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WINE AND MUSIC PAIRING:
Why should anyone care?

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"The brain is built for pleasure, and it is through learning to appreciate the extraordinary in ordinary experiences, through pursuing the variety of pleasures rather than the relentless single-minded pursuit (hedonism) or denial of pleasure (asceticism) that a life well-lived can be constructed."

(Kringelbach, 2015)

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Abstract

This thesis is aimed to explore the nature, mechanisms, and potential of the influence of auditory stimuli not only on consumer's shopping and drinking behaviour but mainly on the perceived taste of wine. Food and wine pairings have become a normal part of our everyday life, and music and wine pairings are believed to be the future of advertising, marketing, hospitality, gastronomy, entertainment, nutrition and possibly even healthcare. Crossmodal correspondences between hearing, smelling, and tasting have been widely studied recently due to the increasing interest on the topic. This thesis adds new evidence to the growing number of research in multisensory studies initially through an in-depth analysis of the available literature, followed by an online survey designed to gather information on the conscious aspects related to the impact of music on wine taste perception, with a final pilot experiment designed to test the subconscious aspects of music's influence on the perceived taste of wine. Relevance and limitations of both the survey and the pilot experiment are discussed in context of the published research, and ideas for further research in the sphere of music and wine interaction are described. Finally, possible fields of application of the thesis's findings are suggested.

Chapter 1. Introduction

Nowadays anyone can find a lot of information on the best choices for food and wine pairings. One of the most famous pairings "white wine goes better with fish" already sounds outdated and archaic as there are numerous recommendations on a particular type of fish prepared in a specific way paired with a particular type of wine of a certain variety, producer and even vintage. And the wine doesn't even have to be white. It is already known and continues to gather even more proof that different characteristics of wine such as acidity, sweetness, body, alcohol levels, astringency and many more may influence the perception of different dishes we eat and vice versa. Taste influences taste, this is known to be logically and empirically true. Smell and even sight also influence taste (that is why a professional wine degustation normally starts with color and aroma examinations). But what about sounds? Can they also influence taste? In our research we are specifically interested in an interaction between background music and peoples' perception of the taste of wine. Is it possible that what we hear also affects what we taste in wine? In this regard music and wine pairing becomes a controversial and at the same time an interesting subject for research. Who knows maybe with time it can become as common and obvious as some food and wine pairings?

The specific aims of this thesis are:

- To study the available literature on the influence that music has on consumer behaviour and taste perception;
- To gather, via a survey, information on what social drinkers know, think and experience about the influence of background music on the taste of wine during consumption (*conscious part*);
- To perform statistical analysis of the survey's results in order to find links between socio-demographic factors and social drinkers' preferences and experiences;
- To gather, via a pilot wine tasting experiment, new evidence on the influence that music has on wine taste perception among social drinkers (*subconscious part*);
- To make suggestions for the possible fields of application of the thesis' findings (from the literature, the survey, and the experiment) and for further research in the field of music and wine pairing.

Some people are still sceptical about the role of audio stimuli and sensitivity during wine tasting, so another general goal of the thesis is to add data to the growing number of research in the field.

The thesis starts with an overview of an existing literature on the effects of sounds and music on customer's behaviour and tasting experience from different fields of study: psychology, sensory

studies, marketing and consumer behaviour, linguistics, psychophysics, and neuroscience. Chapter 2 is fully devoted to this matter and is finalized by a structured table with all the available research up to date. To figure out what people think about the influence of background music on the perception of wine taste, an online survey was conducted, the design and results of which are presented in Chapter 3. Based on a literature review, the survey's results, and our hypothesis, a pilot experiment was carried out as described in Chapter 4. Due to the pandemics the survey was held online to avoid possible endangerment of the respondents. The pilot experiment, on the contrary, was held offline but all the participants had to undergo a rapid COVID-19 test to be able to participate. Chapter 5 is devoted to conclusions, suggestions for further research, and possible fields of application of findings.

Chapter 2. Literature review

2.1. Terms that need clarification

We live in a world which we perceive in a multisensorial way: by touch, taste, smell, hearing, sight, and an arguable number of other senses. Our senses work together and, as mentioned by Crisinel and Spence, "our brains constantly combine information from different sensory modalities in order to make sense of our environment" (Crisinel and Spence 2010b). In this regard, and for the sake of further research, we need to mention some of the terms that frequently occur in the literature and have to deal with senses: synaesthesia, oenesthesia and crossmodal correspondences.

Synaesthesia (from Greek "syn" = together and "aisthesis" = perception) is not only a psychological condition but also a linguistic phenomenon (Shen and Aisenman 2008). As a psychological condition it refers to the experience of a crossmodal association, meaning that a stimulation of one sensory modality (for example, sight) creates a perception in one or more other senses (for example, taste, hearing, or both). Take for example a famous Russian mnemonist and synaesthete Solomon Shereshevsky whose unusual abilities were studied and documented by a soviet neuropsychologist Alexander Luria in his work (Luria 1994). When presented with a 50-Hz tone (G1 chord), Shereshevsky experienced a taste of a sweet and sour soup called borsch or "a sensation that gripped his entire tongue". Meanwhile, listening to a 3000-Hz tone (close to a G7 chord) would evoke "an ugly taste – rather like that of a briny pickle" instead. As you can guess it is a very rare condition, that is why some authors started to divide it into two options: strong and weak synaesthesia (Martino and Marks 2001). Where a strong one is more of an ability of certain individuals as in the example mentioned above, whereas a weak synaesthesia is more commonly seen in our everyday life as, for example, an ability of many people to feel or anticipate lemon's acidity while just looking at a lemon.

As a linguistic phenomenon synaesthesia is widely spread in literature and even in our everyday conversations no matter what our native language is. How often do we use such metaphorical expressions as: "to hear a smell", "notes of a perfume", "a cold light", "a warm colour" and others using descriptors from different modalities. In a way these metaphors are instruments to express our ability to perceive something simultaneously by different senses, in other words, to experience weak synaesthesia.

The term "oenesthesia" was suggested by a sound artist and wine writer Jo Burzynska to describe some sort of synaesthesia or a particular widespread tendency for a crossmodal match between music (sounds, instruments) and flavours, aromas and tastes that are present in wine (Spence et al. 2013).

Although current research is about the influence of music on the perceived taste of wine, we would prefer to use the term "crossmodal correspondences" to avoid unnecessary confusion with strong synaesthesia or oenesthesia and because we agree with the position of Charles Spence and Quain Janice Wang on the matter of a significant difference between the terms. According to these researchers, crossmodal correspondences are "the surprising associations that we all share" between aspects of one sensory modality and some aspects of another sensory modality, such as pitch and brightness or sweetness and roundness (Spence and Wang 2015a).

2.2. Review of literature on the influence of music on consumer behaviour and taste perception

Almost 80 years of the past research in the field of taste perception demonstrates its multisensorial character (Spence and Shankar 2010). Cross-modal correspondences or matches of different modalities are not random, they have a pattern which is shared by many people in a group or most subjects in some experiments.

Nevertheless, the power of sound and its influence on consumer is still a relatively new subject of study, that is why this thesis is mainly concentrated on this topic. Starting from literature on the effects of sounds and music used in advertisement, this thesis will explore how the research spreads towards shopping behaviour and arrives at the point of actual consumption analysis or directly at the level of drinking and eating behaviour. Please refer to the **Annex 1** for a more detailed view.

There are different aspects of music, background sounds and noises that seem to influence different aspects of consumer behaviour (shopping behaviour, eating, and drinking experience, etc.). These aspects of music include, but are not limited to, tempo, pitch, tone, loudness, style, complexity, origin, pleasantness and familiarity to the listener, congruency, or appropriateness.

Most of prior studies that were held in *experimental rooms or labs* were focused on exploring cross-modal associations between audio stimuli and odours, tastes, flavours. For example, according to one of the experiments, auditory pitch can be commonly associated with odours differing in quality (Belkin et al. 1997). In this experiment 32 participants were asked to smell twenty different fragrance materials presented in a randomized order and choose a pitch of a preselected audio tone to match the aroma. As a result, these untrained subjects were able to extract some perceptual features from smells and consistently select auditory matches based on pitch. Researchers Anne-Sylvie Crisinel and Charles Spence went even further with auditory pitch: their experiments showed that subjects tend to associate low pitch with bitter taste and high pitch with sour and sweet taste of foodstuffs (Crisinel

and Spence 2009), and that fruit odours seem to be associated with high-pitched notes (Crisinel and Spence 2012). From pitch they broadened their research towards different musical instruments: 34 subjects were asked to pair 12 gustatory stimuli with 52 different sounds, or 13 notes played by four instruments (piano, strings, woodwind, and brass). It turned out that sounds of instruments were commonly associated with specific tastes/flavours, i.e., raspberry taste was matched with piano sounds while musk taste was matched with brass sounds (Crisinel and Spence, 2010). Moreover, in this experiment the choice of instrument was not independent from the pleasantness rating of each taste/flavour, revealing that piano sound was preferred for pleasant stimuli while brass – for unpleasant. This effect can also be explained by the congruency of sounds which seems to affect how participants perceive odours' pleasantness (Seo and Hummel 2011). Another in-lab experiment discovered a significant correlation between the tone of music (major, minor or atonal) and peoples' perception of time (Kellaris and Kent 1992). After studying 150 university students James Kellaris and Robert Kent could conclude that "happier" major key resulted in the longest time duration estimates and the largest gap with actual time thus disproving in a way a conventional wisdom that "time flies when you are having fun".

Some of the previous studies were concentrated on *advertisement*. For example, Gerald Gorn experimented with 244 undergraduates who had to choose between two products (two pens of different colour) after watching their ads which differed only in music. This experiment showed that in a TV commercial a pleasant music can do more than some information about the product in terms of nudging indecisive customers towards the decision of buying the product (Gorn 1982). Another example of studies in advertisement is the study devoted to sonic logos or "sogos" (auditory analogues of visual logos, like Nokia's tune or McDonald's "I'm loving it") which revealed the correlation between the number of tones in a sonic logo and the consumers' willingness to pay (Krishnan, Kellaris, and Aurand 2012). A moderate number of tones in a sogo (i.e., six as opposed to three or nine) can add value to a brand in the perception of customers.

A generous amount of research was devoted to aspects of music that may influence consumers' shopping behaviour in a *supermarket (or a store)*. From the study of Smith and Curnow it can be concluded that customers tend to leave a store faster and spend less time shopping during louder sessions of background music (P. C. Smith and Curnow 1966). Moreover music's tempo also influences the speed of customers' in-store movement in a way that customers move slower and buy more during slower background music (Milliman 1982). Style of music was also shown to influence peoples' shopping behaviour. In the study by Kim and Areni a wine store was observed for two months with a changing condition of background music playing inside. The classical music mode included compositions by Mozart, Chopin, Vivaldi, and Mendelssohn, while the "Top-Forty" music

mode included songs by Fleetwood Mac, Robert Plant, Rush and others. The aim was to figure out during which condition customers spend more time and money in the store. And while the time spent didn't vary significantly between modes, classical music induced customers to buy more expensive wines thus spending more money (Kim and Areni 1993). One of the most cited experiments in the literature on the topic is devoted to the origin of music. It was conducted by Adrian North, David Hargreaves and Jennifer McKendrick. During a two-week period, they observed how an in-store display of French and German wines played French and German music on different days. A total of 82 shoppers completed a questionnaire after the wine purchase from the mentioned display. The results showed that not only the origin of music raised the sales volumes of wines of the same origin, but also that the respondents were largely unaware of the music's effect on their choice (North, Hargreaves, and McKendrick 1997). Another significant finding suggests that music's degree of familiarity to customers also influences their shopping behaviour in a way that familiar music seems to lengthen shoppers' perception of time spent in a supermarket while the actual time spent is longer when exposed to unfamiliar one (Yalch and Spangenberg 2000).

Moving forward in the existing evidence on music's influence on consumers' behaviour we can spot several studies held in a dining or drinking environment, such as a university *cafeteria, a restaurant or a bar*. It was in 1985 when Thomas Roballey and his colleagues proved that the tempo of background music influences the speed of consumption in a way that a high-tempo music increases the number of bites per minute thus increasing the consumption speed (Roballey et al. 1985). Another significant finding was made in relation to an actual presence of music in a bar and its influence on beer consumption by male subjects. Researchers observed 123 men in two bars in a small Pennsylvania town with two variables: music (on vs. off) and companionship (alone vs. together with someone). As a result more beers were consumed when the music was on and in the presence of company (Drews, Vaughn, and Anfiteatro 1992). Loudness of music in a bar is another significant aspect that deserves attention. In 2004 three other researchers analysed behaviour of 120 participants and showed that a higher sound level than usual was associated with a higher speed of consumption and a greater amount of beer consumed (Gueguen, Guellec, and Jacob 2004). Style of music showed its influence on consumers' behaviour both in a bar and in a restaurant environment. According to the restaurant's study of North, Shilcock and Hargreaves classical music (i.e. excerpts from Vivaldi's "Four Seasons" and Strauss' "Emperor Walz") gave rise to the greatest money spending on food and drinks as opposed to pop music (i.e. Britney Spears's "Crazy" and Ricky Martin's "Living La Vida Loca") or silence (North, Shilcock, and Hargreaves 2003). This was consistent with the authors' previous finding about classical music in a cafeteria setting (North and Hargreaves 1998). Another study on music's style was held by Celine Jacob in a French bar where 93 subjects were unknowingly

observed under three different music conditions (Top 40, cartoon music and so called "drinking songs"). Drinking songs like "The Drunken Sailor Song" and others praising good food and alcohol increased the amount of time and money spent in a bar as opposed to Top-40 or cartoon music (Jacob 2006).

With time researchers got to test their hypothesis about even more complex matters during *public events* or specifically in *wine tasting* rooms. One of the largest and probably the most famous multisensory tasting experiments was organised by Charles Spence, Carlos Velasco, and Klemens Knoeferle in London where over a period of four days almost 3000 people participated in The Colour Lab study. Each participant received a non-transparent black tasting glass filled with Rioja wine (Campo Viejo Reserva 2008) and was asked to enter a room and taste the wine inside during two changing conditions: either red, green, or white light and either sweet or sour music (soundtracks were specifically designed for the study). During the experiment subjects filled in the score sheets where they evaluated the wine's freshness, intensity, and pleasantness. The result showed that the wine was perceived as fresher and less intense under green lighting with sour music and on average was liked the most under red lighting with sweet music (Spence, Velasco, and Knoeferle 2014). In 2012 Adrian North experimented with the taste of wine and the connotations of music (powerful & heavy, mellow & soft, subtle & refined, zingy & refreshing) (North 2012). In his study 250 participants appeared to perceive the taste of Cabernet Sauvignon and Chardonnay (both Montes Alpha 2006, Chile) in a manner consistent with the connotations of music. Charles Spence and his colleagues explored the influence of music's congruency on the wine drinking experience. From one of the experiments the researchers concluded that there existed a significant agreement amongst 24 subjects in terms of specific classical music – fine wine pairings, in other words, the result of the matching task was not random. For instance, Mozart's "Flute Quartet in D major, K285" turned out to be a very good match for the white Pouilly Fumé Silex 2010 (Sauvignon Blanc). Meanwhile, Tchaikovsky's "String Quartet No 1 in D major" was found to be a good match for the red Château Margaux 2004 (Cabernet Sauvignon). Moreover, the second experiment by the same authors revealed that subjects enjoyed the wine drinking experience more while listening to the matching music than while tasting the wine in silence (Spence et al. 2013). Another noteworthy outcome of the study – matching or congruent music made the participants perceive the wine as tasting sweeter. In their further work Spence and Wang also discovered that music has a significant impact on wine's fruitiness and acidity ratings (Wang and Spence 2015).

As we can conclude from the earlier works of different researchers a lot of musical aspects in the background, such as tempo, pitch, tone, loudness, style, origin, complexity, instruments, pleasantness, congruency and familiarity, can influence consumer's willingness to pay, shopping

speed, willingness to stay or return to the supermarket, time perception, drinking and eating behaviour, they can also evoke some unusual but commonly shared cross-modal associations with odours, tastes and flavours and even improve the whole dining or drinking experience. It is also worth mentioning that aspects of wine perception that can be changed by music are sometimes divided into four major categories: hedonic (wine's pleasantness), sensory (wine's sweetness, acidity, alcohol, length, astringency, etc.), analytic (age, complexity, quality, balance, price assessment), descriptive (heavy or light, feminine or masculine, etc.) (Spence and Wang 2015c).

2.3. Mechanisms behind the influence of auditory cues on customers

Before going in depth of exploring mechanisms behind cross-modal correspondences between music and wine, let us have a proper look on a neuroscientific picture of what is going on in our brain when we use our senses of smell, taste and hearing. First, if we draw a scheme of how sensory mechanism works step by step for olfaction, gustation, and audition we will get to Figure 1.

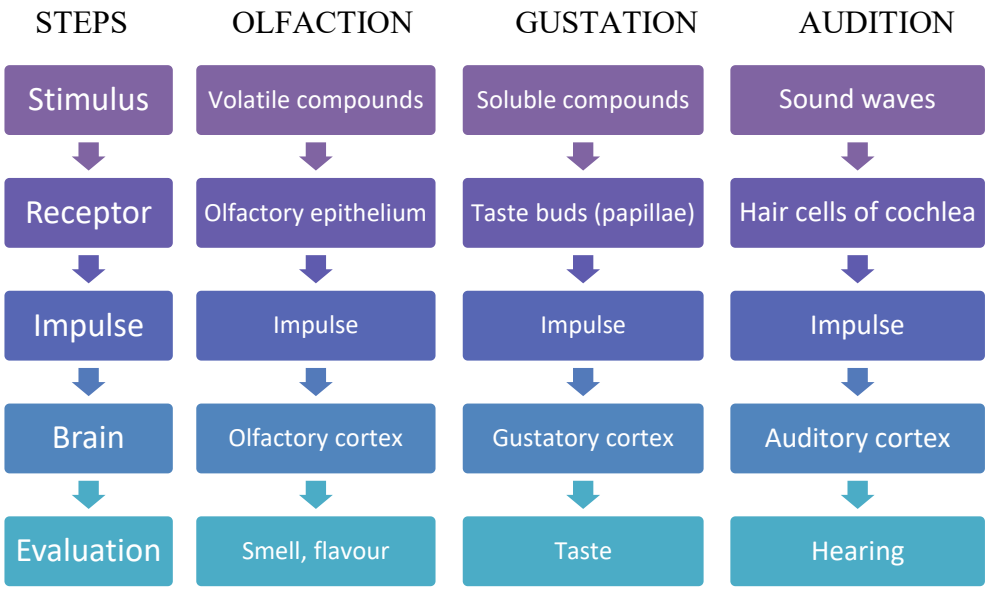

Figure 1. Scheme of sensory mechanism for olfaction, gustation, and audition.

Olfaction and gustation are both chemical senses while hearing is a mechanical sense. The logic of the steps is common, everything starts with a stimulus which is then turned into an electrical impulse by specific receptors and sent to the brain for evaluation and further processing. The brain needs not only to perceive the stimulus (which is unconscious) but also to identify it and measure its intensity (conscious). On Figure 2 we can see where sounds, tastes and smells are processed in the brain.

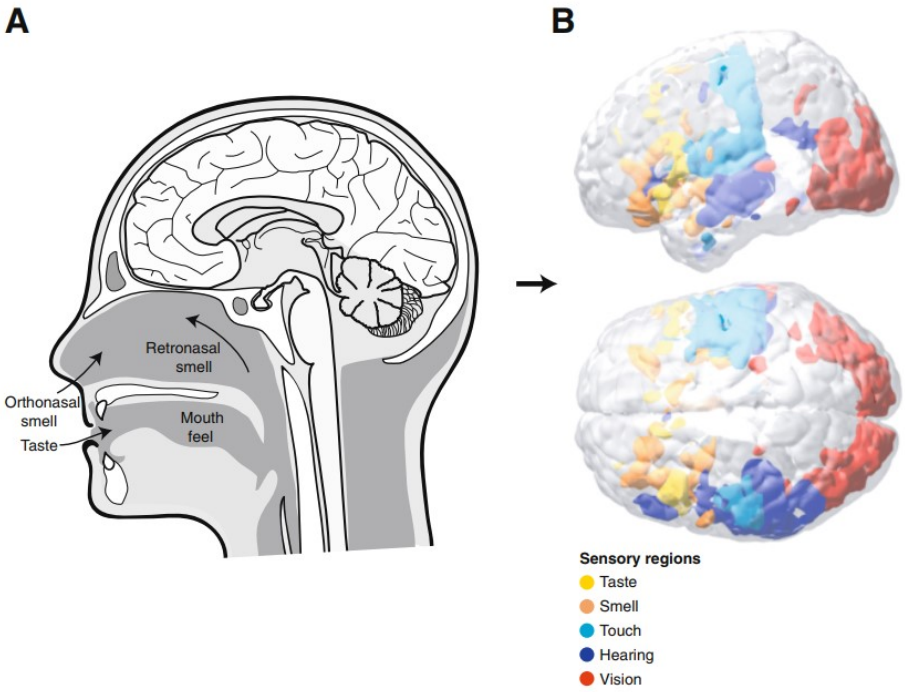

Figure 2. Scheme of food or wine intake (A) and the main senses processing in the brain (B) (Kringelbach 2015).

Firstly, point A shows that the multisensory experience of food and wine intake involves all the senses with different routes into the brain from receptors in the body, typically through the eyes, ears, nose, and oral cavity. From the distant processing of sight and sound of food and wine to more proximal smell, taste and tactile (mouthfeel) processing. Smell is the most important determinant of the flavour of wine and comes to the brain via orthonasal and retronasal pathways, experienced as we breathe in and out, respectively. Moreover, odours take a direct route to the limbic system, including the amygdala and the hippocampus, the regions related to emotion and memory (Walsh 2020). Secondly, point B reflects how remarkably similar topology is found between people with vision (red) always processed in the back of the brain, audition (dark blue) processed in regions of the temporal cortex, touch (light blue) in somatosensory regions, and olfaction (orange) and taste (yellow) in frontal regions (Kringelbach 2015).

Several neuroimaging studies have demonstrated that the brain areas activated by olfactory stimuli are dependent on the type of olfactory tasks, for example, intensity, hedonicity, detection, familiarity, or edibility (Seo and Hummel, 2011).

But what about audition? After reaching the thalamus, sound information is passed to the auditory cortex and is instantaneously broken down into many different elements including, but not limited to, timing, pitch, and timbre (tone). Auditory information is also sent to other parts of the brain to be compared against historical associations and emotional responses (do I like it or not?),

stimulating many parts of the brain in both hemispheres. Although neurologists are still exploring how the auditory cortex functions, they now believe that music processing is much more complex than initially imagined and involves many more parts of the brain than previously suspected. Figure 3 illustrates what parts of the brain are involved in music processing in a more detailed and vusial way.

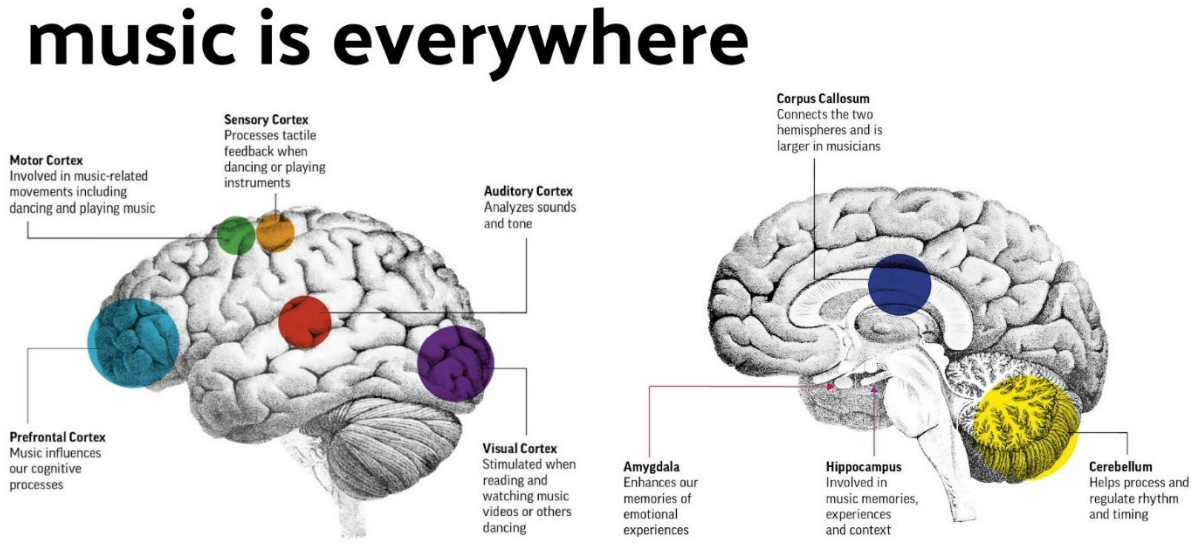

Figure 3. Parts of the brain involved in the processing of music (Buchanan 2021).

You don't need to be a neuroscientist to understand that there is an overlapping of processing of music, odor and taste in both amygdala and hippocampus responsible for memories and emotions.

Although, as was already mentioned in the introduction, some specialists are still sceptical about the role of audition during wine tasting. As an example, please refer to the words of Luigi Moio (current president of the OIV – International Organisation of Vine and Wine) from his book "Il respiro del vino" where he states that auditory sensitivity is not directly involved in wine tasting (Moio 2016). This thesis tends to disagree with Professor Moio and by collecting arguments is proving the contrary.

Taking into consideration the evidence reviewed in Chapter 2.2, researchers tried to explain possible mechanisms behind the influence of auditory cues on people's shopping and dining behaviour, food, and drink perception. This thesis tries to summarise these possible explanations that help understand how and why sounds and music might change how we behave and what we taste.

One of the possible explanations has been made through the time perception theory. If music can shape people's temporal perception, then the slower the time passes the more of it we are ready to spend in the environment thus eating and drinking more. Another popular approach is the arousal theory – usually a heightened state of arousal leads us to an increased consumption of food and drinks. Environmental psychologists emphasize that sounds and music may serve to enhance a person's

mood or the atmosphere's pleasantness, evoke emotions leading to an increased desire to stay longer, enjoy the taste more and consume greater amounts of food and drinks. Another explanation is an ability of music to act as a distraction with people tending to consume more while being distracted. Moreover, auditory stimuli can bias indecisive customer's behaviour encouraging them to finally make a choice between brands. And a final possibility is that background music affects people's perception of the taste, flavour and pleasantness of food and drinks (Spence and Shankar 2010).

Moving forward specifically to music and the perceived taste of wine, scientists came up with further suggestions of what mechanisms lie behind the phenomena.

Among first possible explanations is a statistical regularity of some matches, meaning that the more often we hear a particular musical composition with a certain wine the more we are prone to perceive this match as a proper pairing. Spence and Wang give an example of high-end restaurants with classical or soft jazz music and expensive wines or local Italian restaurants with Chianti and Pavarotti's songs (Spence and Wang 2015a). Unfortunately, this argument has a significant weakness – it strongly limits the observants to Italians or to rich people who can afford expensive restaurants or a trip to Italy. Nevertheless, the researchers offer a solution in the form of a cross-cultural study with two populations which came in handy for the current study.

Another explanation of a crossmodal correspondence between music and wine might be structural in a sense that "there might be a common code for matching sensations in the way in which the brain codes information" (Spence and Wang 2015a). For example, people tend to match more intense tastes with louder sounds (Wang, Wang, and Spence 2016).

One more explanation lies in the field of Linguistics and can be called semantic. It implies that wine and music share a language of description (remember North's experiment where he used descriptors applicable for both music and wine). This argument seems to have some controversies as well. For instance, one word in different languages might have meanings inappropriate to describe both wine and music.

Finally, music and wine may be linked by the existence of affective correspondences – emotions or moods which were mentioned by Clark Smith (C. Smith 2007). A particular pairing may give rise to a common feeling or some associations that influence the whole drinking-listening experience. This suggestion can be also supported by the neuroscientific picture that we demonstrated earlier.

All these things lead us to our next step – finding already existing examples of music and wine pairings to see how they are made and what we can use in our further research.

2.4. Examples of music and wine pairings

Nowadays there are already numerous suggestions on music and wine pairings. Some wine producers like The House of Krug even invite composers to create music specifically to match their wines. The project is called "Krug Echoes" and each year it encourages selected musicians (violinist and composer Iwao Furusawa, pianist and composer Kris Bowers, a music duo "Grand Soleil" and others) to taste some of Krug's champagnes and create special custom-tailored playlists inspired by the wines (Krug Echoes 2020).

Wine writers and wine magazines have plenty of recommendations on which music goes better with which wine. Let's take "Wine Enthusiast" for example. In Table 1 you can discover the magazine's music genre and wine pairings.

Table 1. Wine and music pairings as suggested by "Wine Enthusiast" magazine (Wine and Music Pairings 2022)

Wine	Music genre	Artists
Californian Zinfandel	Country	Patsy Cline, Garth Brooks, Taylor Swift
Oregon Pinot Noir	Jazz	Duke Ellington, Billie Holiday, Louis Armstrong
Finger Lakes Riesling	Indie/Alternative	The Smiths, Arcade Fire, Nirvana
Australian Shiraz	Classic Rock	Led Zeppelin, Rolling Stones, Queen, Journey
Slovenian Orange wine	Rap/Hip-hop	Tupac Shakur, Kendrick Lamar, Eminem, Drake
Bordeaux	Classical	L.V. Beethoven, Igor Stravinsky, Richard Wagner

Another example of music and wine pairings was listed in "Decanter" (Woodard 2008). In the article Aurelio Montes, winemaker, and founder of Montes Wines, shared his approach towards playing music to casks of maturing wine and his plans on adding music recommendations to wine's back labels.

At this point several reasonable questions come to mind. How does a wine writer choose a match worth suggesting? Is there such a thing as a "perfect pairing"? Do these pairings affect social drinkers and wine professionals in the same way? What about musicians? What are the mechanisms behind that feeling of a "right match"? Some of these questions have already been answered by researchers, others are a work in progress.

We already gave some examples of music and wine pairings also in the part devoted to prior research but there is one more personality and his suggestions that are worth mentioning. It is one of the most famous experimenters in the field – Clark Robert Smith, Californian winemaker, and wine

consultant. After having evaluated more than 150 different wines while listening to more than 250 songs Smith created several playlists to match different grape varieties and together with his colleague Dwight Furrow wrote "A Practical Guide to Pairing Wine and Music".

While Smith's early suggestions can be found in his blog "Postmodern winemaking" and are also cited in the works of Spence and Wang (Spence and Wang 2015b), some of his more modern recommendations already exist on Spotify in the form of playlists. Please refer to Table 2.

Table 2. Wine and music pairings as suggested by Clark Smith (Furrow and Smith 2021).

Wine	Composition's name	Artist	Album
Cabernet Sauvignon	People are strange	The Doors	Strange Days
Pinot Noir	Greensleeves	Laura Sullivan	Feast of Joy & Love
Chianti Riserva	The Honeydripper	Jack McDuff	The Prestige Years
Zinfandel	La Vie en rose	Edith Piaf	The best of Edith Piaf
Chablis Grand Cru	Intro	The xx	xx
Chardonnay (buttery/oaky)	I will always love you	Whitney Houston	The Bodyguard: Original Soundtrack Album
Sauvignon Blanc	Arioso	J. S. Bach, S. Comberti, Miriam Keogh	Romance
Port, Tawny 10 Yr.	Take it with me	Tom Waits	Mule Variations
Dry Rosé	I feel love	Donna Summer	The Dance Collection

This is just a small part (one song to some of the wine varieties out of 10-20 compositions in each playlist) destined to show the diversity of genres, styles, origin, and musical eras.

Clark Smith has observed how the flavours of the wines would change from time to time in the presence of different background music. Certain wines would be rated as "more delicious" when tasters were listening to one piece of music rather than another. On the podcast for the American National Public Radio (NPR) he explains his findings the following way: "Music has moods. I think that wines carry mood also. The wine is acting like another musical instrument in the orchestra and if it's playing the wrong thematic mode then it clashes with the rest of the musicians" (C. Smith 2007). His quote is just one of the possible answers to the question about the underlying mechanisms behind music and wine pairings which were described earlier in subchapter 2.3.

Sometimes it is hard to say whether these wine and music pairing suggestions of magazines or wineries are based on actual research. In The House of Krug's case, it raises a legitimate doubt that all the invited musicians are familiar with the available scientific evidence on the topic, so one can only assume that they create music and playlists based solely on their associations and emotions emerged by the wine tasting. What represents a scientific interest are the works and recommendations of Clark Smith and his colleagues as they are based on actual experiments and years of repeated demonstrations showing the same results. Most of them correlate with prior findings of other researchers or are in sync with works of Charles Spence, for example (Furrow and Smith 2021).

Chapter 3. The survey

3.1. Aims of the survey

Most pairing recommendations are provided by American or British magazines or professionals thus firstly aiming their local audience. As well as many experiments in the field of music and wine were held in the US, the UK, or some Western European countries and among WIERDo's (Western, Educated, Industrialized, Rich, and Democratic) – students who typically take part in psychological research and may not be representative of the population at large. Another concern here is whether the crossmodal matches between music and wine that have been established in western populations would extend to those coming from cultures that are different, having different language and music. That is why we started with a survey trying to figure out if social drinkers believe that background music can influence the perception of the wine's taste, whether they listen to music while drinking wine themselves or even pay attention to an already playing music at bars or restaurants, and whether any socio-economic factors are linked to these beliefs and behaviour. Moreover, as around 80% of the respondents were Russians, the further pairing experiment was held among Russian speakers. To our knowledge, there has been nothing published in the world of wine-music matching among tasters of Russian origin or mother tongue. The survey is concentrated mainly on the conscious part of music's influence on wine's taste perception while the experiment is more subconsciously oriented.

3.2. Materials and methods

A questionnaire was created with the use of Google Forms. It consisted of 14 questions and took 5-7 minutes to complete. The first part of the questionnaire contained demographic and socio-economic questions about respondents (their gender, age, country of origin, level of education, average monthly netto income), the second part contained questions about wine consumption (likelihood, favorite wine styles, drinking frequency, places of consumption) and background music (whether respondents listen to it or pay attention to it, favorite genres and whether respondents believe that background music can influence the perception of wine's taste). In the last part of the questionnaire people could leave their contacts if they wanted to continue participation in the research. A comprehensive view of the questionnaire is presented in the **Annex 2**. The form was spread via following social networks: Facebook, Instagram, Twitter and Vkontakte (Russian analog of Facebook).

Google Forms and Microsoft Excel were used to create the questionnaire, gather initial data, and draw some diagrams. IBM SPSS Statistics – where SPSS stands for Statistical Package for Social Sciences – was used to perform statistical analysis, check hypotheses, draw diagrams and create a necessary base for conclusions.

3.3. Socio-demographic portrait of the survey's participants

The questionnaire was answered by 100 respondents. Figure 4 shows a histogram of participants' age – with an average of 31.78 years old and standard deviation of 5.79. Most participants (n = 34) were around 29-30 years of age.

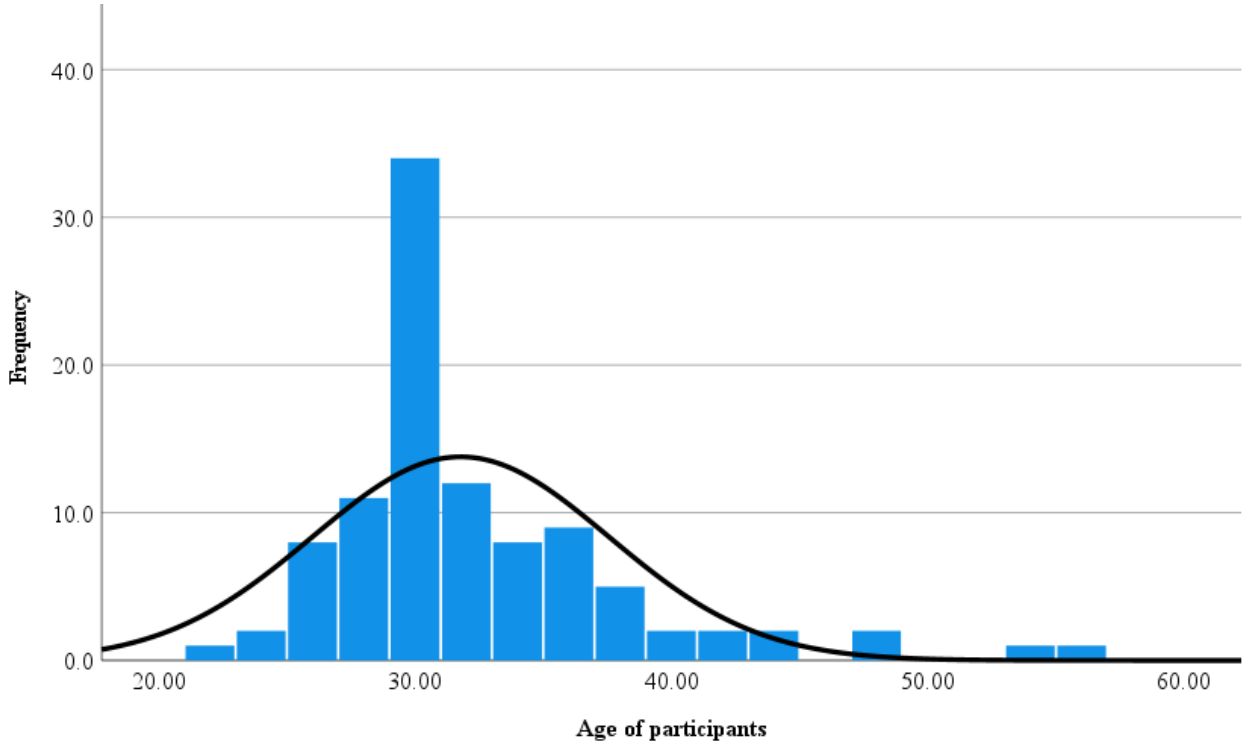

Figure 4. Age of participants with a normal distribution curve (N=100).

Figure 5 shows the origin of respondents. Most of them (77%) were from Russia. Nevertheless, an attempt to analyze differences in responses based on the origin of respondents was still made.

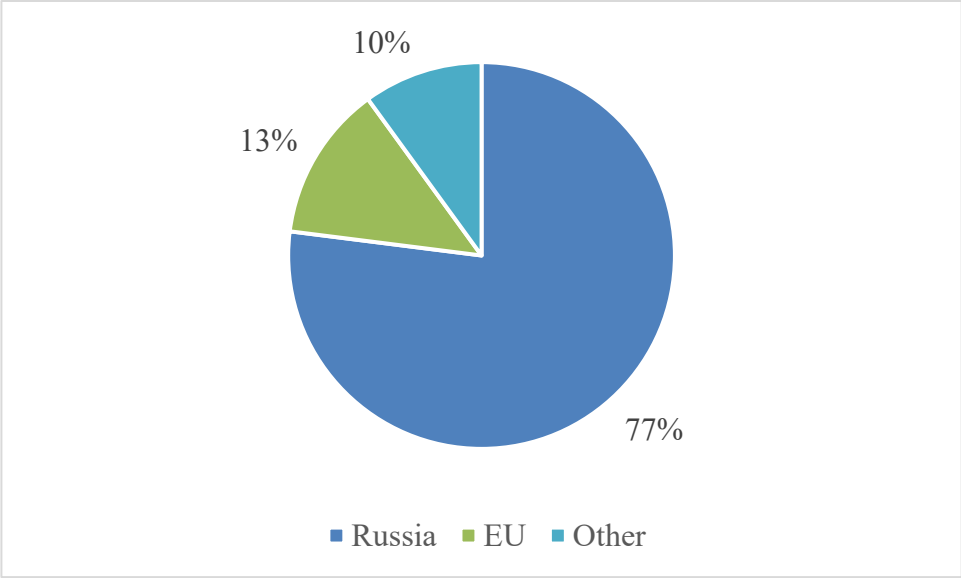

Figure 5. Origin of respondents (EU was represented by Italy, Netherlands, and Bulgaria).

As most participants had Specialist's or Master's Degree (72%) – the role of educational level was difficult to analyze. This will require more detailed research with a wider sample size and higher differentiation.

Figure 6 shows a histogram of the age of participants by gender and Figure 7 shows a histogram of participants' monthly netto income by gender. Out of 100 participants there were 38 men and 61 women, 1 person preferred not to indicate the gender. Moreover, 8 respondents preferred not to indicate their average monthly netto income.

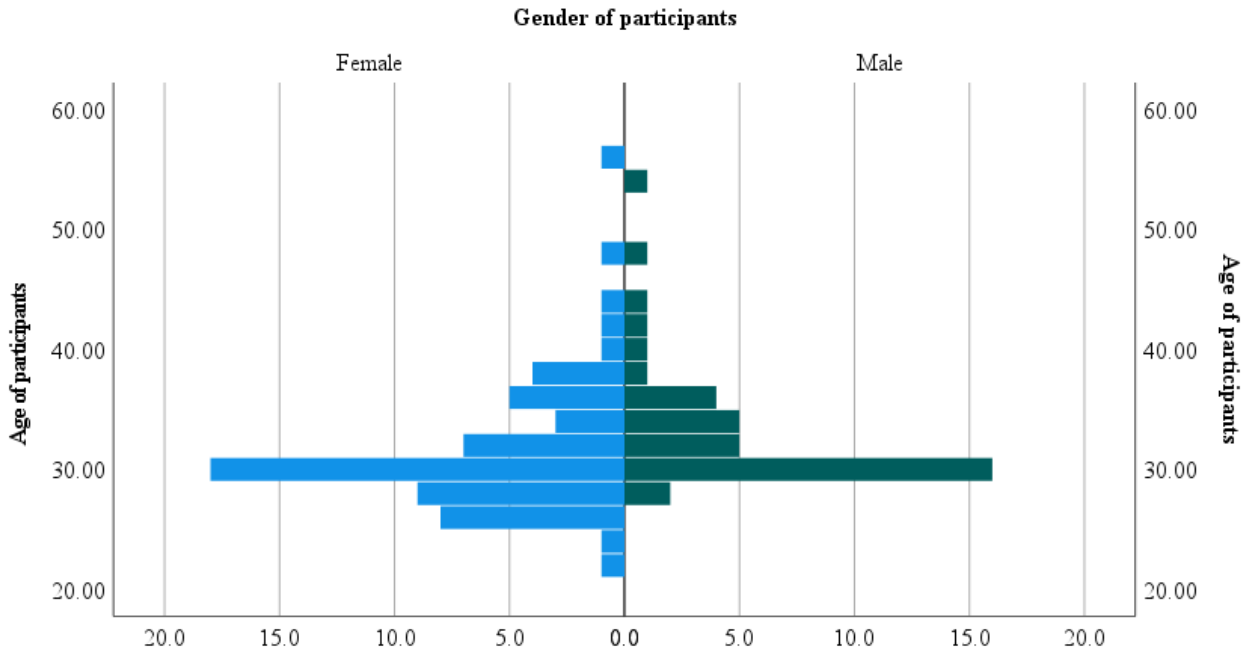

Figure 6. Age of participants by gender (N = 99).

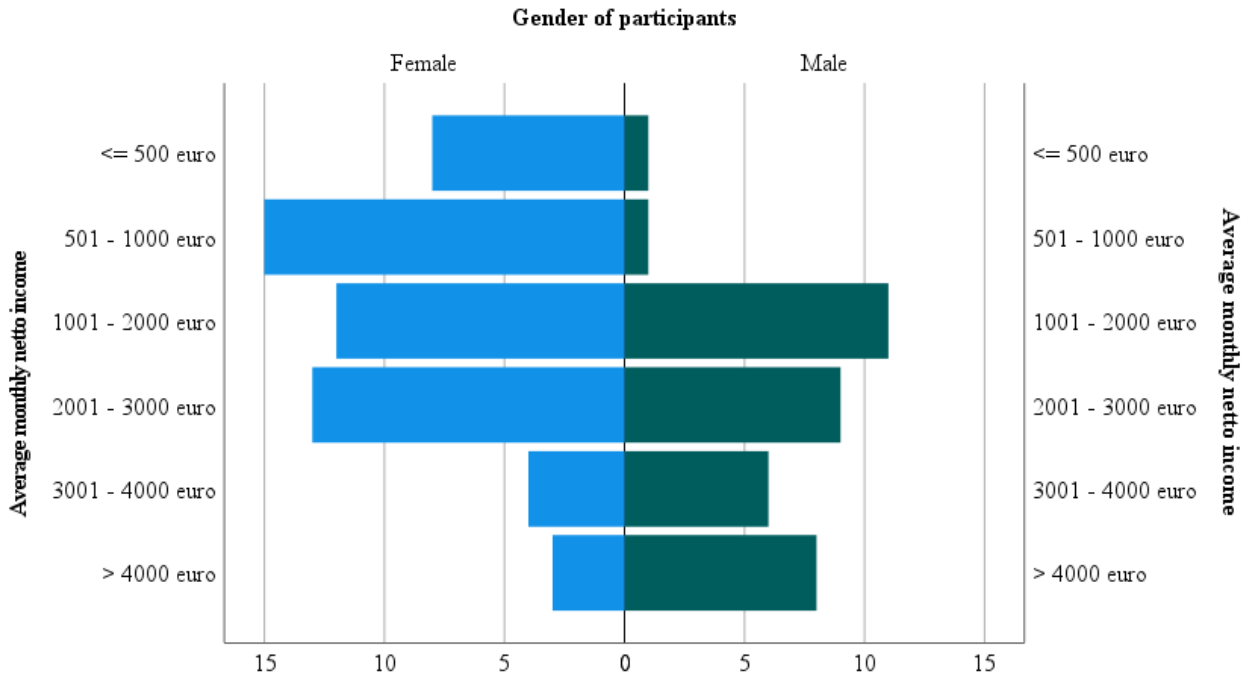

Figure 7. Average monthly netto income of participants by gender (N = 92).

Most of both male and female participants were around 29-30 years old. Out of 61 women 37 were below or equal to 30 years old (the rest 24 were over 30 years old). While out of 38 men on the contrary the majority (20) was older than 30 years old and the rest 18 were below or equal to that age. As all in all there were 56 participants below or equal to 30 years old and 44 participants over 30 years old, the decision was made to create two age groups called “below or equal to 30” and “over 30” for the purpose of further analysis.

Figure 7 not only highlights the existing inequality of income between genders of participants but also aims to show that the amount of netto income which serves as a median to divide the total amount of participants in two more or less equal groups is 2 000 euro. That is why for further research there is a group called “below or equal to 2 000 euro” (consisting of 49 respondents) and a group called “higher then 2 000 euro” (consisting of 43 participants). Only 92 respondents chose to indicate their average monthly netto income. The existing gender pay gap in Russia is much higher than in Europe: 25-30% Russian gap against 13-15% European gap (Eurostat 2021).

3.4. Hypotheses and statistical analysis

The survey’s participants differed conveniently (for the statistical analysis) in age, origin, gender and average monthly netto income so it allowed to check the following:

1) Where do respondents normally drink wine.

2) Whether age, origin, gender, and income are linked to the frequency of listening to music during wine consumption.
3) Whether age, origin, gender, and income are linked to the frequency of paying attention to the background music at bars and restaurants.
4) Whether a belief that background music can influence our perception of the taste of wine during consumption depends on age, origin, gender, and income.

Firstly, it was necessary to establish in what environment people normally drink wine: at home where they can determine the music (if they listen to it while drinking at all) or in the ones where the background music is already chosen for them.

Figure 8 shows that respondents mainly prefer to drink wine at home, then at bars and restaurants, and then at friends' houses.

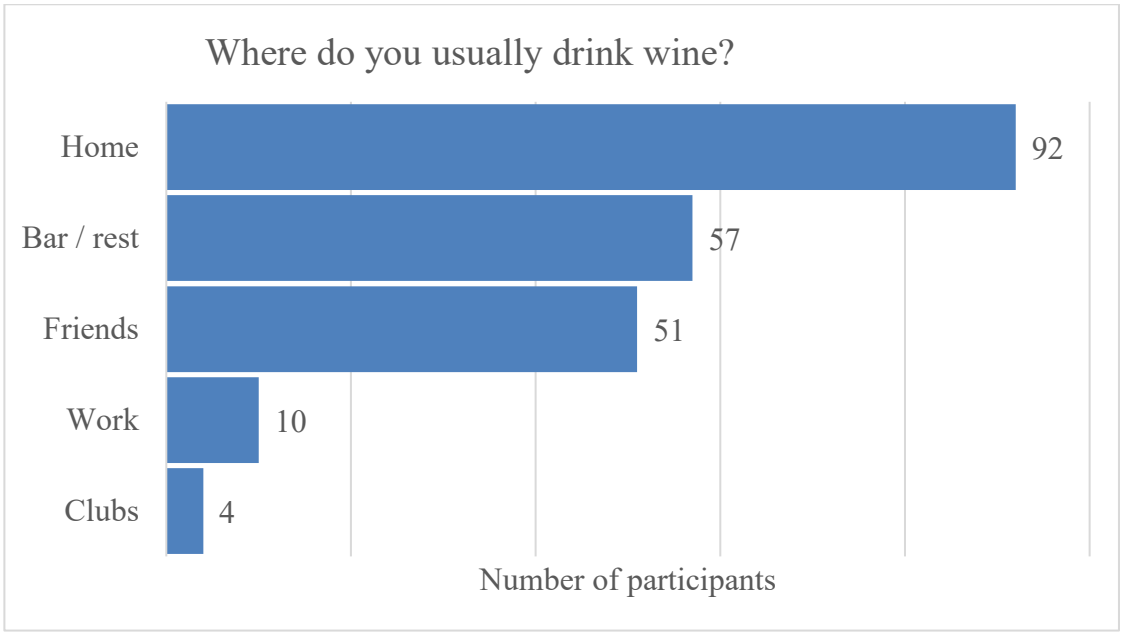

Figure 8. Rating of places to drink wine among respondents (multiple-choice question).

Secondly, with the means of descriptive statistics an attempt to find a link between age, origin, gender, income, and the frequency of listening to music while drinking wine was made. Initially there were five groups of frequency (in line with the five available answers). For the correct analysis, they were regrouped in three ("never-rarely", "sometimes", "often-always"). For the same purpose participants were divided in two groups by age, origin (Russia and other countries), and average monthly netto income. Table 3 below shows all the crosstabs (or contingency tables) from SPSS on that matter.

Table 3. Consolidated contingency table on "How often do you listen to music during wine consumption?" by gender, age, origin, and income of the participants.

How often do you listen to music during wine consumption?			never-rarely	sometimes	often-always	Total
Gender of participants	Male	Number	13	13	12	38
		% of Gender	34.2%	34.2%	31.6%	100.0%
	Female	Number	22	20	19	61
		% of Gender	36.1%	32.8%	31.1%	100.0%
Total		Number	35	33	31	99
		% of Gender	35.4%	33.3%	31.3%	100.0%
Age group	<= 30 y.o.	Number	20	16	20	56
		% of Age group	35.7%	28.6%	35.7%	100.0%
	> 30 y.o.	Number	15	17	12	44
		% of Age group	34.1%	38.6%	27.3%	100.0%
Total		Number	35	33	32	100
		% of Age group	35.0%	33.0%	32.0%	100.0%
Origin	Russia	Number	30	21	26	77
		% of Origin	39.0%	27.3%	33.8%	100.0%
	Other	Number	5	12	6	23
		% of Origin	21.7%	52.2%	26.1%	100.0%
Total		Number	35	33	32	100
		% of Origin	35.0%	33.0%	32.0%	100.0%
Income group	<= 2k EUR	Number	19	13	17	49
		% of Income group	38.8%	26.5%	34.7%	100.0%
	> 2k EUR	Number	13	18	12	43
		% of Income group	30.2%	41.9%	27.9%	100.0%
Total		Number	32	31	29	92
		% of Income group	34.8%	33.7%	31.5%	100.0%

In this case the null hypothesis (H_0) sounds like this: there is no difference in the frequency of listening to music during wine consumption between women and men (Russians and citizens of other countries, people younger than 30 y.o. and older than 30 y.o., lower and higher income groups). Or these differences are due to chance.

Chi-square test of independence was used to check the hypothesis. The results for:

- gender ($\chi^2 = 0.038$; df = 2; p = 0.981).
- age ($\chi^2 = 1.324$; df = 2; p = 0.516).
- origin ($\chi^2 = 5.155$; df = 2; p = 0.076).
- income ($\chi^2 = 2.412$; df = 2; p = 0.299).

In all four cases, the p-value was higher than 0.05 meaning that H_0 should be accepted (or that the experimental data are consistent with the null hypothesis). In other words, the frequency of listening to music is more or less universal between people of different gender, age, origin and income.

The same approach was used for points 3 and 4 from the list provided in the beginning of this subchapter. So, the next step was to analyse the link between age, gender, origin and income level and the frequency of paying attention to background music in bars and restaurants. Table 4 represents the crosstabs from SPSS for the next questionnaire's question.

Table 4. Consolidated contingency table on "How often do you pay attention to background music at bars and restaurants?" by gender, age, origin, and income of the participants.

How often do you pay attention to background music at bars and restaurants?			never-rarely	sometimes	often-always	Total
Gender of participants	Male	Number	10	8	20	38
		% of Gender	26.3%	21.1%	52.6%	100.0%
	Female	Number	10	9	42	61
		% of Gender	16.4%	14.8%	68.9%	100.0%
Total		Number	20	17	62	99
		% of Gender	20.2%	17.2%	62.6%	100.0%
Age group	<= 30 y.o.	Number	15	6	35	56
		% of Age group	26.8%	10.7%	62.5%	100.0%
	> 30 y.o.	Number	6	11	27	44
		% of Age group	13.6%	25.0%	61.4%	100.0%
Total		Number	21	17	62	100
		% of Age group	21.0%	17.0%	62.0%	100.0%
Origin	Russia	Number	16	12	49	77
		% of Origin	20.8%	15.6%	63.6%	100.0%
	Other	Number	5	5	13	23
		% of Origin	21.7%	21.7%	56.5%	100.0%
Total		Number	21	17	62	100
		% of Origin	21.0%	17.0%	62.0%	100.0%
Income group	<= 2k EUR	Number	9	10	30	49
		% of Income group	18.4%	20.4%	61.2%	100.0%
	> 2k EUR	Number	11	5	27	43
		% of Income group	25.6%	11.6%	62.8%	100.0%
Total		Number	20	15	57	92
		% of Income group	21.7%	16.3%	62.0%	100.0%

As for the origin variable there were two cells with the number of expected individuals lower than 5 (3.91) further chi-square analysis was not performed for this variable as inappropriate.

Null hypothesis for this matter (H_0): There is no difference in the frequency of paying attention to background music at bars and restaurants between women and men (people younger than 30 y.o. and older than 30 y.o., lower and higher income groups). Or these differences are due to chance.

After performing a chi-square test of independence in SPSS program there were the following results for:

- gender ($\chi^2 = 2.666$; df = 2; p = 0.264).

- age ($\chi^2 = 4.992$; df = 2; p = 0.082).
- income ($\chi^2 = 1.640$; df = 2; p = 0.440).

All three p-values were greater than 0.05 meaning that H_0 should be accepted (or that the experimental data are consistent with the null hypothesis). In other words, the frequency of paying attention to background music at bars and restaurants is not linked to gender, age, or income level.

Although none of the expected links were found, a general tendency in participants' answers to these two questions is worth mentioning. Both questions ("How often do you listen to music during wine consumption?" and "How often do you pay attention to background music at bars and restaurants?") were answered by 100 participants. With the help of SPSS, the one-sample non-parametric chi-square test was performed with the answers to each question to compare observed probabilities to hypothesized. Please refer to Figure 9 to compare the results.

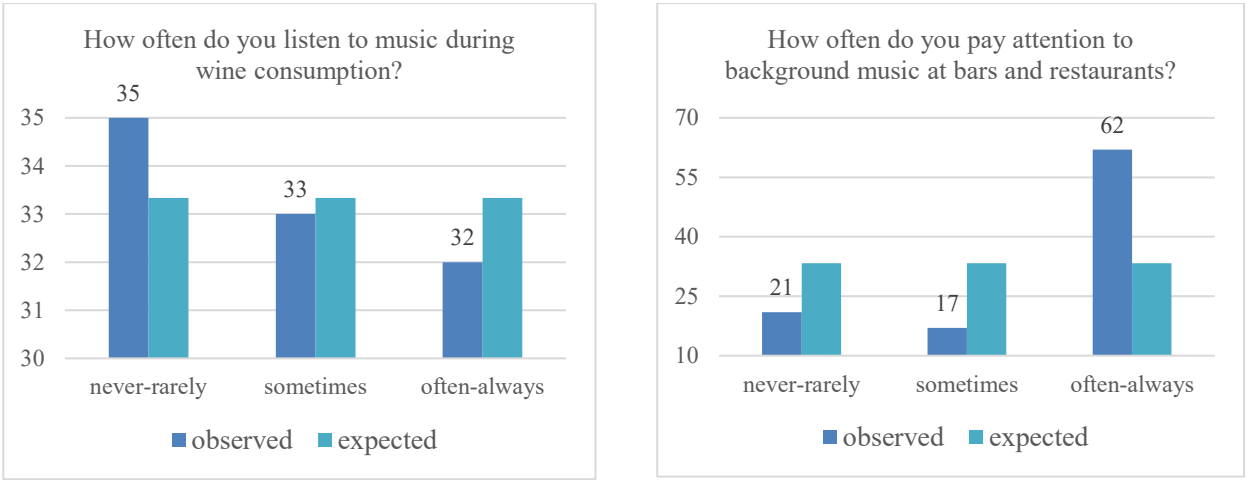

Figure 9. One-sample non-parametric chi-square tests for two questions (expected number of observations equals 33.33 for both charts).

In the case of the first question ($\chi^2 = 0.140$; df = 2; p = 0.932) as the p-value is higher than 0.05 we should accept that answers appear with equal probabilities, or they have a uniform distribution. In other words, it seems like to the population all three answers are equally attractive. On the contrary, as for the second question ($\chi^2 = 37.22$; df = 2; $p < 0.001$) we must reject the null hypothesis (which is all the answers are distributed uniformly) as the p-value is lower than 0.05 meaning that the population tends to pay attention often or always to the background music at bars and restaurants. Although we could not establish any links between the frequency of this attention and gender, age, origin, or income it can be worth studying in future.

Table 5 shows the crosstabs from SPSS for the question "Do you believe that background music can influence our perception of the taste of wine during consumption?"

Table 5. Consolidated contingency table on "Do you believe that background music can influence our perception of the taste of wine during consumption?" by gender, age, origin, and income of the participants.

Do you believe that background music can influence our perception of the taste of wine during consumption?			Yes	No	Total
Gender of participants	Male	Number	29	9	38
		% of Gender	76.3%	23.7%	100.0%
	Female	Number	48	13	61
		% of Gender	78.7%	21.3%	100.0%
Total		Number	77	22	99
		% of Gender	77.8%	22.2%	100.0%
Age group	<= 30 y.o.	Number	43	13	56
		% of Age group	76.8%	23.2%	100.0%
	> 30 y.o.	Number	35	9	44
		% of Age group	79.5%	20.5%	100.0%
Total		Number	78	22	100
		% of Age group	78.0%	22.0%	100.0%
Origin	Russia	Number	56	21	77
		% of Origin	72.7%	27.3%	100.0%
	Other	Number	22	1	23
		% of Origin	95.7%	4.3%	100.0%
Total		Number	78	22	100
		% of Origin	78.0%	22.0%	100.0%
Income group	<= 2k EUR	Number	40	9	49
		% of Income group	81.6%	18.4%	100.0%
	> 2k EUR	Number	32	11	43
		% of Income group	74.4%	25.6%	100.0%
Total		Number	72	20	92
		% of Income group	78.3%	21.7%	100.0%

H_0 for Table 5 sounds like this: there is no difference in this belief between women and men (people younger than 30 y.o. and older than 30 y.o., Russians and citizens of other countries, lower and higher income groups). Or these differences are due to chance.

The SPSS program performed a chi-square test of independence with the following results for:

- gender ($\chi^2 = 0.001$; df = 1; p = 0.978).
- age ($\chi^2 = 0.008$; df = 1; p = 0.930).
- origin ($\chi^2 = 4.170$; df = 1; p = 0.041).
- income ($\chi^2 = 0.341$; df = 1; p = 0.559).

As three out of four p-values were greater than 0.05 (for gender, age, and income) it means that the null hypothesis for these variables should be accepted. So, there is no difference in the answers between women and men, younger and older people, higher and lower income groups. Their beliefs again might be called somewhat universal.

For the origin, on the other hand, the p-value was lower than 0.05 meaning that H_0 for the origin should be rejected. In other words, there is a significant difference (with the level of significance of 0.05) between the answers of Russians and those of the participants of another origin. Judging by the crosstab it can be assumed that Russians tend to be more sceptical about the influence of background music on the taste of wine. However, such a high percentage of positive responses to this question among the participants of non-Russian origin might be explained by the fact that some of them have certain knowledge about wine tasting and cross modal correspondences (as at least 4 of these respondents were studying at the same Master program of Italian food and wine at the University of Padua). It is difficult to estimate the exact number of respondents with such knowledge as the questionnaire was anonymous. Anyways it can be an interesting topic for further research as it can be linked not only to the origin of respondents, but also to the level of their education or their experience with wine. For example, there are already findings that suggest that the level of experience induced specific differences in terms of lateralisation between wine experts and wine novices (Brand and Brisson 2012) or the research concentrated only on wine professionals (Wang and Spence 2018).

3.5. Results and discussions

After the analysis of 100 responses to the questionnaire the following things have been established:

1) Top-3 favourite places to drink wine for the participants were at home (97), at bars or restaurants (54) and at friend's houses (51). So, the most favourite is the place where people can choose background music (or its absence) by themselves, and the second most popular is the one where background music is a prerequisite.
2) There is no link between age, origin, gender, income of people and the frequency of listening to music during wine consumption.
3) There is no link between age, gender, income of people and the frequency of paying attention to the background music at bars and restaurants. The link between the latter and the origin was not analysed. Nevertheless, there seems to be a general tendency towards paying attention to the background music at bars and restaurants towards "often and always".
4) There is no link between age, gender, income of people and their believes that background music can influence the perception of the taste of wine during consumption, but it looks like the origin of social drinkers is linked to that belief. In a way that

Russians tend to be more sceptical (they choose “No” more frequently) answering that question than non-Russians.

Even though no links with the level of education were studied due to the lack of proper diversity among participants, it remains an interesting topic for further research. Moreover, since most respondents were of Russian origin it could be crucial to obtain a wider range of origins and number of participants to avoid creating groups like “non-Russians” being represented only by three European and ten other countries with a total of 23 participants. Another limitation of current survey was the absence of questions about the level of experience with wine as responses could have been analysed through yet another variable. Nevertheless, this survey was an impactful dive into the conscious part of music and wine interaction as only what participants do, know, believe, or understand was studied. Next step of the thesis is an actual experiment aiming to explore the subconscious.

Chapter 4. The pilot experiment

4.1. Aims of the experiment

Most suggestions on music and wine pairings are made by wineries, wine magazines, wine bloggers and specialists in the US, the UK or Europe for their local clients, readers, and participants. Experiments of Clark Smith were mainly concentrated on English speakers. But what about others? Will, for example, a Russian speaker prefer his wine with an American or a Russian song? Will the preferences of a Russian speaker reconcile with what the American specialist is suggesting to pair? And in general, will Russian speakers rate higher the wine which is paired with a more congruent song, or they will not simply feel the difference? Such a choice of the language of speakers is due to several reasons. Firstly, these participants have never been studied before, although, the role of the first language (English versus others) of participants has been described in one of the works of Crisinel and Spence (Crisinel and Spence 2010a). Secondly, as the survey participants of Russian origin seemed to be consciously more sceptical about the influence of background music on the perception of wine's taste, it was even more challenging to test how the music and wine pairings work for them on a subconscious level. Thirdly, being held abroad (in Luxembourg) the experiment could involve more participants as the selection was not based on the origin but rather on the first language of participants.

4.2. Description of the experiment and participants

The experiment was held in the form of a blind wine tasting in a dining room of a private apartment. Seven Russian speakers were offered 4 glasses of wine, one after another, each paired with its own background music. Each participant received a questionnaire in the form presented in the **Annex 3**, a glass of still water and some non-salty simple crackers. All wines were served in equal simple Luminarc Vinetis glasses of 50 cl. The participants were not informed that out of 4 glasses two had the same wine, the tasting was blind, the wines were put in such an order as not to duplicate the same wine, so participants were thinking they drink four different wines.

Wines of the experiment:

Chianti Riserva DOCG, 2017 by Bonacchi: 100% Sangiovese, 13% alcohol, 12 months of aging in stainless steel tanks with temperature control and then from 6 to 12 months in French oak barrels. Colour: intense bright red. Aroma: intense clean, characterized by notes that remind red fruits,

blackberries, blackcurrant with hints of vanilla. Taste: fresh, full, velvety, and enveloping, intense tannin well balanced by softness and acidity (Bonacchi Chianti Riserva, technical wine sheet).

Cabernet Sauvignon California, 2020 by Gallo Family Vineyards: 100% Cabernet Sauvignon, 13% alcohol, aged in stainless steel tanks. Colour: ruby red. Aroma: blackcurrant complemented by plum and spices. Taste: structured, full bodied, smooth mouthfeel, velvety with medium long finish.

Music of the experiment:

To check the pairing offered by Clark Smith Chianti Riserva was paired initially with Jack McDuff's "The Honeydripper", and then with The xx's "Intro" which according to the winemaker is a better match for a Chablis Grand Cru. Both music compositions don't have any words, so whether Russian speakers would prefer wine with a more congruent music ("The Honeydripper") was tested.

To check another Smith's pairing versus a Russian song Cabernet Sauvignon was initially paired with The Doors' "People are strange" and then with Splean's "Doch samuraya" ("Daughter of a samurai"). Both songs have words and are in a way similar in their tempo and style, so whether Russian speakers would prefer the Smith's choice of American origin over a Russian song was tested.

Additionally, this experiment allowed to see in general whether there is a perceived difference in taste intensity or hedonic preference between two glasses of the same wine in two different musical conditions.

The order of wines and music was organized in the following way:

1. (856) Chianti Riserva + Jack McDuff "The Honeydripper" (8:14)
2. (436) Cabernet Sauvignon + The Doors "People are strange" (2:10)
   10 minutes break
3. (624) Chianti Riserva + The xx "Intro" (2:08)
4. (210) Cabernet Sauvignon + Splean "Doch samuraya" (3:37)

Figure 10 shows how wine bottles were prepared for the tasting.

The music was played using Spotify Application on the Sonos Play:5 Speaker at an average of 70 dB volume.

Each pairing was assigned with a random three-digit number generated online not to influence the preference or choice among participants. Each wine bottle was covered with foil to guarantee a blind tasting. Each song was played for 3 minutes 30 seconds regardless of its actual length. If the length of the composition (i.e., "Intro" by The xx or "People are strange" by the Doors) was less than 3 minutes it was restarted again and played for the missing time so as to exclude the factor of length as hypothetically influencing the answers of participants. Please refer to **Annex 4** to observe how the tasting was prepared.

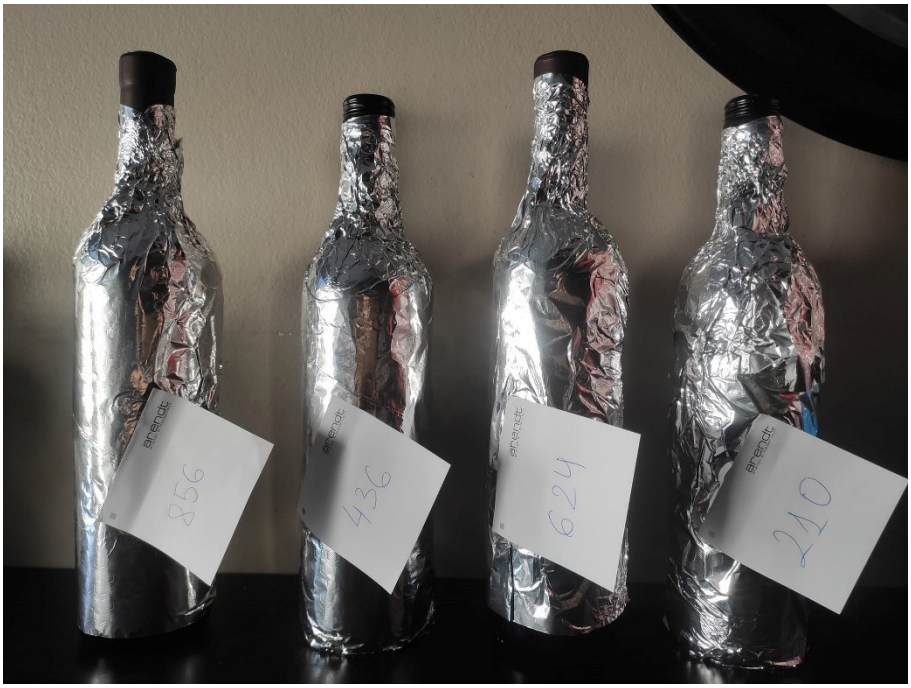

Figure 10. Preparation of wine bottles for the pilot experiment.

Participants of the experiment:

Six out of seven participants were female, 3 participants were from Russia, 3 from Kazakhstan, and 1 from Ukraine. The participants' age varied between 27 to 41 years old, with the average of 33 years old. First language for all of them was Russian.

The experiment was called pilot because of its small sample size as unfortunately the number of people expected to participate initially could not take part in the experiment due to the existing epidemiological situation. Thus, the results of the pilot experiment should be reviewed carefully as not giving valid estimates of effect size. Nevertheless, it was still worth providing the results of such an experiment as it showed the feasibility of a technique and tried out the procedure, which can save money, time, and other resources for potential future research with wider sample size.

4.3. Results and discussions

After the experiment was held all the answers were transferred to Excel and consolidated in the table with sparklines and conditional formatting for better visual reflection of the results. Please refer to Table 6 for a more detailed view. Win/loss sparklines show answers like "yes" up the cell in blue, and "no" at the cells bottom in red. If to the last question participants answered "I don't know" the square is absent in a sparkline (neither "yes", nor "no"). Light blue data bars with numbers show the average rating among participants (scale from 1 to 5).

Table 6. Consolidated and conditionally formatted table of answers to the experiment.

Questions	Chianti Riserva		Cabernet Sauvignon	
	Jack McDuff	The xx	The Doors	Splean
Do you like the wine?				
How intense is the flavour of the wine?	3.86	4.29	3.00	3.14
How much do you like the wine?	3.14	2.86	4.29	4.14
Do you know the music?				
Do you like the music?				
How much do you like the music?	4.43	4.29	4.71	4.00
Is this music congruent to the wine?				

	A "yes" answer from one participant
	A "no" answer from one participant
3.14	Average rating among participants

In the case of Chianti Riserva, it is interesting to observe that 2 people out of 7 changed their mind about liking the wine when the music changed to a less congruent one according to Clark Smith's pairings. Although participants did not seem to agree on which of the two musical backgrounds, Jack McDuff's "The Honeydripper" or the xx's "Into", fitted the wine the most. Nevertheless, on average participants rated the wine as having higher flavour intensity when being paired with the xx, and at the same time liked the wine more when listening to Jack McDuff. Another noteworthy observation is that familiarity of music didn't seem to increase the pleasantness of wine in the experiment. No one knew "The Honeydripper", yet everyone liked the music and on average liked the wine during listening to it even more than with the composition that most participants (5/7) already knew.

In the case of Cabernet Sauvignon practically the same number of participants liked the wine even with different music on the background, both compositions were familiar to more or less the same number of people, and both musical conditions were liked by almost all the participants. Nevertheless, on average the wine tasted slightly more intense during listening to Splean (Russian song) and at the same time the wine was preferred more when listening to the Doors (American song chosen by Clark Smith as the best pairing to Cabernet Sauvignon). And what is even more crucial, is that 6 out of 7 people chose the Doors as being congruent to the wine, once again proving Clark Smith's theory. Even being Russian speakers, they still preferred an American song for the pairing. Worth adding that "People are strange" by the Doors was the most liked music out of all four from the tasting. It might explain why participants on average liked the wine paired with it the most at the same time perceiving it as tasting the least intense.

For both cases music recommended by Clark Smith as the best pairing seemed to work well with the wine, decreasing its perceived intensity and increasing its pleasantness. So maybe proper background music could really "season" the taste of wine in the way that was preferred by most participants. Even though the experiment was small the results seem to be in agreement with the prior findings.

4.4. Limitations of the pilot experiment

Despite the small sample size of the pilot experiment, an extension of it might be useful for the future research on wine and music pairing. Will the greater sample size experiment repeat the results of the pilot one proving that Chianti Riserva is liked more when paired with Jack McDuff's "The Honeydripper" and Cabernet Sauvignon is liked more when accompanied by the Doors "People are strange" no matter what gender, age, income, origin, and mother tongue the participants have? Some limitations of the pilot experiment to take into consideration:

- small sample size creates a precaution against generalising these findings too far beyond the scope of the study;
- particular wines were used, maybe with the same varieties but from other locations and producers the results would not be the same;
- particular music was chosen, it might happen that, for example, some other Russian song would be a better match than the Doors for Cabernet Sauvignon;
- wine expertise and musical training of participants were not evaluated;
- most participants were well-educated females currently living as expats in Luxembourg, the wealthiest country in the world according to the International Monetary Fund (GDP per capita, current prices 2022 n.d.);
- terminology used in the questionnaire could be improved (not all the participants understood the word "congruent", so the word "fits" was added to the last question);
- headphones could be used instead of a speaker to eliminate the factor of distance from the speaker and additionally cover some background noise;
- temperature of wines was not controlled during serving, but all of them were served at the same room temperature;
- other external factors as lighting, humidity or temperature in the room were not measured or adjusted, but they were the same for both wines;

- participants dealt with the forced choice, silent or “no music” condition was absent therefore was not evaluated;
- there was no question about the expected price of the wine during different background music, which could also be an indicator worth studying.

Because the pilot experiment was held among social drinkers without any specific wine expertise or knowledge, a short introductory explanation of key wine tasting steps was made before the tasting. A more detailed training might be useful for a wider scale research if some more complicated wine characteristics are studied, for instance balance, body, astringency, acidity, alcohol, carbonation, tannins, sweetness, complexity, aftertaste, and others. That also explains why only the question about flavour intensity was included in the current study.

Another interesting research objective could be to understand on what participants base their understanding of a good pairing, what they themselves imply when answering that one music is a better match for a particular wine than another. For this purpose, an additional open answer question could be an intriguing and eye-opening choice for the questionnaire.

Chapter 5. Conclusions and suggestions

5.1. Conclusions

Consumers are normally exposed to hours of music each day: at home, at bars and restaurants, in supermarkets and stores, in cars, at work, etc. Growing number of empirical evidence shows that what we hear can not only influence our shopping behaviour and determine our choices as consumers, but also influences what we taste in a glass of wine, how much we like it and all in all modifies the whole drinking experience. Properly selected music in an advertisement can help indecisive customers to choose a particular wine, make people spend more money on wines in a wine store or a restaurant, lead social drinkers to preferring particular wines by increasing some of the desired tasting qualities and decreasing undesired ones. Taken together, the results of the various studies reported in Chapter 2 clearly demonstrate that music has an influence on the wine drinking experience.

There are several theories trying to understand how sound and music influence wine's taste. One line of empirical research states that background sounds interfere with tasting due to attentional distraction. Environmental psychologists offer a so-called PAD (pleasure-arousal-dominance) model to explain the cross-modal correspondences between wine and music. For instance, arousal elicited by loud music, or preference/liking carries-over to influence hedonic judgements of wine tasted. Semantic priming effects linked to the type and style of music are also relevant. Familiarity or statistical regularity of some pairings might also be taken into consideration as one of the ways. Final route is through the congruency of music or sonic seasoning, so as the soundscape is specifically designed or chosen to be congruent with a particular wine (Spence et al. 2019).

For the past years different wine writers, magazines and even wine producers created full playlists to suggest pleasant music pairings to different wines. The main disadvantage of these pairings is that they are rarely research based. Wine writers have been tempted to make a connection between the wine that they are tasting but which the reader might not be able to taste, and a particular piece or style of music, that one presumes is expected to be already familiar and meaningful to the reader (Spence and Wang 2015a). That is why in our pilot experiment we used two pairings suggested by Clark Smith – a Californian winemaker and wine consultant, one of the most famous practitioners in the field of music and wine pairings.

Before the experiment an online survey was conducted to understand the conscious part of respondents' attitude towards the studied topic. The main aim was to gather information on what social drinkers know, think and experience about the influence of background music on the taste of

wine during consumption, and analyse the results statistically to find links, if any, between socio-demographic factors (like gender, age, origin, and income) and these preferences and experiences. The survey's results showed that the two most popular places to enjoy wine among participants (29-30 years old, well educated, mostly of Russian origin, speaking English, with an average netto monthly income around 2 000 euro) are at home, and at bars or restaurants. Moreover, participants tend to pay attention to background music in the venues often or always. Unfortunately, there were no links found between age, gender, and income of people and the frequency of listening to music during wine consumption, the frequency of paying attention to the background music at bars and restaurants, and the believes that background music can influence the perception of the taste of wine during consumption. Although the origin showed to be a significant factor for the latter, as Russians tend to be more sceptical answering "No" to the question "Do you believe that background music can influence our perception of the taste of wine during consumption?" more frequently than non-Russians. That was one of the reasons why Russian speakers were chosen to be studied during the pilot experiment – not only because it is more challenging, but also because the role of Russian as a first language in sensory research has not been studied before.

The pilot experiment was chosen as an instrument to prepare for a potential wider sample experiment on the subconscious part of the music and wine pairing. Seven Russian speaking participants were invited to a private apartment in Luxembourg to blindly taste two different wines each with two different musical conditions. At the same time, participants were not informed that they were tasting only two wines, so as they had four different wine-music pairings they had to rate each wine's pleasantness, intensity, and each pairing's congruency. For both cases music recommended by Clark Smith as the best pairing (Jack McDuff's "The Honeydripper" for Chianti Riserva and The Doors "People Are Strange" for Cabernet Sauvignon) seemed to work better with the wine than other compositions, decreasing its perceived intensity and increasing its pleasantness. Even though people might be largely unaware or in a disbelief of the effect that music had on the perceived taste of wine, sonic seasoning of American origin seemed to work on participants speaking absolutely another language as a mother tongue. Thus, the result of a small pilot experiment was in line with the findings from prior research. In other words, what you hear, or listen to, really can affect the sensory evaluation of the wine that one happens to be drinking.

5.2. Suggestions for further research

Current study adds new evidence to a growing list of cross-modal integrations of different sensory channels. Further study using various olfactory, gustatory, and auditory stimuli is needed to generalize the current findings. For example, would similar effects occur in a greater sample experiment? Would they also occur when music is playing incidentally in the background of a wine bar? Is music that has been composed in one country to convey a specific taste is also associated with the same taste by those coming from a different musical/ cultural background (Spence and Wang, 2015b). How do, for instance, vocal sounds separately influence the perceived taste of wine if they do?

Having a knowledgeable sample of participants may mean more sophisticated wine related terms could be used in a study. Thus, future studies could focus on the effect of music on more complex and nuanced wine characteristics, that are going beyond the basic tastes, like balance, body, astringency, acidity, alcohol, carbonation, tannins, sweetness, complexity, viscosity, and even length of the aftertaste. For the latter, a TDS method – temporal dominance of sensations – might be used. It is a promising method from the field of sensory science that could potentially be used to analyse the perceived properties of both music and taste/flavour as they evolve through time (Spence and Wang 2015a). Having trained musicians among experiment's participants may also reveal unexpected results. Moreover, level of education of participants, as has been already mentioned in Chapter 3, might be an interesting variable worth studying in future.

It would also seem reasonable to suggest that if we like the music, then we might be a little more likely to appreciate the wine as well – one can think of this as an example of "sensation transference" (Spence and Wang 2015b). Unfortunately, from the pilot experiment it is difficult to make conclusions about that due to the small sample size. And if this assumption is true, could unpleasant music, on the contrary, reduce the pleasantness of wine thus reducing the amount consumed? Additionally, if participants can choose what to their mind is a good or congruent music-wine pairing, maybe they can also help researchers explain the basis of that choice (by additional open-answer questions in a questionnaire, for example). This could enlarge our knowledge about the mechanisms behind "proper" or "perfect" pairings.

Much more could be studied in connection to the individual musical preferences of participants or familiarity of music as through the mechanisms mentioned in this work, they could evoke specific moods and emotions influencing the perceived taste of wine. Future research might be more fruitful if means of non-invasive functional neuroimaging are used (EEG, ERP, MEG, PET, fMRI). These

methods have already shown their usefulness in studying brain response to olfactory stimuli (Royet and Plailly 2004).

5.3. Possible fields of application of findings

Even nowadays the topic of wine and music pairing and mechanisms behind it seems to be quite understudied. It makes it an even more attractive and interesting sphere of research full of potential new scientific breakthroughs. Marketing and advertising, studies of consumer behaviour, neuroscience, sensory studies, social psychology, food design, food science and nutrition, brand management, hospitality management, health sciences like geriatrics – this is just a small number of fields that could benefit from a growing number of research on buying, trying, and drinking wine while listening to different background music and sounds.

Marketers should take into consideration main objectives of their business as the music chosen for a wine shop or a bar, for example, should be in line with these aims and with the specific market situation (Milliman 1982). Do you need to slow down your customers or increase their turnover? Do you want them to prefer local wines to those from abroad? Do you want clients to buy just more bottles of wine, or you would prefer them to buy less bottles but of more expensive wines? Properly selected background music can help you with that. As can be concluded from the literature review music can not only affect product preferences (Gorn 1982), but also may help to frame drinking experience (Spence and Shankar 2010). In other words, researchers have demonstrated how modifying the auditory attributes of the drinking environment can bias both consumer choice and drinking behaviour (Spence and Wang 2015c). Music can also return your customers back to your business as music in an environment should condition the responses to that environment itself (North and Hargreaves 1996).

Sonic branding and sonic seasoning are proving to be promising marketing tools. Sonic branding is an essential and somewhat ignored piece to the development of the branding literature (Krishnan, Kellaris and Aurand, 2012). Sonic logos or “sogos” should be considered a useful instrument to increase sales. While sonic seasoning as a deliberate pairing of sound/music with taste/flavour in order to enhance or modify the multisensory tasting experience could also be widely commercialized (Spence et al. 2021). If a particular background music makes the wine taste more intense as showed in a pilot experiment and people tend to like it less, you (as a chef, sommelier, or an owner of a restaurant) should be more attentive and selective in terms of pairing. Using scientific tools and insights allows playful chefs to create unique and highly pleasurable dining experiences,

especially by using sound as interesting extra in their gastronomical palette (Kringelbach, 2015). For example, world's first sonic bar has already been opened in New Zealand by Jo Burzynska, a wine writer. Researching the interaction between sound and taste, the 35-seater bar runs themed nights pairing music to specific grape varieties and wine to specific types of music (Burzynska 2017). Another noteworthy project is called "Wine listening" which originated in Italy. A group of enthusiasts conducts research on how music influences the taste of wine and then organizes immersive events based on their findings (Cedrone, Iacobelli, and Arazi 2022). A growing number of such multisensory events shows that brands and advertisers seek new ways of connecting with their customers through sonic seasoning (Spence et al. 2021).

Both interest and excitement around wine and music pairing are growing even judging by the steadily increasing number of sensory mobile applications for customers to interact with in the comfort of their own homes. As was already mentioned, for example, Krug's app and pairing recommendations on Spotify. In 2019 Coravin company launched their Moments App which pairing algorithm is the result of collaboration between sommeliers, data scientists, and designers. The result is a platform that pairs wine with traditional counterparts like food, as well as with more abstract ones like music, films, moods, and activities (Coravin Moments App 2022). With the continuing technological progress one can only imagine how, for instance, hyper directional loudspeakers, not to mention digitally augmented glassware may help deliver the most stimulating, the most memorable, and certainly the most multisensory of tasting experiences in the years to come (Spence and Wang, 2015c). It would be great if we could take Vivino (mobile app that helps to sell, compare, review, and rate wines) for example, and Spotify or Apple Music (digital music streaming services) and combine them for a better wine drinking experience: you scan the wine, and a specifically trained algorithm based on all the available research and your individual preferences suggests you a playlist of selected tracks to pair with your wine.

In the field of healthcare matching sounds and tastes could be especially useful for patients with impaired gustatory functioning, allowing them to better enjoy a meal through congruent sensory stimulation of their residual intact modalities (Crisinel and Spence, 2009). On the other hand, negative pairings, meaning non congruent or when specific sounds make wine taste worse or maybe even barely drinkable, might be a great solution to conquer the problem of alcoholism.

ANNEX 1. Summary of findings from scientific studies

on the various ways in which characteristics of background music can influence various aspects of consumers behaviour, experience, and perception of products

Characteristics of background music	Influence what?	Where?	Study	Result
Tempo	Shopping behaviour: Speed of movement (pace of traffic flow), Sales volume	Supermarket, In-store shopping	(Milliman 1982)	The pace of in-store traffic flow was significantly slower with the slow tempo music than with high tempo or no music. Higher sales volumes were consistently associated with the slower tempo music
Tempo	Eating behaviour: Speed of consumption	University cafeteria	(Roballey et al. 1985)	Eating speed (bites per minute) would increase with high-tempo background music
Pitch	Cross-modal associations with odours and tastes	Experiment room	(Crisinel and Spence 2010b) (Crisinel and Spence 2012)	The odours affected the choice of pitch. Pleasantness and complexity of odours are essential in the choice of pitch, also fruit odours seem to be consistently associated with high-pitched notes. Sour and sweet tastes are preferentially associated with high-pitched sounds
Pitch	Cross-modal associations with the taste of foodstuffs	Experiment room	(Crisinel and Spence 2009)	Stronger association between low-pitch sounds and bitter-tasting foodstuffs, and between high-pitch sounds and sour-tasting foodstuffs
Pitch	Cross-modal associations with odours	Experiment room	(Belkin et al. 1997)	People can analogize perceptual dimensions from the auditory and olfactory modalities in the context of a cross-modal matching task

Loudness	Shopping behaviour: Time spent	Supermarket	(P. C. Smith and Curnow 1966)	Significantly less time was spent by subjects in a supermarket during loud sessions of background music
Loudness	Drinking behaviour: Amount & speed of alcohol consumption	Bar	(Gueguen, Guellec, and Jacob 2004)	Analysis showed that a higher sound level than usual was associated with consuming faster and ordering more drinks
Tone (major key, minor key, atonal)	Perception of time	Experiment room (listening lab)	(Kellaris and Kent 1992)	Music in major key ("happier") produced the longest duration estimates and the largest gap with between actual and perceived time. Atonal music produced the shortest and closest to actual temporal estimations
Number of tones (in a sonic logo or sogo)	Willingness to pay	Laboratory experiment	(Krishnan, Kellaris, and Aurand 2012)	Number of tones in a sogo systematically influences WTP. Very few (3) or too many (9) tones are perceived as less valuable than sogos with moderate (6) number of tones
Style (Classical vs. Top-40)	Shopping behaviour: Sales volume	Wine store	(Kim and Areni 1993)	Subjects spent more money when classical music was played inducing people to purchase more expensive wines (rather than greater quantities of wine)
Style and complexity	Responses to different aspects of the environment	University cafeteria	(North and Hargreaves 1996)	The more the music was liked the more subjects liked the atmosphere, desired to return and the more they were attracted to the source of music (moderate-complexity new age won)
Style/type (sweet or sour)	Wine pleasantness	Public event (experimental chamber)	(Spence, Velasco, and Knoeferle 2014)	Wine was perceived as fresher and less intense under green lighting and sour music; participants liked the wine most under red lighting while listening to sweet music

Style (pop, classical and no music)	Money spent, Time spent	Restaurant	(North, Shilcock, and Hargreaves 2003)	Classical music gave rise to the greatest money spending on food and drinks
Style (Top-40, cartoon and 'drinking songs')	Drinking behaviour: Money spent, Time spent	Bar	(Jacob 2006)	Drinking songs appeared to increase the length of time customers stayed in the bar and the average amount spent
Instruments	Cross-modal associations with odours, tastes and flavours	Experiment room	(Crisinel and Spence 2010b) (Crisinel and Spence 2012)	The odours influenced the choice of instruments, for example blackberry and raspberry odours were more associated with piano, while the odour of musk was more associated with brass sounds. Brass was often matched to unpleasant stimuli while piano to pleasant tastes and flavours
Presence of music (ON/OFF condition)	Time spent, Amount consumed	Bar	(Drews, Vaughn, and Anfiteatro 1992)	Males stayed at a bar longer and drank more beer when music was being played
Pleasantness (liked / disliked) of the music	Product preferences	TV commercials	(Gorn 1982)	In a nondecision making mode choice of a product by individuals was more affected by the pleasant music than by the information about the product inside the commercial
Connotations (powerful & heavy; subtle & refined; zingy & refreshing; mellow & soft)	Flavour perception	University campus	(North 2012)	Participants appeared to perceive the taste of the wine in a manner consistent with the connotations of the music
Origin (French vs. German)	Shopping behaviour: Sales volume	Supermarket	(North, Hargreaves, and McKendrick 1997)	French wine outsold German wine when French music was played, whereas German wine outsold French wine when German music was played

			(North, Hargreaves, and McKendrick 1999)	
Degree of familiarity	Shopping behaviour: perceived vs. actual time spent	Supermarket	(Yalch and Spangenberg 2000)	Analysis revealed that individuals reported themselves as shopping longer when exposed to familiar music but actually shopped longer when exposed to unfamiliar music
Congruency or appropriateness of music	Shopping behaviour: Sales volume, time and money spent	Supermarket (zoning diff depts)	(Yalch and Spangenberg 1993)	Appropriate music (for specific department) resulted in more shoppers making purchases and spending more money. Time and cash spent depended on age, gender & type of music played in each store department
Congruency of sounds	Odour pleasantness	Experiment room	(Seo and Hummel 2011)	Participants rated the odours as being more pleasant while listening to a congruent sound than while listening to an incongruent sound
Putative congruency of music (to wine)	Wine drinking experience	Public Event	(Wang and Spence 2015)	Music has a significant impact on wine's fruitiness and acidity ratings. Weak but positive correlation between music's congruency (to wine) and wine pleasantness
Putative congruency of music (to wine)	Cross-modal associations, Wine drinking experience	Wine tasting room	(Spence et al. 2013)	Music & wine pairing is not random. Social drinkers share a number of crossmodal associations when it comes to pairing wines and music. Listening to the appropriate classical music can enhance the overall experience associated with drinking wine

ANNEX 2. Wine and music survey questionnaire

Wine & Music

Questionnaire Form for the research on the influence of background music on wine tasting.

Please, fill the form carefully.

1. How old are you? *(Short-answer text)*
2. What is your gender?
    - o Female
    - o Male
    - o Prefer not to say
3. What country are you from? *(Short-answer text)*
4. What is your level of education?
    - o Middle school
    - o High (secondary) school
    - o Higher education (Bachelor's degree)
    - o Higher education (Specialist's or Master's degree)
    - o PhD or higher
    - o Prefer not to say
    - o Other *(possibility to indicate)*
5. What is your average monthly netto income?
    - o lower or equal to 500 euro
    - o 501 - 1000 euro
    - o 1001 - 2000 euro
    - o 2001 - 3000 euro
    - o 3001 - 4000 euro
    - o higher than 4000 euro
    - o Prefer not to say
6. Do you like to drink wine?
    - o Yes
    - o No
7. What is your favourite wine style/s? *(Multiple choice is possible)*
    - ☐ Sparkling (Champagne, Cava, Prosecco, etc.)

- ☐ Red (red wines from Pinot Noir, Cabernet Sauvignon, Merlot, Syrah, etc.)
- ☐ White (white wines from Chardonnay, Sauvignon Blanc, Pinot Grigio, Riesling, etc.)
- ☐ Rosé (rosé wines from Grenache, Sangiovese, Zinfandel, Pinot Noir, etc.)
- ☐ Dessert (Sauternes, Tokaji, Passito, Ice wine, Port, Sherry, etc.)

8. How often do you drink wine?

- o Never
- o Yearly (several times per year)
- o Monthly (several times per month)
- o Weekly (several times per week)
- o Daily (practically every day)

9. Where do you usually drink wine? *(Multiple choice is possible)*

- ☐ At home
- ☐ At bars / restaurants
- ☐ At friends' houses
- ☐ At clubs / discos
- ☐ At work
- ☐ Other *(possibility to indicate)*

10. How often do you listen to music during wine consumption?

5-point scale meaning: 1 - never, 2 - rarely, 3 - sometimes, 4 - often, 5 – always

11. How often do you pay attention to background music at bars and restaurants?

5-point scale meaning: 1 - never, 2 - rarely, 3 - sometimes, 4 - often, 5 – always

11. What is your favourite musical genre/s? *(Multiple choice is possible)*

- ☐ Classical
- ☐ Pop
- ☐ Rock
- ☐ Soul
- ☐ Electronic
- ☐ Funk
- ☐ Country
- ☐ Latin
- ☐ Reggae
- ☐ Hip Hop
- ☐ Punk

- ☐ Folk
- ☐ Jazz
- ☐ Blues
- ☐ Metal
- ☐ R’n’B
- ☐ Other *(possibility to indicate)*

12. Do you believe that background music can influence our perception of the taste of wine during consumption?

- o Yes
- o No

13. Would you like to participate in further research on the topic?

- o Yes
- o No

14. Only if the prior answer was “Yes”

Please leave your email for my further instructions: *(possibility to leave an email)*

ANNEX 3. Questionnaire for the pilot experiment

Questionnaire Form for the experiment on the influence of background music on wine perception.

Please, fill the form carefully.

General questions:

1. How old are you? *(Number)* _____

2. What is your gender?

- ☐ Female
- ☐ Male
- ☐ Prefer not to say

3. What country are you from? *(Short-answer text)* _____

4. What is your mother tongue (first language)? *(Short-answer text)* _____

Tasting session questions (please circle your answers):

Sample 856

1. Do you like the wine? Yes / No
2. How intense is the flavour of the wine? 1 (low) – 2 – 3 – 4 – 5 (high)
3. How much do you like the wine? 1 (not at all) – 2 – 3 – 4 – 5 (very much)
4. Do you know the music? Yes / No
5. Do you like the music? Yes / No
6. How much do you like the music? 1 (not at all) – 2 – 3 – 4 – 5 (very much)
7. Do you think that the music is congruent to (fits) the wine? Yes / No / I don't know

Sample 436

1. Do you like the wine? Yes / No
2. How intense is the flavour of the wine? 1 (low) – 2 – 3 – 4 – 5 (high)
3. How much do you like the wine? 1 (not at all) – 2 – 3 – 4 – 5 (very much)
4. Do you know the music? Yes / No
5. Do you like the music? Yes / No
6. How much do you like the music? 1 (not at all) – 2 – 3 – 4 – 5 (very much)
7. Do you think that the music is congruent to (fits) the wine? Yes / No / I don't know

10 minutes break

Sample 624

1. Do you like the wine? Yes / No
2. How intense is the flavour of the wine? 1 (low) – 2 – 3 – 4 – 5 (high)

3. How much do you like the wine? 1 (not at all) – 2 – 3 – 4 – 5 (very much)
4. Do you know the music? Yes / No
5. Do you like the music? Yes / No
6. How much do you like the music? 1 (not at all) – 2 – 3 – 4 – 5 (very much)
7. Do you think that the music is congruent to (fits) the wine? Yes / No / I don't know

Sample 210

1. Do you like the wine? Yes / No
2. How intense is the flavour of the wine? 1 (low) – 2 – 3 – 4 – 5 (high)
3. How much do you like the wine? 1 (not at all) – 2 – 3 – 4 – 5 (very much)
4. Do you know the music? Yes / No
5. Do you like the music? Yes / No
6. How much do you like the music? 1 (not at all) – 2 – 3 – 4 – 5 (very much)
7. Do you think that the music is congruent to (fits) the wine? Yes / No / I don't know

ANNEX 4. Preparation for the experiment

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