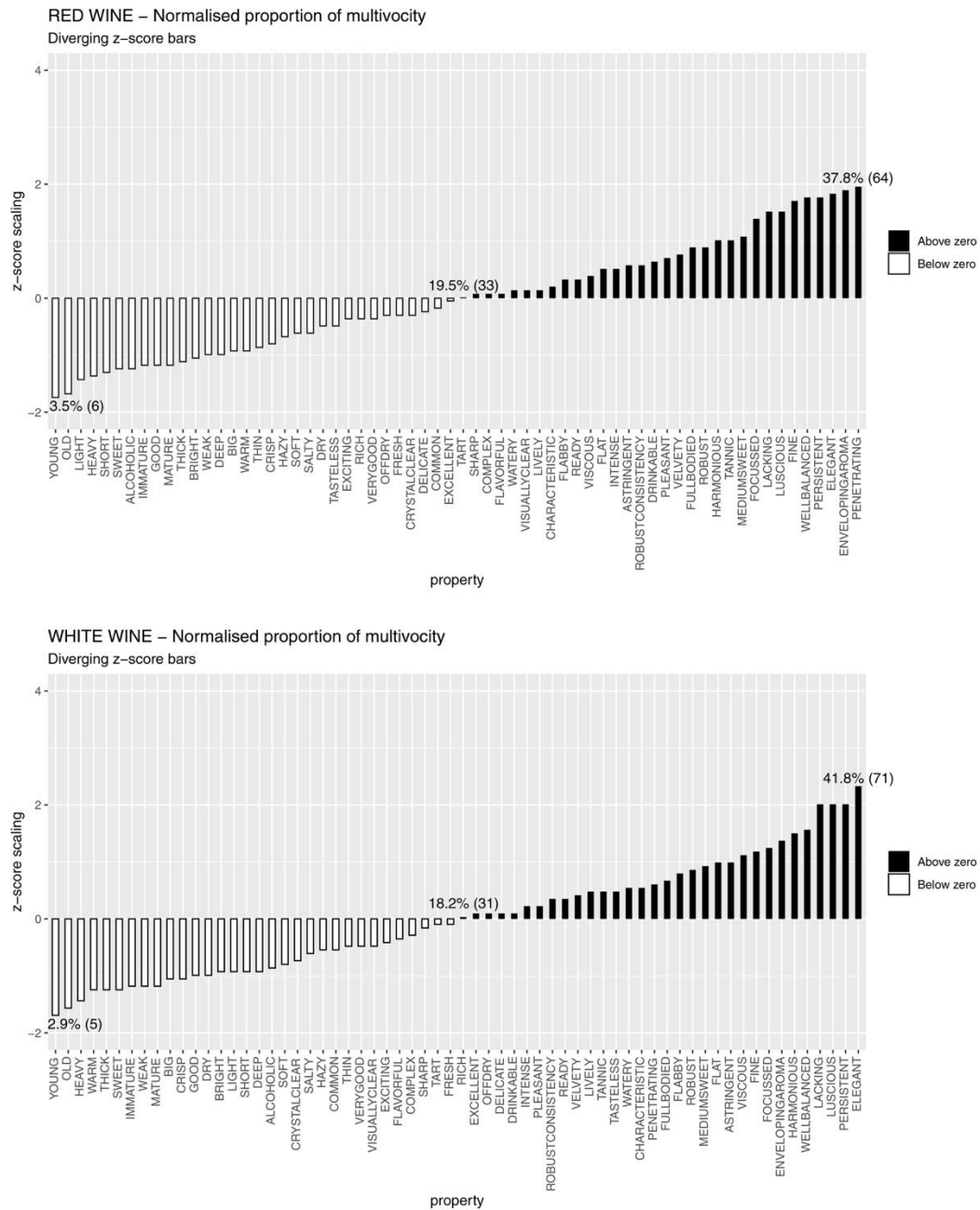


Fig. 10. Scaling (based on z values) of the 64 target properties in terms of the number of different opposites given by participants, in relation to red wine (top graph) and white wine (bottom graph). Values in brackets (e.g., (31)) are the number of different opposites given for each property.

Another way of measuring convergence on the same opposite was offered by the mode, as explained in the introduction to the study. Figure 11 shows the ranking of the 64 target properties according to the proportion of participants (out of the total number) who agreed on the most frequently elicited term, that is the mode, which is displayed near the bars in Figure 4. An idea of the average degree of convergence on the most frequent response is represented by the percentages reported on the graphs in correspondence to the 0 z-score; this is 33.1% for red wine and 38.8% for white wine. More than 85% of the participants, however, agreed on the opposite of *heavy* in reference to wine and, in fact, *light* was the most frequent response for both red and white wine. There was also a high degree of convergence for terms such as *thick*, *weak*, *big* and *good*. The reason for this is probably due to the fact that these are non-technical terms, or at least they are understood as such by standard consumers. We will go back to this question in the final discussion.

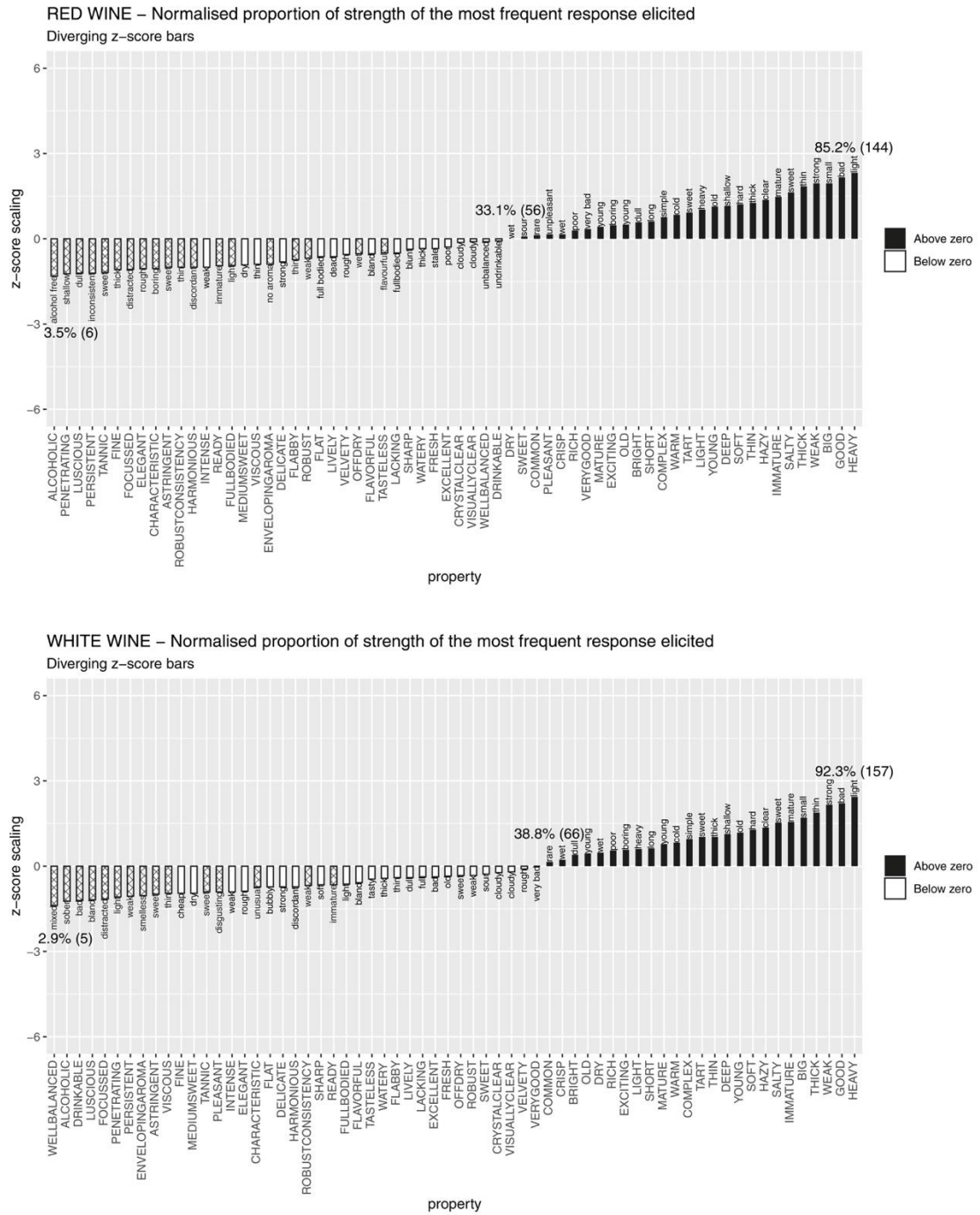


Fig. 11. Scaling (based on z values) of the 64 target properties in terms of the strength of the most frequent opposite, in relation to red wine (top graph) and white wine (bottom graph). Textured bars indicate that “I don’t know” or non-X was the most frequent response and therefore the opposite displayed over the bar refers not

to the first but the second most frequent response. Numbers in brackets (e.g., (66)) are the number of people who gave the modal response.

*c) Relationship between indexes relating to multivocality, “I don’t know” responses, Negation and Strength of the most frequent opposite*

We explored the relationship between these four indexes by means of Pearson Correlations (Table 9).

The analyses showed that only negation is independent of the other indexes. Conversely, for both red and white wine, a strong significant correlation was found between “I don’t know” responses and multivocality (positive correlation) and the strength of the most frequent opposite (in this case negative). This may be interpreted as a confirmation that “I don’t know” responses are associated with uncertainty. The higher the number of “I don’t know” responses, the greater the uncertainty about the opposite of that property. This is reflected both in the low number of participants converging on the same opposite (indicating a low degree of strength related to the most frequent opposite) and, conversely, the large number of different opposites evoked by that property.

A strong negative correlation was also found between Multivocality and the Strength of the most frequent opposite, again for both red and white wine. The higher the number of different opposites that the same term evoked in the participants’ minds, the lower the number of participants who agreed on the same opposites (i.e. the most frequent).

Table 9 – Pearson Correlation Matrix on the frequency of the 4 variables studied: number of different opposites (multivocality), frequency of “I don’t know” responses, frequency of responses making use of mere negation of the target property, and mode (strength of the most frequent term).

RED WINE	Multivocity	I don't know_	Negation_	Strength of the most frequent opposite
Multivocity_	—			
I don't know	0.659** *	—		
Negation	0.056	0.146	—	
Strength of the most frequent opposite	- 0.730** *	- 0.641* **	-0.390**	—
WHITE WINE	Multivocity	I don't know_	Negation_	Strength of the most frequent opposite
Multivocity_	—			
I don't know	0.625 ***	—		
Negation	0.157	0.041	—	
Strength of the most frequent opposite	- 0.739 ***	- 0.534* **	0.446***	—

Note. \* p < .05, \*\* p < .01, \*\*\* p < .001

## CONCLUSIONS

“Wine is not just an object of pleasure, but an object of knowledge; and the pleasure depends on the knowledge” (Scruton, 2013). It has been repeatedly acknowledged that wine appreciation varies depending on the drinker’s level of interest and degree of expertise. The differences between experts and non-experts concern the ability to discriminate the properties of wine, their memory of other wines they have drunk (for comparison purposes) and the richness and variety of the language that they are able to use to talk about wine (e.g. Ballester, Patris, Symoneaux, & Valentin, 2008; Charters & Pettigrew, 2007; Croijmans, Speed, Arshamian, & Majid, 2020; Hopfer & Heymann, 2014; Hughson & Boakes, 2000; Zucco, Carassai, Baroni, & Stevenson, 2011; Torri et al., 2013). Professionals have an essential role in influencing the sales of wine by means of their reviews and ratings; but standard consumers have an important role too since their buying behavior has a direct impact on the wine market. Wine sensory descriptions are written by wine experts, but these descriptions are often not meaningful for non-experts (e.g. Parr, et al. 2011; Rodrigues et al. 2015; Solomon, 1990) and terms often have different meanings for experts and nonexperts (e.g. Bianchi et al. 2021; Ivanova et al., 2022). The issue of ensuring efficient communication between experts and non-experts is therefore crucial.

In this thesis, we have addressed this topic in a cross-cultural perspective, starting from a seed study carried out in Italian, and assuming opposition as a key configuration to describe the sensorial characteristics of wine (as discussed in pages 33- 40 in the present thesis).

References to a wine being young–old, heavy–light, strong–delicate, mature–immature, balanced–unbalanced, complex–simple, harsh–smooth, but also distinguished–ordinary, pretentious–honest and integrated–disjointed are common in wine reviews and on bottle labels (e.g. Lehrer, 2009). Moreover,



the dimensions used for the purposes of evaluation in professional contexts are also often expressed in terms of scales ranging between two opposite extremes (Paradis, 2015) – see, for instance, the discussion developed in these tastes at pages 41-48 in relation to the qualifying tests used by the WSET - the Wine and Spirit Education Trust).

The general question underlying this paper concerns whether opposites can play a role in modeling the dimensions evoked by common descriptors of wine, not only in experts' and professionals' lexicon but also for *non-expert* consumers. A positive answer to this question was suggested by a study carried out with Italian Participants (Bianchi et al, 2021). Italy belongs to the so-called the Old World countries, that are considered to be the birthplace of wine (i.e. Europe and the Middle East). The aim of the studies developed in this PhD project was to test the extension of this conclusion to other two samples of standard consumers: Vietnamese, who are much less familiar with grape wine (section 2.2, pp 67-79) and Australians, who are familiar with wine since they live in one of New World countries who have started to produce wine on a larger scale (section 2.3 – pp 80-91).

Why did we consider relevant to empirically establish whether the conceptualization of wine properties in terms of dimensions and opposites works well also for standard consumers and in Countries with very different wine tradition? Because once this has been established, the use of this “configuration” (Paradis, 2008) can be taken for granted and then the problem of bridging the gap between experts and non-experts in communications about wine shifts to the level of understanding whether these terms and dimensions are attributed *the same or at least similar meanings* by experts and non-experts. This is an interesting aspect to consider not only in terms of basic research but also of applied research, primarily in relation to the marketing and advertising of wine.

What are the main results emerging from the studies discussed in this thesis in relation to the 64 terms analyzed?

In more than 80% of the cases both Australian and Vietnamese participants were able to find what they considered to be an opposite for the target properties presented. These percentages are similar to those found in previous studies using the same set of terms with Italian standard consumers. This is an interesting result since it indicates that opposites represent a potential common ground between expert and non-expert ways of communicating about wine, independently of people's knowledge of wine. Standard consumers in Italy, Australia and Vietnam have different levels of expertise in terms of their knowledge of grape wine. Italians have traditionally been renowned wine producers for a very long time and Australians have strongly emerged as extremely popular New World wine producers. Both countries have a certain tradition for wine production and the market is well established. Conversely, Vietnam is a relative newcomer to grape wine as the national beverage is rice wine. However, now imported grape wine is fairly frequently found at social events.

The fact that opposites seem to be useful for the purposes of modeling standard consumers' conceptualization of the sensory dimensions relating to wine is both of practical interest (in relation to wine advertising) and of interest for basic research being carried out on opposites, since it confirms the applicability of opposition to the naïve conceptualizations pertaining to this specific sensorial domain. The results thus enrich previous studies on the pervasiveness of opposites in human perception and cognition (as revised in chapter 1 in the present thesis, page 33-48).

The critical point of interest regards the extent to which standard consumers were consistent in their choice of opposites. There was a great deal of variability between the properties in this study in terms of the opposites which were chosen by the participants. In the Vietnamese study (Truong, 2021), the range varied from 4 to 77 for white wine (specifically *heavy* was associated with 4 different opposites

while *embracing* had 77 different opposites), and from 5 to 41 for red wine (*fluid* was associated with 4 different opposites, while *embracing* had 41 different opposites). In the Australian study, the number of different opposites ranged from 5 to 71 for white wine (specifically, *young* was associated with 5 different opposites, while *elegant* had 71 different opposites), and from 6 to 64 for red wine (specifically *young* was associated with 6 different opposites while *penetrating* had 64 different opposites). There was also a high degree of variability in the study with the Italian participants (Bianchi et al. 2021): the range varied from 15 to 99 for white wine (specifically *young* was associated with 15 different opposites while *sharp* had 77 different opposites), and from 12 to 100 for red wine (specifically *old* was associated with 12 different opposites, while *sharp* had 100 different opposites).

The number of participants who took part in the Australian, Italian and Vietnamese studies differed, and therefore we need to assess this data in terms of the proportion of different opposites with regard to the overall total number of participants. Table 10 shows the results of this analysis. The properties which elicited different opposites represent 2.9% -5.3% of the total number of responses for the properties with lower multivocality (min in Table 4), but 34%-43% of the total number of responses for the properties with higher multivocality. In other words, in the latter case we have around 4 different opposites for every 10 participants. The indication is that the dimensions relating to wine are ambiguous. This represents a potential source of misunderstanding: even if a wine producer carefully selects the words to describe the particular characteristics of their products, standard consumers may still interpret them in a different way and thus the efficacy of the description is at best unpredictable and at worst compromised.

Table 10 – Properties that elicited the minimum (min) and maximum (max) number of different opposites, in relation to white and red wine, in the three samples of participants: Australian (present study), Italian (Bianchi et al., 2021) and Vietnamese (Truong et al., 2021).

Table 10- The percentages express the number of different opposites out of the total number of participants.

<b>Sample</b>	<b>Type of wine</b>	<b>min</b>	<b>Max</b>
Vietnamese (N=300)	white	2.2% ( <i>heavy</i> )	43.0% ( <i>embracing</i> )
	red	3.3% ( <i>fluid</i> )	34.0% ( <i>embracing</i> )
Australian (N= 339)	white	2.9% ( <i>young</i> )	41.8% ( <i>elegant</i> )
	red	3.5% ( <i>young</i> )	37.8% ( <i>penetrating</i> )
Italian (N=558)	white	5.3% ( <i>young</i> )	35.1% ( <i>sharp</i> )
	red	4.3% ( <i>old</i> )	36.8% ( <i>sharp</i> )

One of the limitations of the studies presented in this thesis is that the terms used as target properties were words frequently used for descriptions of wines in Italy. They were taken from popular wine guides and from the technical scales used by the Italian Sommeliers Association to analyze the sensory profiles of wine. However, Italy is one of the main producers and exporters of wine, and the description of the Italian wines travel around the World together with the wine bottles. Therefore, the terms assessed in the study, despite having an Italian origin, seem to us representative of a diffused terminology about wine.

Another limitation of the studies presented is that they were conducted on a sample of respondents who were part of an existing research panel, and therefore may not be representative of the general population. However, this research may not require a representative sample as we were interested in relationships between variables, rather than prevalence per se. The use of online convenience samples for such

research is common and may not necessarily be a limitation. Because the survey was conducted online, some participants may have looked up opposites for each property, reducing the number of “don’t know” responses. We do not have any evidence to suggest that this was the case, but note that it was possible for participants to do this.

Further investigations are needed to get deeper into the overall question addressed in this thesis or to focus on specific properties that might be of special interest for wine makers; to explore in detail what are the differences in conceptualization of the same dimensions in various consumers samples in a cross-cultural perspective, but also to better understand the differences between the meaning associated by experts and non-experts to the same terms. In fact, it cannot be taken for granted that the terms selected more frequently by the participants in these studies are consistent with the interpretation of an expert and with the dimension that an expert would identify. On the contrary, in the Italian study (Bianchi et al., 2021) a preliminary assessment of the gap between the most frequently chosen opposites in Italian and the dimension that expert sommeliers associated with the same properties revealed that good agreement was reached in only one-third of the dimensions identified by standard consumers.

Analysing the nature of this gap represents an important basis for developing more effective communication between standard consumers and experts. It would provide information, on the one hand, about the terms which are understood in a similar way by both groups and, on the other hand, the terms that risk being understood differently and are therefore better to avoid as descriptors. In the case of these latter terms, for which misinterpretation is highly probable, wine producers and experts may need to find alternative terms to describe their product. Obviously, standard consumers cannot be expected to enrol in sommelier courses in order to understand the label on a wine bottle. and it would be more reasonable for wine producers and experts to be willing to adapt their language to make it more accessible to non-experts. Similarly, it would be extremely useful for them to invest

in research into how standard consumers conceptualize and categorize the properties of wine. This is not only an interesting issue for basic research, but would also have a clear impact on the efficacy of the marketing and advertising of wine.

## ➤ REFERENCES

- Abraben, L. A., Grogan, K. A., & Gao, Z. (2017). Organic price premium or penalty? A comparative market analysis of organic wines from Tuscany. *Food Policy*, *69*, 154-165.
- Amerine, M.A., & Rossler, E. B. (1976). *Wines: Their Sensory Evaluation*. San Francisco: Freeman.
- Arroyo, B. L., & Robert, E. B. (2015). How specific wine tasting descriptors are?. *Procedia – Social and Behavioral Sciences*, *198*, 287-299
- Banks, G., & Overton, J. (2010). Old World, New World, Third World? Reconceptualising the Worlds of wine. *Journal of Wine Research*, *21*(1), 57-75.
- Bakker, J., & Trinberlake, C. F. (1986). The mechanism of colour changes in aging port wine. *The American Journal of Enology and Viticulture*, *37*, 288-292.
- Barsalou, L. (2008). Grounded cognition. *Annual Review of Psychology*, *59*, 617-645.
- Bartoshuk, L. M. (1980). *Sensory analysis of the taste of NaCl*. In M.R. Kare, M. J. Fregley, & R.A.
- Baud-Bovy, G., & Gentaz, E. (2004). The visual localization of the center of triangles in young children and adults. *Current Psychology Letters*, *13*, 2-11.
- Bedichek, R. (1960). *The Sense of Smell*. London: Michael Joseph.
- Bianchi, I., & Savardi, U. (2008). *The perception of Contraries*. Roma, IT: Aracne.
- Bianchi, I., Savardi, U., & Kubovy, M. (2011). Dimensions and their poles: A metric and topological theory of opposites. *Language and Cognitive Processes*, *26*(8), 1232–1265.
- Bianchi, I., Burro, R., Torquati, S., & Savardi, U. (2013). The middle of the road: Perceiving intermediates. *Acta Psychologica*, *144*(1), 121–135.
- Bianchi, I., Savardi, U., Burro, R., & Martelli, M. F. (2014). Doing the opposite to what another person is doing. *Acta Psychologica*, *151*, 117-133.

- Bianchi, I., Paradis, C., Burro, R., Weijer, J., Nystrom, M., & Savardi, U. (2017). Identification of opposites and intermediates by eye and by hand. *Acta Psychologica, 180*, 175-189.
- Bianchi, I., Branchini, E., Torquati, S., Fermani, A., Capitani, E., Barnaba, V., Savardi, U., & Burro, R. (2021). Non-experts' understanding of terms frequently used by experts to describe the sensory properties of wine: An investigation based on opposites. *Food Quality and Preference, 92*, 104-215.
- Billet, J. B., & McClendon, M. J. (2000). Modeling acquiescence in measurement models for two balanced sets of items. *Structural Equation Modeling, 7*(4), 608–622.
- Blonston, G. (1985). Wheel of flavours. *Science, 85*, 74.
- Borghi, A. M., & Cimatti, F. (2010). Embodied cognition and beyond: Acting and sensing the body. *Neuropsychologia, 48*(3), 763-773.
- Brentari, E., Levaggi, R., & Zuccolotto, P. (2011). Pricing strategies for Italian red wine. *Food quality and preference, 22*(8), 725-732.
- Broadbent, J. M. (1979). *Wine Tasting-Enjoying and Understanding*. London: Christie's Wine
- Brochet, F., & Dubor, D. (2001). Wine descriptive language supports cognitive specificity of chemical senses. *Brain and Language, 77*(2), 187-196.
- Bruce, N. (1999). Classification and hierarchy in the discourse of wine: Émile Peynaud's The Taste of Wine. *Asp, 23*, 149-164
- Bruwer, J., Jiranek, V., Halstead, L., & Saliba, A. (2014). Lower alcohol wines in the UK market: Some baseline consumer metrics. *British Food Journal, 116*, 1143-1161.
- Bryce, Rankie (1990). Talking and writing about wine. *Tasting and enjoying wine* (pp. 38-49). Adelaide, Australia: the Australian Industrial Publishers Pty Ltd.
- Burro, R., Savardi, U. & Bianchi, I. (2008). Are Opposites Unidimensional?, *Gestalt Theory, 2*, 191-195.



- Caballero, R., & Paradis, C. (2015). Making sense of sensory perceptions across languages and cultures. *Functions of Language*, 22(1), 1-19.
- Cardello, V. (1992). The role of human senses in food acceptance. Meiselman & MacFie (Eds.), *Food choice acceptance and consumption* (pp. 1-64). UK: Blackie Academic & Professional.
- Chang, K. J., Thach, M. L., & Olsen, J. (2016). Wine and health perceptions: Exploring the impact of gender, age, and ethnicity on consumer perceptions of wine and health. *Wine Economics and Policy*, 5(2), 105-113.
- Charters, S., & Pettigrew, S. (2007). The dimensions of wine quality. *Food Quality and Preference*, 18(7), 997-1007.
- Charters, S. (2006). *Wine and Society: The Social and Cultural Context of a Drink*. Oxford: Elsevier Butterworth-Heinemann.
- Charters, S., Velikova, N., Ritchie, C., Fountain, J., Thach, L., Dodd, T. H., & Terblanche, N. (2011). Generation Y and sparkling wines: A cross-cultural perspective. *International Journal of Wine Business Research*, 23(2), 161-175.
- Chrea, C., Melo, L., Evans, G., Forde, C., Delahunty, C. & Cox, D. N. (2011). An investigation using three approaches to understand the influence of extrinsic product cues on consumer behavior: An example of Australian wines. *Journal of Sensory Studies*, 26(1), 13-24.
- Cholewiak, S. A., Fleming, R. W., & Singh, M. (2015). Perception of physical stability and center of mass of 3-D objects. *Journal of Vision*, 15(2), 1-11.
- Churchill, Creighton (1967). Wines of the New World. *The world of wines* (pp. 183-185). New York, USA: Collier Books.
- Clarke, O. (2012). Bordeaux: The wines, the vineyards, the winemakers. *Bordeaux's Wines* (pp. 26-30). UK: Pavilion Books.

- Clive, H. (2011). Tasting wine. *The Australian wine guide* (pp. 50-72.). Putney: Hospitality Books.
- Cruse, A., & Togia, P. (1996). Towards a Cognitive Model of Antonymy. *Journal of Lexicology, 1*, 113-141.
- Cruse, A. (2002). The Construal of Sense Boundaries. *Revue de Semantique et Pragmatique, 12*, 101-119.
- Cox, R. H., & Williams, K. (1993). Development of the concept of middleness in children. Response time and complexity. *Perceptual and Motor Skills, 77*, 1275-1281.
- Dalton, P., Doolittle, N., Nagata, H., & Breslin, P. A. S. (2000) The merging of the senses: integration of subthreshold taste and smell. *Natural Neuroscince, 3*, 431–432.
- Do, V. B., Patris, B., & Valentin, D. (2009). Opinions on wine in a new consumers country: A comparative study of Vietnam and France. *Journal of Wine Research, 20*, 253-271.
- Dollar, D., Glewwe, P., & Jennie, I. L. (1998). *Household Welfare and Vietnam's Transition*. Washington, DC: World Bank Publications.
- Dover, S., & Treglode, B. D. (2004). *Viet Nam contemporain*. Bangkok and Paris: IRASEC/Les Indes savants.
- Frank, R. A., Shaffer, G., & Smith D. V. (1991). Taste–odor similarities predict taste enhancement and suppression in taste–odor mixtures. *Chemical Senses, 16*, 523.
- Ganzevles, P. G. K., & Kroeze, J. H. A. (1987). The sour taste of acids. The hydrogen ion and the undissociated acid as sour agents. *Chemical Senses, 12*(4), 563-576.
- Gawel, R. (1998). The use of language by trained and untrained experienced wine tasters. *Journal of Sensory Studies, 12*, 267-284.
- Gawel, R., Oberholster, A., Francis, & Leigh, I. (2000). A ‘mouth-feel Wheel’: terminology for communicating the mouth-feel characteristics of red wine. *Australian Journal of Grape and Wine Reseaarch, 6*(3), 203-207.

Graham, V., Jackson, T. A., & Wetch, L. (1944). Generalization of the concept of middleness. *The Journal of Genetic Psychology*, 65, 227-237.

Gia, L. (2000). *Culture of Wine*. Hanoi: Culture and Information Press.

Gibbs, R. W. (2006). *Embodiment and cognitive science*. Cambridge: Cambridge University Press.

Goode, J. (2014). *The Science of Wine: Our interaction with wine* (pp. 188-194). California, US: University of California Press

Halliday, J., & Johnson, H. (2006). *The art and science of wine*. London: Hardie Grant Books.

Harris, M. M., & Bladen, A. (1994). Wording effects in the measurement of role conflict and role ambiguity: A multitrait-multimethod analysis. *Journal of Management*, 20(4), 887–901.

Hartley, C. (2011). Tasting wine. *The Australian wine guide* (pp. 50-72.). Putney: Hospitality Books.

Hayden, W. (2006). *Good wine, bad language, great vineyards*. Sydney, Australia: Drink Australia Pty Ltd.

Health, D. B. (1995). An introduction to alcohol and culture in international perspective. In: D.B. Health (Eds.), *International Handbook on Alcohol and Culture* (pp. 1-6). Westport, US: ABC CLIO Publisher.

Henderson, J. P., & Rex, D. (2005). *Tasting wine. About wine*. New York: Thomson Delmar Learning.

Herdenstam, A., Hammaren, M., Ahlstrom, R., & Wiktorsson, P. (2009). The professional language of wine: Perception, Training and Dialogue. *Journal of Wine Research*, 20(1), 53-84.

- Hidalgo-Baz, M., Martos-Partal, M., & Gonzalez-Benito, O. (2017). Assessments of the quality of organic versus conventional products, by category and cognitive style. *Food Quality and Preference*, 62, 31-37.
- Hopfer, H., & Heymann, H. (2014). Judging wine quality: Do we need experts, consumers or trained panelists? *Food quality and preference*, 32, 221-233.
- Huang, H. W., Lee, C. L., & Federmeier, K. D. (2010). Imagine that! ERPs provide evidence for distinct hemispheric contributions to the processing of concrete and abstract concepts. *NeuroImage*, 49, 1116-1123.
- Hugh, J., & Jancis, R. (2009). Australia. In J. Hugh & R. Jancis (Eds.), *The concise world atlas of wine* (6<sup>th</sup> ed., pp. 277 – 297). London: Mitchell Beazley.
- Hugh, J., & Jancis, R. (2019). Italy. In J. Hugh & R. Jancis (Eds.), *The world atlas of wine* (8<sup>th</sup> ed., pp. 302-315). London, UK: Octopus Publishing Group Ltd.
- Jackson, R., S. (2000). *Wine science*. San Diego, CA: Academic Press.
- Jefford, A. (2008). The Elements: The Magnificent Seven Grapevines. *Andrew Jefford's Wine Course* (pp. 36-52). US: Ryland Peters & Small.
- Jiang, Lirong (2011). Comparison of the Difference between Chinese and Western Drinking Culture. *Asian Social Science*, 7(5), 251-257.
- Jones, J. (2002). *Antonymy: A Corpus-Based Study*. London; New York, NY: Routledge.
- Jones, S. (2007). 'Opposites' in discourse: a comparison of antonym use across four domains. *Journal of Pragmatics*. 39, 1105–1119.
- Jover, A. J. V., Montes, F. J. L., & Fuentes, M. D. F. (2004). Measuring perceptions of quality of food product.: The case of red wine. *Food Quality and Preference*, 15(5), 453-469.
- Kolpan, S., Smith, B., & Weiss, M. (2010). *Exploring wine* (3<sup>rd</sup> ed.). New York: Wiley & Sons.

- Lacey, S., Stilla, R., & Sathian, K. (2012). Metaphorically feeling: Comprehending textural metaphors activates somatosensory cortex. *Brain & Language, 120*(3), 416-421.
- Laird, D. G., & Breen, W. J. (1939). Sex and age alterations in taste preferences. *Journal of the American Dietetic Association, 15*, 549-550.
- Langacker, R. (1987). *Cognitive Grammar*. Stanford: Stanford University Press.
- Le, Thi, M., & Jolibert, A. (2001). L'influence de la culture Vietnamienne sur le comportement du consommateur, *Decision Marketing, 22*, 43-52.
- Le, Van (2005). *Wine: The gift of God*. Hanoi: Virginia.
- Lee, K., Zhao, J., & Ko, J. Y. (2005). Exploring the Korean wine market. *Journal of Hospitality & Tourism Research, 29*(1), 20-41.
- Lehrer, Adriennne (1975). Talking about wine. *Language, 51*(4), 901-923.
- Lehrer, Adriennne (2009). *Wine and Conversation*. New York: Oxford University Press.
- Li, H., Wang, H., Li, H., Goodman, S., Lee, P. V. D., Xu, Z., Fortunato, A., & Yang, P. (2018). The worlds of wine: Old, new and ancient. *Wine Economics and Policy, 7*, 178-182.
- Lockshin, L., Wade, J. A., d'Hauteville, F., & Perrouty, J. P. (2006). Using simulations from discrete choice experiments to measure consumer sensitivity to brand, region, price, and awards in wine choice. *Food Quality and Preference, 17*(3-4), 166-178.
- Luna, D., & Forquer, G., S. (2001). An integrative framework for cross-cultural consumer behavior. *International marketing review, 18*(1), 45-69.
- Ly, Ung, & Cung, Toan (1969). *Traditional wines for medicine*. Hanoi: Exercises and Sport Press.
- Lyons, J. (1977). *Semantics*. Cambridge: Cambridge University Press.

- Martinez, L. M. C., Molla-Bauza, M. B., Gomis, F. J. D., & Poveda, A. M. (2006). Influence of purchase place and consumption frequency over quality wine preferences. *Food Quality and Preference*, *17*(5), 315-327.
- McBride, R. L., & Johnson, R. L. (1987). Perception of sugar-acid mixtures in lemon juice drink. *International Journal of Food Science and Technology*, *22*, 299-408.
- McBurney, D. H. (1974). Are there primary tastes for man? *Chemical Senses and Flavors*, *1*, 17-28.
- McBurney, D. H., & Gent, J. F. (1979). On the nature of taste qualities. *Psychological Bulletin*, *36*, 151-167.
- McGee, G.W., Ferguson, C. E., & Seers, A. (1989). Role conflict and role ambiguity: Do the scales measure these two constructs? *Journal of Applied Psychology*, *74*, 815–818.
- Merrit, F. (1997). Problems of judging wine quality. *The Australian and New Zealand Wine Industry Journal*, *12*, 79-82.
- Morrot, G., Brochet, F., & Dubor, D. (2001). *The Color of Odors*. *Brain and Language*, *79*(2), 309-320.
- Mouret, M., Lo Monaco, G., Urdapilleta, I., & Parr, W. V. (2013). Social representations of wine and culture. A comparison between France and New Zealand. *Food Quality and Preference*, *30*(2), 102-107.
- Mueller, S., Lockshin, L., Saltman, Y., & Blanford, J. (2010). Message on a bottle: The relative influence of wine back label information on wine choice. *Food Quality and Preference*, *21*(1), 22-32.
- Murphy, D. A. (1977). *Guide to Wine Tasting*. Melbourne: Macmillan.
- Murphy, C., Cardello, A. V., & Brand, J. G. (1981). Tastes of fifteen halide salts following water and NaCl: anion and cation effects. *Physiology and Behaviour*, *26*, 1083-1095.
- Murphy, C., & Withee, J. (1986). Age-related differences in the pleasantness of chemosensory stimuli. *Psychology of Aging*, *1*, 312-318.

- Murphy, C., & Gilmore, M. M. (1989). Quality-specific effects of aging on the human taste system. *Perception and Psychophysics*, *45*, 121-128.
- Nguyen, D. (2001). *Culture of Wine*. Hanoi: Culture and Information Press
- Nguyen, D. T., & Nguyen, T. H. (2015). *Alcohol Industry and Quality Evaluation*. Hanoi: Hanoi University of Science and Technology.
- Nguyen, Trinh (1990). *999 remedies for wine soaking*. Hanoi: National Culture Press.
- North, A. C., Shilcock, A., & Hargreaves, D. J. (2003). The effect of musical style on restaurant customers' spending. *Environment and Behavior*, *35*, 712–718.
- North, C. A. (2011). The effect of background music on the taste of wine. *The British Psychological Society*, *103*, 293-301.
- Ough, C. S., & Baker, G. A. (1961). Small panel sensory evaluation of wines by scoring. *Hilgardia*, *30*, 587-619.
- Ough, C. S., & Winton, W. A. (1976). An evaluation of the Davis wine score card and individual expert panel members. *American Journal of Enology Viticulture*, *27*, 136-144.
- Parr, W., Ballester, J., Peyron, D., Grose, C., & Valentin, D. (2015). Perceived minerality in Sauvignon wines: Influence of culture and perception mode. *Food Quality and Preference*, *41*, 121-132.
- Parr, W. V., Mouret, M., Blackmore, S., Pelquest-Hunt, T., & Urdapilleta, I. (2011). Representation of complexity in wine: Influence of expertise. *Food Quality and Preference*, *22*(7), 647-660.
- Paradis, C. (2000). It is Well Weird. Degree Modifiers or Adjectives Revisited: The Nineties. In J. Kirk (Eds.), *Corpora Galore: Analyses and Techniques in Describing English* (pp. 147-160). Amsterdam: Rodopi.
- Paradis, C. (2001). Adjectives and Boundedness. *Cognitive linguistics*, *12*(1), 47-65.

Paradis, C. (2003). Is the Notion of Linguistic Competences Relevant in Cognitive Linguistics. *Annual Review of Cognitive Linguistics*, 1, 247-271.

Paradis, C. (2005). Ontologies and construals in lexical semantics. *Axiomathes*, 15, 541-573.

Paradis, C., Willners, C. (2006). Antonymy and negation: The boundedness hypothesis. *Journal of Pragmatics*, 38(7), 1051-1080.

Paradis, C. (2007). Configuration, construals and change: expression of DEGREE. *English Language and Linguistics*, 12(2), 317-343.

Paradis, C. (2010). Touchdowns in winespeak: Ontologies and Construals in use and meaning-making. In M. Goded Rambaud & A. Poves Luelmo (Eds.), *Proceedings for the 1<sup>st</sup> Congress on Linguistic Approaches to Food and Wine Descriptions*. Marid: UNED University Press.

Paradis, C., & Eeg-Olofsson, M. (2013). Describing Sensory Experience: The Genre of Wine Reviews. *Metaphor and Symbol*, 28, 22-40.

Patrick, I., & Gago, P. (2002). Australian wine styles. In I. Patrick & P. Gago (Eds.), *Australian Wine styles and tastes* (1<sup>st</sup> ed., pp. 52-163). Adelaide, AU: Patrick Iland Wine Promotion Pty Ltd.

Peterson, J. (2002). *Sweet Wines: A Guide to the World's Best*. New York: Stewart.

Perng, C. M., & McDaniel, M. R. (1989). *Optimization of a black berry juice drink using response surface methodology*. Presented at the 49th Annual Meeting of the Institute of Food Technologist, Chicago, IL.

Peynaud, E. (1984). *Knowing and Making Wine*. New York: Wiley.

Pilar, M., Navajas, S., Ballester, J., Peyron, D., & Valentin, D. (2014). Extrinsic attributes responsible for red wine quality perception: A cross-cultural study between France and Spain. *Food Quality and Preference*, 35, 70-85.



Piqueras-Fiszman, B., & Spence, C. (2012). The weight of the bottle as a possible extrinsic cue with which to estimate the price (and quality) of the wine? Observed correlations. *Food Quality and Preference*, 25(1), 41-45.

Price, Pamela (1976). *The Taste of Wine*. London: DK Publishing

Rankine, B. (1971). Wine tasting and judging. *Food Technology*, 26, 443-453.

Rankie, B. (1990). *Tasting and enjoying wine: A guide to wine evaluation for Australia and New Zealand*. Adelaide: WINETITLES

Rocchi, B., & Stefani, G. (2006). Consumer's perception of wine packaging: A case study. *Journal of Wine Marketing*, 18(1), 33-44.

Rodebaugh, T. L., Woods, C. M., & Heimberg, R. G. (2007). The reverse of social anxiety is not always the opposite: The reverse-scored items of the social interaction anxiety scale do not belong. *Behavior Therapy*, 38, 192-206.

Rodrigues, H., & Wendy, V. P. (2019). Contribution of cross-cultural studies to understanding wine appreciation: A review. *Food Research International*, 115, 251-258.

Rodrigues, H., Valentin, D., Tomaskova, L., Otheguy, M., Honore-Chedozeau, C., Baron, M., & Otterbring, T. (2017). Effect of culture on conceptual representation of new and old world wine: A comparison between Brazil, Czech Republic and Sweden. *Poster Presentation at the 12th SLACA Symposium, Campinas, SP, Brazil, November, 2017*.

Rohles, F. H. (1971). The middle-ness concept in children. *Perceptual and Motor Skills*, 33, 943-948.

Saba, A., & Messina, F. (2003). Attitudes towards organic foods and risk/benefit perception associated with pesticides. *Food Quality and Preference*, 14, 637-193.

Savardi, U., Bianchi, I., & Burro, R. (2009). From opposites to dimensions: filling in the gaps. In U. Savardi (Ed.), *The perception and cognition of contraries* (pp. 275-294). Milano: Mc-Graw Hill.

Savardi, U., Bianchi, I., & Burro, R. (2009). *The perception and cognition of contraries*. Milano, IT: Mc-Graw Hill.

Saenz-Navajas, M. P., Ballester, J., Peyron, D., & Valentin, D. (2014). Extrinsic attributes responsible for red wine quality perception: A cross-cultural study between France and Spain. *Food Quality and Preference*, 35, 70-85.

Schiffstein, H. N. J., & Verlegh, P. W. J. (1996). The role of congruency and pleasantness in odor-induced taste enhancement. *Acta Psychol*, 94, 87–105

Shepherd, G. M. (2017). *Neuroenology: How the Brain creates the Taste of Wines* (pp. 157-168). US, New York: Columbia University Press.

Shepherd, G. M. (2015). Neuroenology: How the brain creates the taste of wine. *Flavour*, 4(19), 1-5.

Spence, C., Harrar, V., & Piqueras-Fiszman, B. (2012). Assessing the impact of tableware and other contextual variables on multisensory flavour perception. *Flavour*, 1(1),7.

Spence, C., & Shankar, M. (2010). The influence of auditory cues on the perception of, and responses to, food and drink. *Journal of Sensory Studies*, 25(3), 406–430.

Stevenson, R. J., Prescott, J., Boakes, R. A. (1995). The acquisition of taste properties by odors. *Learn Motiv*, 26(1), 23

Stolz, H., & Schmid, O. (2008). Consumer attitudes and expectations of organic wine. *Organic wine and viticulture conference, Levizzano, Italy, 2008*. Online verfügbar unter <http://orgprints.org/13974>.

Tanimura, S., & Mattes, R. D. (1993). Relationships between bitter taste sensitivity and consumption of bitter substances. *Journal of Sensory Studies*, 8(1), 31-41.

Talmy, L. (2000). *Towards a Cognitive Semantics I*. Cambridge: The MIT Press.

Thomas Wilson (2005). Drinking cultures. *Consuming wine in France: The 'Wandering' Drinker and the Vin-anomie* (pp. 130-131). UK: The Oxford International Publishers Ltd.

- Torri, L., Dinnella, C., Recchia, A., Naes, T., Tuorila, H., & Monteleone, E. (2013). Projective Mapping for interpreting wine aroma differences as perceived by naïve and experienced assessors. *Food Quality and Preference*, 29, 6-15.
- Vann, E. F. (2003). Anthropological perspectives on economic development and integration. Production matters: consumerism and global capitalism in Vietnam. *Research in Economic Anthropology*, 22, 225-257.
- Van Ittersum, K., Candel, M., & Meulenberg, M. T. G. (2003). The influence of the image of a product's region of origin on product evaluation. *Journal of Business Research*, 56(3), 215-226.
- Veale, R., & Quester, P. (2009a). Tasting quality: the roles of intrinsic and extrinsic cues. *Asian Pacific journal of marketing and logistics*, 21 (1), 195-207.
- Veale, R., & Quester, P. (2009b). Do consumer expectations match experience? Predicting the influence of price and country of origin on perceptions of product quality. *International business review*, 18(2), 134-144.
- Velikova, N., Charters, S., Fountain, J., Ritchie, C., Fish, N., & Dodd, T. (2016). Status or fun? A cross-cultural examination of young consumers' responses to images of champagne and sparkling wine. *British food journal*, 118(8), 1960-1975.
- Vietnamese Drug and Alcohol Professionals – NSW. (2009). *Safe and Joyful Drinking. Some facts about Vietnamese Drinking Cultures*. Australia: NSW Health Risky Drinking Fund and Fairfield Community Drug Action.
- Vine, R. (2000). *Wine Appreciation*. New York: John Wiley & Son.
- Von Sydow, E., Moskowitz, H., Jacobs, H., & Meiselman, H. (1974). Odor-taste interaction in fruit juices. *Lebensmittel Wissenschaft und Technologie*, 7, 9-16.
- Wan, X., Woods, A. T., Seoul, K. H., Butcher, N., & Spence, C. (2015a). When the shape of the glass influences the flavour associated with a coloured beverage: Evidence from consumers in three countries. *Food Quality and Preference*, 39, 109-116.

Wan, X., Zhou, X., Woods, A., T., & Spence, C. (2015b). Influence of the glassware on the perception of alcoholic drinks. *Food Quality and Preference*, *44*, 101-110

Yoo, Y. J., Saliba, A. J., Mac Donald, D. D., Prenzler, P. D., & Ryan, D. (2013). A cross-cultural study of wine consumers with respect to health benefits of wine. *Food Quality and Preference*, *28*, 531-538

Young, A. (1986). *Making sense of wine. Sight, Smell, Taste, Touch* (pp. 25-111). Richmond, AU: Greenhouse Publication Pty Ltd.

Zampini, M., Sanabria, D., Phillips, N., & Spence, C. (2007). The multisensory perception of flavor: Assessing the influence of color cues on flavor discrimination responses. *Food Quality and Preference*, *18*, 975–984.

Zampini, M., Wantling, E., Phillips, N., & Spence, C. (2008). Multisensory flavor perception: Assessing the influence of fruit acids and color cues on the perception of fruit-flavored beverages. *Food Quality and Preference*, *19*, 335–343.

*Understanding and describing the sensory experience of wine for Italian, Vietnamese and  
Australian non-expert consumers – Hang Thuy Truong*

PhD thesis

Verona, 22 February 2022

132