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Testing Australian standard consumers' understanding of the language used to describe wine

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Abstract

With reference to 64 common descriptors of the sensory properties of wine (e.g., tannic, full-bodied, etc.), we investigated the extent to which these terms are understood by Australian standard consumers in relation to an opposite property (i.e., as happens in the case of experts). The study also determined how consistently these dimensions were among the group of participants. The results confirmed that the sensorial dimensions relating to wine can be modeled in terms of opposites for standard wine consumers in more than 80% of cases. However, there was a great deal of variability between the properties in terms of the opposites which were elicited indicating that some terms are less open to ambiguity while others are associated with *many* different opposites. A comparison of the results with those from similar studies with Italian and Vietnamese participants is addressed in the final section.

Practical Applications

The aim of the study was to replicate previous research conducted with Italian participants, but in this case involving Australian participants, with a view to compare participants from a traditional wine-producing country with those from a relatively newly established wine-producing country. A similar study had already been carried out with Vietnamese participants, that is, with consumers from a country with less familiarity with grape wines. The importance of this study rests on the fact that English is one of the most commonly spoken languages in the world and, as such, the study represents a relevant evolution of the original research.

Opposites seem to be a useful point of reference for standard consumers in all of these countries in terms of their understanding of the terms used to describe wine. This and the fact that there seems to be a certain degree of uncertainty regarding people's understanding of many of these terms indicate that it may be necessary to reconceptualize the sensory dimensions relating to wine. From a practical point of view, this is certainly of interest to wine producers since it can help in the marketing of their products.

1 | INTRODUCTION

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

Communications on the subject of wine vary depending on the context (Caballero, Suárez-Toste, & Paradis, 2019; Paradis & Eeg-Olfsson, 2013). However, one cannot help noticing that the sensory dimensions relating to wine are frequently described by means of opposite terms. This is the central point of interest for the aims of the present paper. References to a wine being young–old, heavy–light, strong–delicate, mature–immature, balanced–unbalanced, complex–simple, harsh–smooth, but also distinguished–ordinary, pretentious–honest and integrated–disjointed are common in wine reviews and on bottle labels (Lehrer, 2009). Moreover, the dimensions used for the purposes of evaluation in professional contexts are also often expressed in terms of scales ranging between two opposite extremes (Paradis, 2015). For example, in the beginner to intermediate qualifying test for the WSET (the Wine and Spirit Education Trust—a worldwide standard for professional qualifications), the visual dimension referring to clarity is defined by the pair bright–cloudy, intensity is defined by the opposites weak–pronounced, the dimension referring to sweetness on the palate is defined by the pair dry–luscious and the dimension referring to body is defined by the pair thin–heavy. At the more advanced level (level 4), the dimensions relating to the palate are defined by low–high (alcoholic content), light–full (body), light-pronounced (flavor intensity), short–long (finish) and poor–outstanding (quality). The only exceptions are represented by the sensory dimension relating to olfactory aspects, such as fruity, floral, or spicy, where "opposites" are denoted by the lack of sensation (e.g., not fruity, not floral, not spicy).

The general question underlying this paper concerns whether opposites can play a role in modeling the dimensions evoked by common descriptors of wine, not only in experts' and professionals' lexicon but also for *nonxpert* consumers. Once we have empirically established that the conceptualization of wine properties in terms of dimensions and opposites works well for both types of consumers, then the problem of bridging the gap between experts and nonexperts in communications about wine shifts to the level of understanding whether these terms and dimensions are attributed *the same or at least similar meanings* by experts and nonexperts. This is an interesting aspect to consider not only in terms of basic research on the relevence of opposites for human perception and cognition (see, for example, Bianchi & Savardi, 2008, 2018; Bianchi et al., 2011, 2013; 2014; 2017; Biassoni, 2009; Burro et al., 2018; Croft & Cruse, 2004; Jones, 2002; Paradis & Willners, 2011; Paradis et al., 2013) but also of applied research, primarily in relation to the marketing and advertising of wine.

Initial confirmation of the hypothesis that nonexperts can, in effect, think of the sensory properties of wine in terms of opposites emerged from two previous studies, one carried out with Italian participants—that is, adults living in a country with a well-established wine culture (Bianchi et al., 2021)—and another one with Vietnamese participants, who are much less familiar with grape wine (Truong, Burro, & Bianchi, 2021).

The main goal of the present paper is to further test the usability of opposites in relation to the wine culture and market, this time in Australia, an important wine producer. Carrying out tests in Australia is interesting from a linguistic point of view since the principal language spoken is English. The fact that it is one of the group of New World countries who have started to produce wine on a larger scale (along with the U.S., New Zealand, Argentina, Chile, and South Africa) makes it possible to compare the results with the so-called Old World countries, that are considered to be the birthplace of wine (i.e., Europe and the Middle East). Australia is also of interest because it has a strong wine industry and is consistently in the top five wine exporters in the world, behind France, Italy and Spain, i.e. all Old World countries (OEC, 2020). In addition, Australia has a strong domestic wine market, typically drinking Australian-made wine, with only 16.6% imported (Wine Australia, 2020). Since the study aims to replicate previous work conducted in Italian and Vietnamese, Australia represents an interesting comparison to these previous studies because it is the first time that this research has been conducted in English.

2 | THE STUDY

The study was inspired by the aforementioned Italian study (Bianchi et al., 2021). The aim was to make a comparison between the responses of a sample of nonexpert consumers from the study carried out in Italy with those of nonexpert consumers in Australia in relation to 64 sensory descriptors of wine.

The first research question concerned whether the nonexpert participants in the study were capable of identifying the opposite property of 64 stimuli properties. In other words, we aimed to learn

how many and which of these 64 terms were in effect understood by the participants as constituting a dimension (i.e., the properties which could be conceived of in relation to an opposite property). Two types of response were considered as cues that participants found it difficult to determine what the underlying dimension was, that is, *"I don't know" type responses* (in these cases it is clear that the participants had no idea what the corresponding opposite property could be) and *simple negation* (i.e., giving "*not sweet*" as the opposite to "*sweet*," or "*not fresh*" as the opposite to "*fresh*") which also suggests that the participants were unable to find the right word, or that they did not have a well-structured dimension in mind. As noted in the introduction, this issue contributes, on one hand, towards enriching the existing knowledge concerning the pervasiveness of opposites in natural languages (of interest for scholars of both Cognitive Linguistics and Psychology) and, on the other hand, it can offer scientifically based hints which might improve communication in the context of wine advertising and marketing.

The second question concerned the univocity/multivocity of the dimensions which were identified. If the meaning of a term is univocal (unambiguous), then the participants should be consistent in identifying the underlying sensory dimension. If a term is not univocal, it would result in a variety of different opposites (i.e., multiple meanings). This, again, is of interest for both basic research and from an applied perspective. In terms of basic research, it contributes to the topic known in Cognitive Linguistics as the canonicity of antonyms. There are terms with conventional partners in texts and discourse which are called canonical antonyms, but there are also terms with no clearly preferred partners. A pair of antonyms depends on the experiential context that is mentally activated and various different discourse contexts, both of which could potentially lead to different opposites (Paradis, 2015). From an applied perspective, the question is relevant since, if a term is associated with different opposites by different participants (i.e., it is multivocal), this means that we cannot predict for sure what consumers would understand when reading it on wine bottles or in wine reviews. On the contrary, terms that are associated with univocal meanings guarantee efficient communication since everyone agrees on the meaning. We used two indexes to capture the univocity/multivocity of the dimensions which were identified: (i) *the number of different opposites elicited* (the greater the number of opposites that were given, the less univocal the dimension was deemed to be) and (ii) *the strength of the most frequent response* (the greater the number of participants who converge on the most frequent response—in statistical terms the mode—the more evident the dimension).

2.1 | Method

2.1.1 | Participants

A total of 339 Australian wine drinkers (230 females and 109 males, ranging in age from 18 to 60) participated in the study (they agreed that they drank wine before taking part in the study; frequency of consumption was not asked; participant's level of expertise about wine was assessed with a specific question in the introductory section of the questionnaire—see materials). A total of 169 participants completed the online questionnaire in relation to red wine; 170 participants completed the white wine version of the questionnaire. They were recruited using CloudResearch. They volunteered to take part in the study, were informed that they could withdraw at any time, and all gave their informed consent prior to filling in the questionnaire. The study conforms to the ethical principles of the declaration of Helsinki (World Medical Association, 2013) and was approved by the ethical committees of the university departments involved, both in Italy and Australia (Table 1).

TABLE 1 Summary table of the characteristics of the participants in the study (gender, age, and level of expertise: $N = 339$)

Variable	Level	*n*/%
Gender	Male	109/32.2%
	Female	230/67.8%
Age	35 or under	157/46.3%
	Over 35	182/53.7%
Level of expertise	Sommelier, etc.	0/0%
	Medium-high training	6/1.8%
	Medium-low training	19/5.6%
	Interested, no training	244/72.0%
	No specific interest	70/20.6%
Level of expertise (grouped)	Medium-low or medium-high training	25/7.4%
	No training or no specific interest	314/92.6%

2.1.2 | Materials

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

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

consider to be the opposite property." The list of 64 target terms then followed, with the order to the 64 terms randomized between participants. The whole list is shown in Appendix S1 (together with the original Italian terms).

2.1.3 | Procedure

The questionnaire was made available online using CloudResearch. It could be accessed by means of smartphones or computers. No time limits were set for completing the questionnaires. The participants were allowed to take breaks since there were no time limits. The average time needed to fill in each questionnaire was around 30 min.

2.1.4 | Data analysis

The data analysis was carried out using version 4.1.2 of the R software for statistical computing.

The "scale" function in R ("base" package—see Becker, Chambers, & Wilks, 1988) was used for the scaling methods on the standardized *z*-scores. The effect of the type of wine (red versus white), on the various dependent variables studied (i.e., the proportion of "I don't know" responses; the proportion of mere negations; the strength of the most frequently chosen opposite; the proportion of multivocity) was determined by means of Linear Mixed Effects Models. In these models, the effect to be studied was the fixed effect whereas the 64 target properties were studied as random effects (R package: lme4).

We used K-means as a cluster analysis method—R packages *stats* (R Core Team, 2019), *factoextra* (Kassambara & Mundt, 2017) and *cluster* (Maechler, Rousseeuw, Struyf, Hubert, & Hornik, 2019). The optimal number of clusters was determined by using the Average Silhouette method (Rousseeuw, 1987), the Elbow method (Thorndike, 1953), and the Gap statistic method (Tibshirani, Walther, & Hastie, 2001).

2.2 | Results

The statistical data analyses were conducted after an initial cleaning of the data matrix to eliminate responses consisting of random typing errors (e.g., "*n*" as the opposite of *viscous*, "susinsns" as the opposite of *hazy*, "usua" as the opposite of *complex*) or nonsensical responses (e.g., "blood" as opposite of *thick*; "someone else sense of humor" as opposite of *tasteless*, "boring" as opposite of *alcoholic*). In total, 9% of the responses were eliminated for red wine and 11% for white wine.

2.2.1 | Identifiable opposites (indications of the participants' ability or otherwise to identify an underlying sensory dimension)

Responses manifesting an incapacity to identify an opposite (i.e., responses such as "I don't know" and mere negations) represented, respectively, 14% and 5% of the total number of responses for red wine and 9% and 7% of the responses for white wine. This means that the participants were able to find an opposite in 81% of cases for red wine and in 84% of cases for white wine. This finding generally supports the idea that opposites are, in effect, a suitable way to model nonexperts' understanding of the meanings pertaining to the 64 sensory properties of wine used in the study.

We see a more analytical picture, however, if we take into consideration the proportion (out of the total number of responses for each target property) of "I don't know" responses and of mere negations as separate categories. Figures 1 and 2 show the outcome of the scaling methods used to rank the 64 target properties based on how frequently the participants responded "I don't know" (Figure 1) and how frequently they responded by means of mere negation (Figure 2). On the right of both figures are the properties for which indeterminate responses were more frequently used. The scaling was performed on the *z*-scores. A *z-score* measures exactly how many standard deviations *above* or *below* the mean a data point is. To give an idea of how many responses correspond to the bar lengths, we report on the graphs some anchor values, in percentages, corresponding to the central bar and the two bars at the extremes. As shown in Figure 1, in more than 40% of cases, the participants were unable to think of a sensory property that they would consider to be the opposite of *astringent*, either for red or white wine. A similar percentage of "I don't know" responses was found for *tannic*. The frequency of "I don't know" responses is within 2 standard deviations for all other terms.

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

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

2.2.2 | Multivocity of the property

The fact that participants were able to identify an opposite still does not tell us how consistent they were in their choice of an opposite,

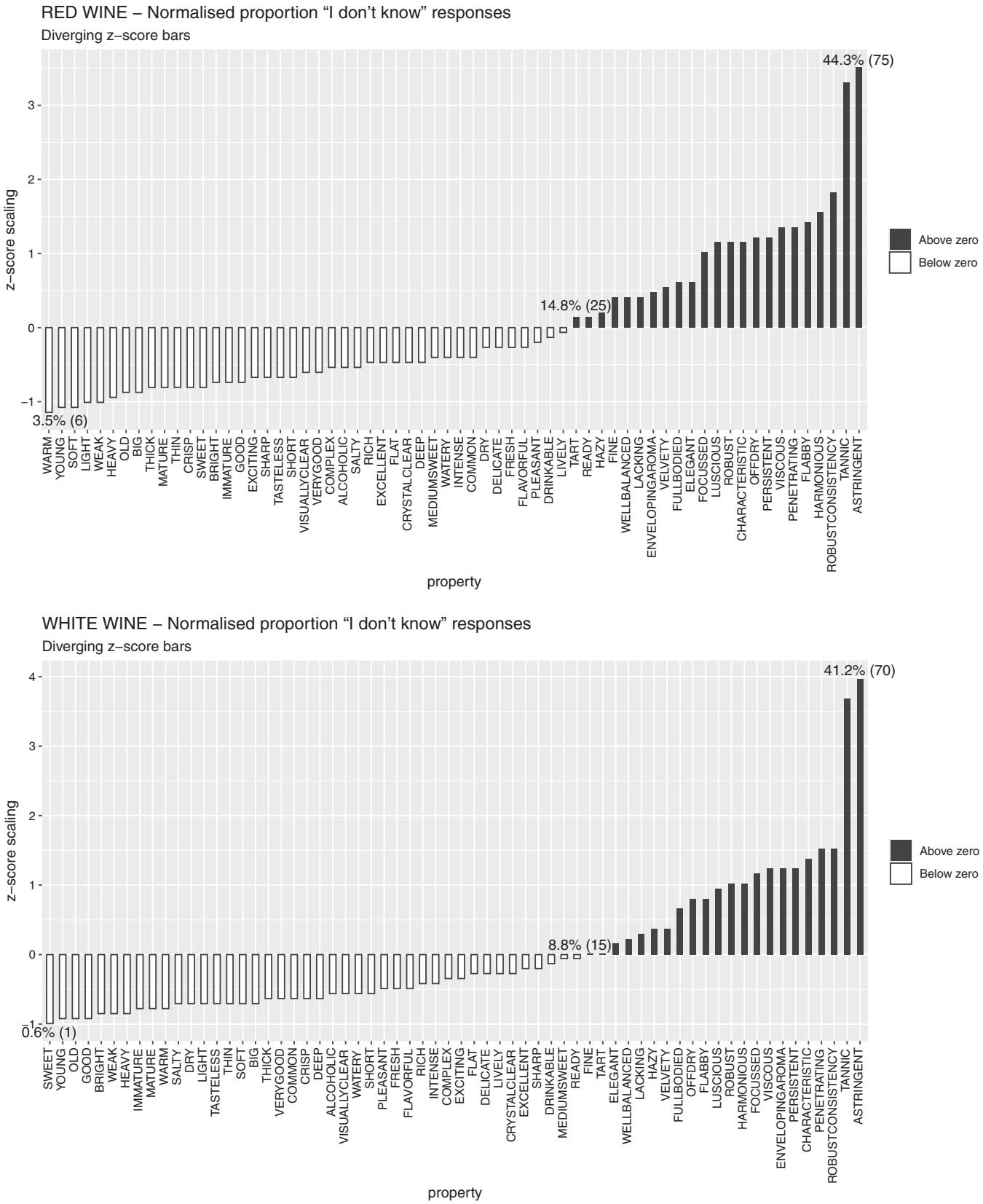

FIGURE 1 The scaling (based on *z* values) of the 64 target properties in terms of the proportion of "I don't know" responses given by participants for each property in relation to red wine (top graph) and white wine (bottom graph). Values in brackets, e.g. (15), are the raw number of people who indicated "I don't know" for that property

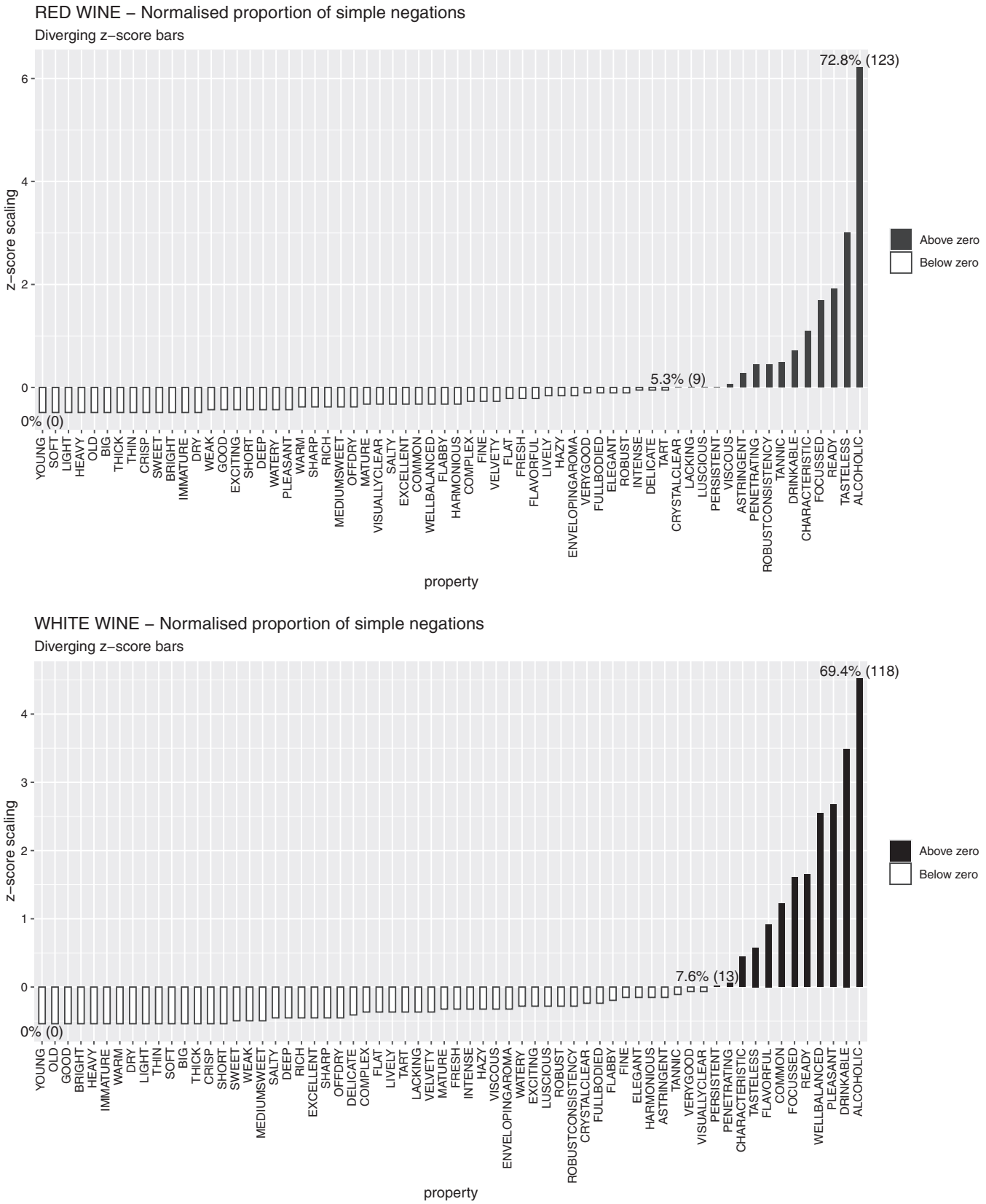

FIGURE 2 The scaling (based on *z* values) of the 64 target properties in terms of the proportion of responses consisting of a mere negation (e.g., "not tannic" as the opposite of "tannic") in relation to red wine (top graph) and white wine (bottom graph). Values in brackets, e.g. (13), are the raw number of people who used a simple negation for that property

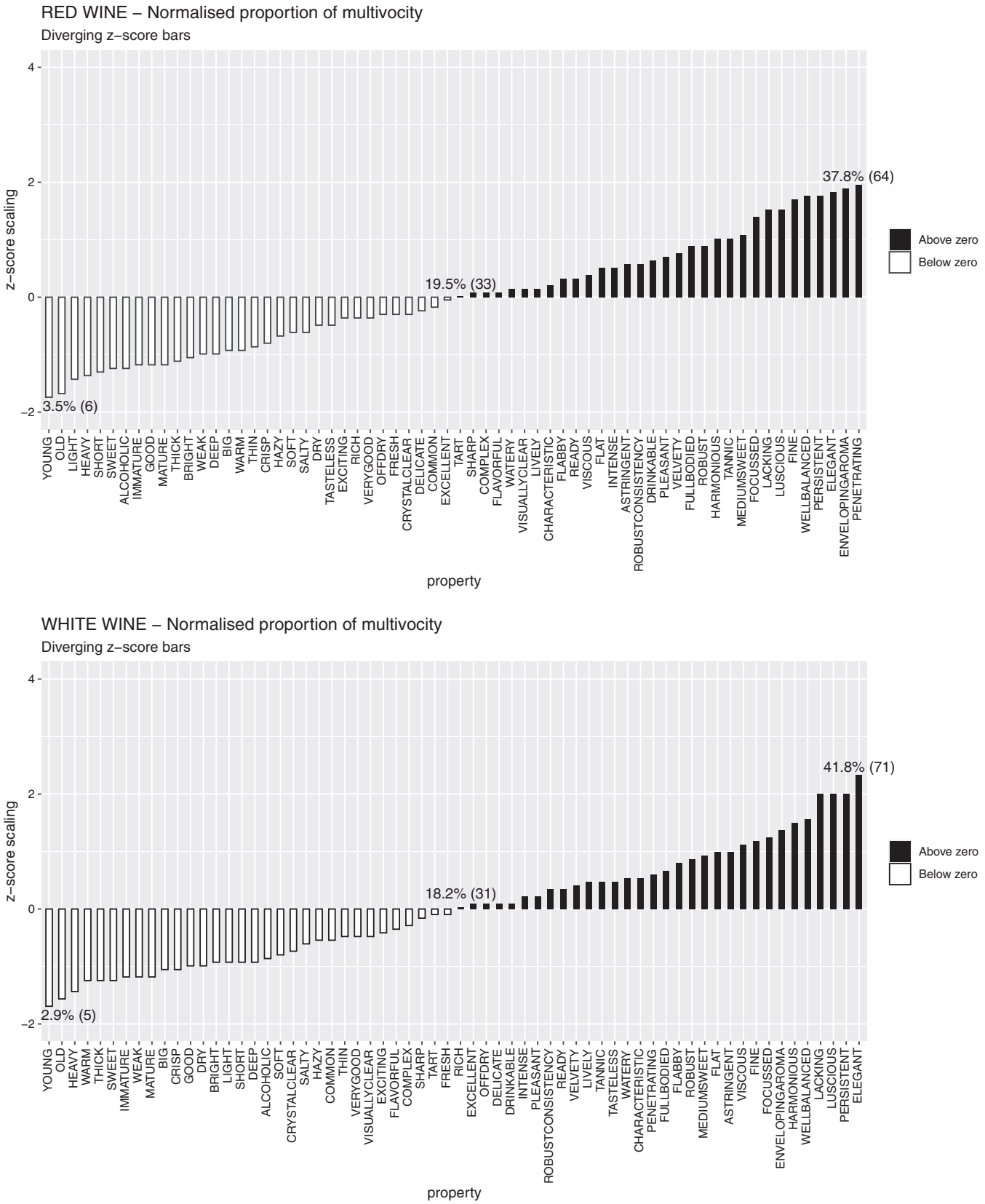

FIGURE 3 The scaling (based on *z* values) of the 64 target properties in terms of the number of different opposites given by participants, in relation to red wine (top graph) and white wine (bottom graph). Values in brackets, e.g. (31), are the number of different opposites given for each property

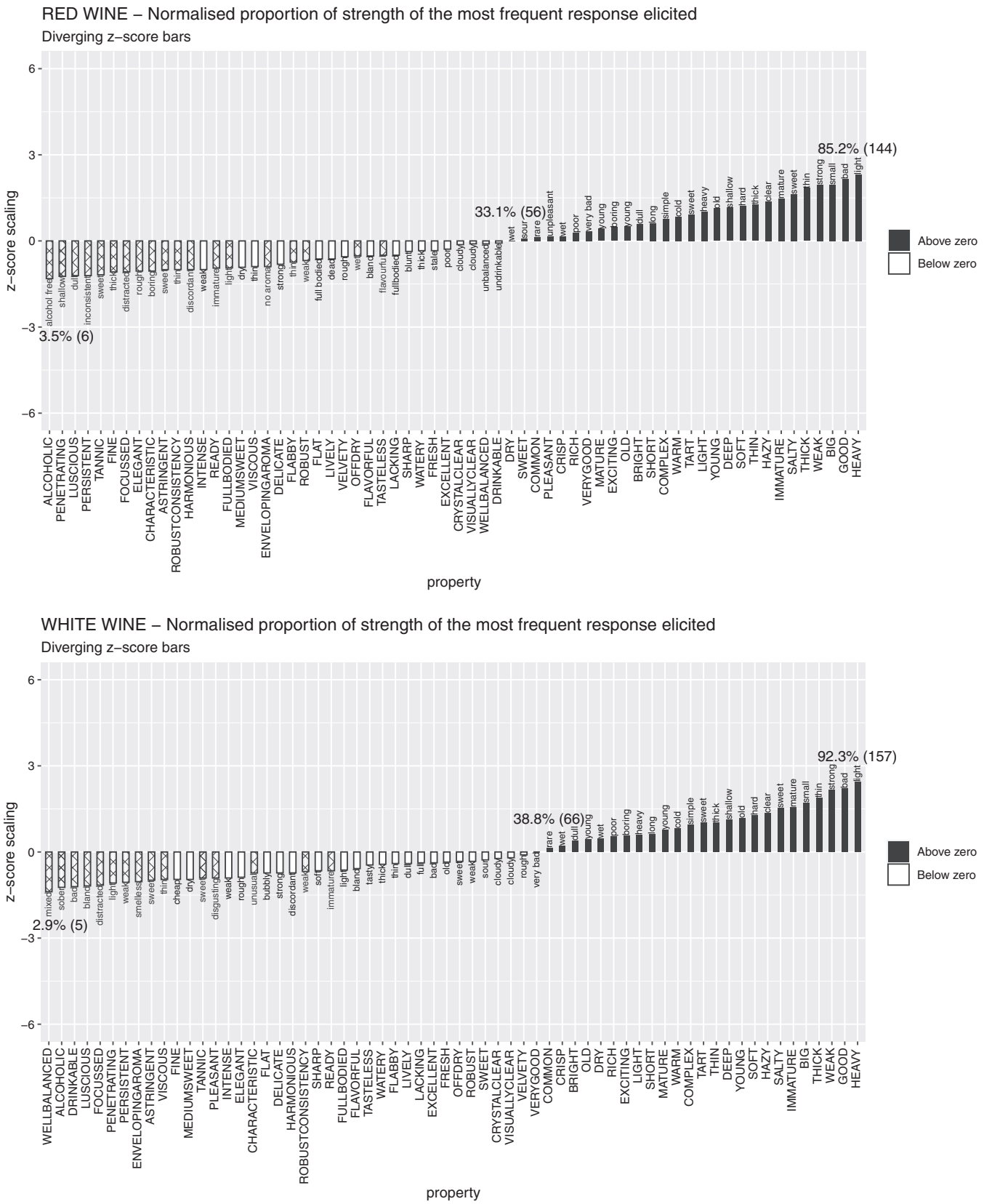

FIGURE 4 The scaling (based on *z* values) of the 64 target properties in terms of the strength of the most frequent opposite, in relation to red wine (top graph) and white wine (bottom graph). Textured bars indicate that "I don't know" or non-X was the most frequent response and therefore the opposite displayed over the bar refers not to the first but the second most frequent response. Numbers in brackets, e.g. (66), are the number of people who gave the modal response

TABLE 2 Pearson correlation matrix on the frequency of the four variables studied: number of different opposites (multivocity), frequency of "I don't know" responses, frequency of responses making use of mere negation of the target property, and mode (strength of the most frequent term)

	Multivocity	I don't know	Negation	Strength of the most frequent opposite
Red wine				
Multivocity	–			
I don't know	0.659***	–		
Negation	0.056	0.146	–	
Strength of the most frequent opposite	−0.730***	−0.641***	−0.390**	–
White wine				
Multivocity	–			
I don't know	0.625***	–		
Negation	0.157	0.041	–	
Strength of the most frequent opposite	−0.739***	−0.534***	0.446***	–

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

that is, how often they chose the same opposite as the other participants. Figure 3 shows the ranking of the 64 target properties according to the total sum of opposites which were different from those chosen by the other participants. The variation in the number of different opposites elicited was high: it ranged from 6 to 64 for red wine (e.g., *young* was associated with 6 different opposites while *penetrating* with 64 different opposites) and from 5 to 71 for white wine (e.g., *young* was associated with 5 different opposites while *elegant* with 71 different opposites).

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

2.2.3 | Relationship between indexes relating to multivocity, "I don't know" responses, negation and strength of the most frequent opposite

We explored the relationship between these four indexes by means of Pearson Correlations (Table 2). The analyses showed that only negation is independent of the other indexes. Conversely, for both red and white wine, a strong significant correlation was found between "I don't know" responses and multivocity (positive correlation) and the strength of the most frequent opposite (in this case negative). This may be interpreted as a confirmation that "I don't know" responses are associated with uncertainty. The higher the number of "I don't know" responses, the greater the uncertainty about the opposite of that property. This is reflected both in the low number of participants converging on the same opposite (indicating a low degree of strength related to the most frequent opposite) and, conversely, the large number of different opposites evoked by that property.

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

2.2.4 | Overview: cluster analyses of the four indexes discussed thus far concerning identifiability and multivocity of the opposite property identified in relation to the 64 wine descriptors

We performed a *K*-means clustering in order to partition the 64 descriptors into subsets based on the four indexes presented above. The aim was to ascertain the ease or difficulty of identifying the opposite property (as measured by the number of "I don't know" responses and negations) and the multivocity of the dimension (as measured by both the number of opposites and the strength of the most frequent opposite). The clusters were identified based on eight variables since the four indexes were calculated for red wines and for white wines separately. Four clusters emerged and these explain 80.2% of the total variance. The cluster plot in Figure 5 is based on a Principal Component Analysis representing the two components that account for most of the variance (first component, *x*-axis: 59.3% and second component, *y*-axis: 20.9%). For ease of readability, the properties falling in the 4 clusters are also reported in Table 3.

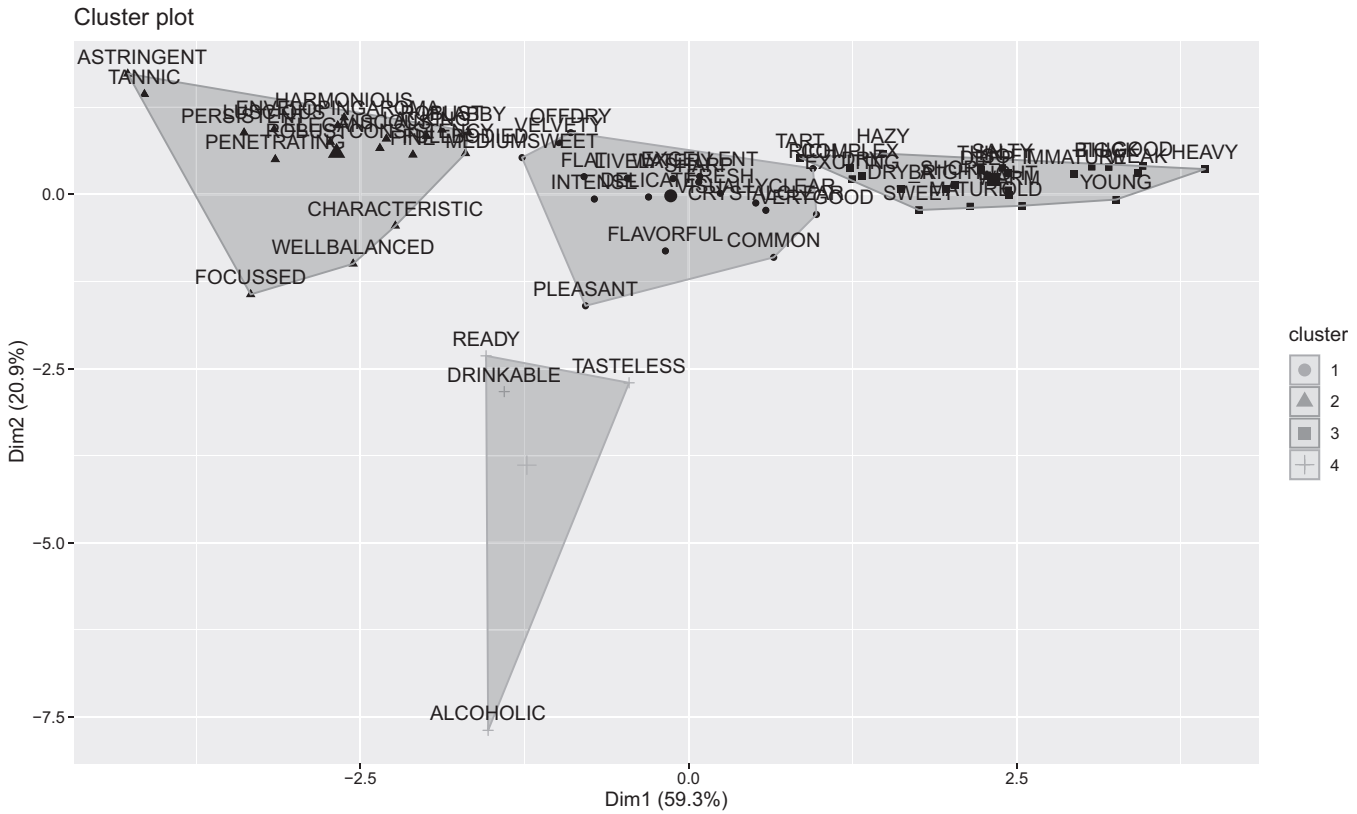

FIGURE 5 The four clusters which emerged from a *K*-means Cluster analysis; for further details see the main text. The plot is the result of a *K*-means Cluster analysis in relation to the first and second PCA components that, taken together, account for 80.2% of the variance

Four Linear Mixed Models were run on each of the variables used in the cluster analyses, that is, the proportion of "I don't know" responses; the proportion of responses consisting of mere negations of the target property; the number of different opposites elicited, multivocity and the strength of the most frequent opposite (see Note of Table 3; Bonferroni correction was applied to post-hoc comparisons). This allowed us to identify any significant differences between the clusters. No significant effect emerged for the type of wine (i.e., red versus white wine) for any of the four variables, either as a main effect or in interaction. This means, therefore, that the clusters can simply be examined in terms of the properties and dimensions involved, independently of whether they refer to red or white wine.

Cluster 2 includes the properties whose meaning was less clear (as compared to all the other clusters) in relation to two of the variables considered. The properties in this cluster elicited "I don't know" responses more frequently than the properties in all of the other three clusters, among which, conversely, there were no differences concerning this variable. Moreover, the properties in this cluster elicited a higher number of different opposites (indicating a higher degree of multivocity) than the properties in all of other three clusters. The properties in cluster 2 are also associated with a more frequent use of negation as compared those in cluster 3, and the most frequently elicited opposite (the mode) was weaker than those in cluster 1 and cluster 3.

Clusters 1 and 3 include the properties for which the identification of an opposite turned out to be easier (i.e., less uncertain). The incidence of "I don't know" responses and negative responses is lower for these two clusters than for the other clusters, without any difference between them, either in the use of "I don't know" responses or negation. However, the properties in cluster 3 can be said to point to clearer underlying dimensions than those in cluster 1, since the proportion of participants who converged on the most frequently chosen opposites (the most frequent = the mode) was greater for cluster 3 than cluster 1; the properties in cluster 3 also elicited a smaller number of opposites as compared to those in cluster 1 (i.e., a lower degree of multivocity).

Cluster 4 is characterized by a significantly higher use of negation than all of the other clusters. The properties in cluster 4 are similar to those in cluster 1 in terms of their multivocity score and the strength of the most frequently chosen opposite. These properties are in effect in an intermediate position between clusters 2 and 3 in terms of multivocity: they have a greater score for multivocity than those in cluster 3 but a lower score than those in cluster 2 (Table 4).

3 | FINAL DISCUSSION

In this final discussion we will summarize the main findings presented in this paper, discussing them in comparison with the findings from

TABLE 3 The properties falling in the four clusters represented in Figure 5 and main effects of the Linear Mixed Models run on each of the variables used in the cluster analyses (as described in the main text of the paper)

Cluster 1	Cluster 2	Cluster 3	Cluster 4
Common	Astringent	Big	Alcoholic
Crystal clear	Characteristic	Bright	Drinkable
Delicate	Elegant	Complex	Ready
Excellent	Enveloping aroma	Deep	Tasteless
Flat	Fine	Dry	
Flavorful	Flabby	Dry	
Fresh	Focused	Exciting	
Intense	Full bodied	Good	
Lively	Harmonious	Hazy	
Medium sweet	Lacking	Heavy	
Off dry	Luscious	Immature	
Pleasant	Penetrating	Light	
Rich	Persistent	Mature	
Sharp	Robust	Old	
Velvety	Robust consistency	Salty	
Very good	Tannic	Short	
Visually clear	Viscous	Soft	
Watery	Well balanced	Sweet	
		Tart	
		Thick	
		Thin	
		Warm	
		Weak	
		Young	

Note: Differences between clusters in relation to the dependent variables: "I don't know": $F(3, 64) = 42.132$, $p < .0001$; negation: $F(3, 64) = 45.611$, $p < .0001$; multivocity: $F(3, 64) = 77.091$, $p < .0001$; strength of the mode: $F(3, 64) = 74.958$, $p < .0001$.

the two previous studies, where the same set of terms was tested with two different populations of nonexpert consumers, Italian (Bianchi et al., 2021) and Vietnamese (Truong et al., 2021) adults. Although the results of the three studies are not conclusive—the sample of consumers of all three studies is not representative of the wine consumer population and the characteristics of the three samples are quite similar for Italians and Australians and more dissimilar for Vietnamese (see Appendix S2)—some consistencies in the results seem to emerge, together with some differences. We discuss them here, as a provisional conclusion and as a prompt for future studies.

(a) *Opposites seem to be useful to model the sensorial dimensions of wine for standard consumers—at least, with regard to the set of properties which are frequently used in wine guidebooks and tasting scales and used in the three studies*. The results of the study presented in this paper have confirmed that the sensorial dimensions relating to wine can be modeled in terms of opposites for standard wine consumers in Australia. In more than 80% of the cases (specifically 81% of cases for red wine and in 84% of cases for white wine), the participants were able to find what they considered to be an opposite for the target properties presented. These percentages are similar to those found in previous studies using the same set of terms with Italian and Vietnamese adults. In about 85% of the cases, both the Italian participants and Vietnamese were able to find an opposite.

This is an interesting result that suggests that opposites represent a potential common ground between expert and nonexpert ways of communicating about wine, independently of people's "cultural knowledge" of wine. Standard consumers in Italy, Australia, and Vietnam have indeed different levels of knowledge of grape wine. Italians have traditionally been renowned wine producers for a very long time and Australians have strongly emerged as extremely popular New World wine producers. Both countries have a certain tradition for wine production and the market is well established. Conversely, Vietnam is a relative newcomer to grape wine as the national beverage is rice wine; however, now imported grape wine is fairly frequently found at social events.

The fact that opposites seem to be useful for the purposes of modeling standard consumers' conceptualization of the sensory dimensions relating to wine makes an interesting contribution to the research being carried out on opposites since it confirms the applicability of opposition (as a configuration—see Paradis, 2008) to the naïve conceptualizations pertaining to this specific sensorial domain. The results thus enrich previous studies on the pervasiveness of opposites in human perception and cognition (as revised in the introduction). This result is also of practical interest to wine producers since this can help them in advertising and marketing their product.

(b) *A critical point of interest regards the extent to which standard consumers were consistent in their choice of opposites*. There was a great deal of variability between the properties in this study in terms of the opposites which were chosen by the participants. The number of different opposites ranged from 5 to 71 for white wine—specifically, *young* was associated with 5 different opposites, (i.e., 2.9% out of the total number of responses), while *elegant* had 71 different opposites (i.e., 41.8% out of the total number of responses)—and from 6 to 64 for red wine—specifically *young* was associated with 6 different opposites (i.e., 3.5% out of the total number of responses), while *penetrating* had 64 different opposites (i.e., 37.8% out of the total number of responses). Similar results were found in previous studies. The number of participants who took part in the Australian, Italian and Vietnamese studies differed, and therefore we need to assess this data in terms of the proportion of different opposites with regard to the overall total number of participants (see Table 5).

For the study with Italian participants, the range varied from 15 to 99 for white wine—specifically *young* was associated with 15 different opposites (i.e., 5.3% out of the total number of responses), while *sharp* had 77 different opposites (i.e., 35.1% out of the total number of responses)—and from 12 to 100 for red wine—specifically *old* was associated with 12 different opposites (i.e., 4.3% out of the total number of responses), while *sharp* had 100 different opposites (i.e., 36.8% out of the total number of responses). In the Vietnamese study the range varied from 4 to 77 for white wine—specifically *heavy*

TABLE 4 Bivariate comparisons (column—row) between clusters in terms of the four variables

		Cluster 1				Cluster 2				Cluster 3			
	Mean; *SD*	*d*	*SE*	*t*	*P*	*D*	*SE*	*T*	*p*	*d*	*SE*	*t*	*P*
"I don't know"													
Cluster 1	−0.270; 0.406	—	—	—	—	—	—	—	—	—	—	—	—
Cluster 2	*1.252; 0.961*	−1.522	0.196	−7.754	<.001	—	—	—	—	—	—	—	—
Cluster 3	−0.681; 0.323	0.410	0.184	2.237	.171	1.933	0.184	10.527	<.0001	—	—	—	—
Cluster 4	−0.331; 0.322	−0.061	0.326	−0.189	1.000	1.583	0.326	4.865	<.0001	−0.349	0.318	−1.098	1.000
Negation													
Cluster 1	−0137; 0.593	—	—	—	—	—	—	—	—	—	—	—	—
Cluster 2	0.124; 0.648	−0.261	0.176	−1.477	.865	—	—	—	—	—	—	—	—
Cluster 3	−0.450; 0.106	0.314	0.165	1.901	.368	0.574	0.165	3.481	.005	—	—	—	—
Cluster 4	2.759; 1.947	−2.896	0.293	−9.898	<.0001	−2.635	0.293	−9.007	<.0001	−3.210	0.286	−11.229	<.0001
Multivocity													
Cluster 1	0.093; 0.455	—	—	—	—	—	—	—	—	—	—	—	—
Cluster 2	1.191; 0.589	−1.099	0.156	−7.049	<.001	—	—	—	—	—	—	—	—
Cluster 3	−0.949; 0.423	1.043	0.146	7.153	<.0001	2.141	0.146	14.689	<.0001	—	—	—	—
Cluster 4	−0.086; 0.690	0.180	0.258	0.696	1.000	1.278	0.258	4.948	<.0001	−0.863	0.252	−3.418	.006
Strength of the mode													
Cluster 1	−0.372; 0.393	—	—	—	—	—	—	—	—	—	—	—	—
Cluster 2	−0.897; 0.287	0.525	0.159	3.309	.009	—	—	—	—	—	—	—	—
Cluster 3	1.084; 0.664	−1.456	0.148	−9.816	<.0001	−1.981	0.148	−13.353	<.0001	—	—	—	—
Cluster 4	−0.797; 0.446	0.424	0.263	1.618	.661	−0.0993	0.263	−0.377	1.000	1.882	0.257	7.323	<.0001

Note: Mean = mean in *z* values; *d* = Cohen's *d*; *t* = *t* ratio.

TABLE 5 Properties that elicited the minimum (min) and maximum (max) number of different opposites, in relation to white and red wine, in the three samples of participants: Australian (present study), Italian (Bianchi et al., 2021) and Vietnamese (Truong et al., 2021)

Sample	Type of wine	Min	Max
Australian ($N = 339$)	White	2.9% (*young*)	41.8% (*elegant*)
	Red	3.5%(*young*)	37.8% (*penetrating*)
Italian ($N = 558$)	White	5.3% (*young*)	35.1% (*sharp*)
	Red	4.3% (*old*)	36.8% (*sharp*)
Vietnamese ($N = 302$)	White	2.2% (*heavy*)	43.0% (*embracing*)
	Red	3.3% (*fluid*)	34.0% (*embracing*)

Note: The percentages express the number of different opposites out of the total number of participants.

was associated with 4 different opposites (i.e., 2.2% out of the total number of responses), while *embracing* had 77 different opposites (i.e., 43% out of the total number of responses), and from 5 to 41 for red wine—*fluid* was associated with 4 different opposites (i.e., 3.3% out of the total number of responses), while *embracing* had 41 different opposites (i.e., 34% out of the total number of responses).

Overall, the properties with lower multivocity (Min in Table 5) elicited 2.9%-5.3% different opposites out of the total number of responses, whereas those with higher multivocity (Max in Table 5) elicited 34–43% different opposites out of the total number of responses. In other words, in the latter case we have around 4 different opposites for every 10 participants. This indicates that the dimensions relating to wine are often ambiguous. This represents a potential source of misunderstanding: even if a wine producer carefully selects the words to describe the particular characteristics of their products, standard consumers may still interpret them in a different way and thus the efficacy of the description is at best unpredictable and at worst compromised.

Taking into account the canonicity of opposites may help towards explaining this variability. The term canonicity indicates the extent to which two antonyms are semantically related and conventionalized (Murphy, 2003). Many studies in the field of Cognitive Linguistics have assumed that opposition is conceptual in nature rather than merely lexical, and that pairs of antonyms are always subject to contextual constraints (Jones, Murphy, Paradis, & Willners, 2012; Paradis, Willners, & Jones, 2009). Some opposites tend to co-occur more frequently in varying contexts and the association between them in people's memories becomes stronger. These types of opposites are known as "canonical pairs." Some other pairs of opposites are more loosely connected in people's minds since they are connected in relation to specific contexts. For example, in an elicitation task which required the participants (50 native speakers of English) to write the first opposite that came to their mind (see Paradis et al., 2009), 29 different terms were suggested as the opposite of *calm*, whereas all participants suggested the same antonym as the opposite of *heavy* (in this case *light*), *hot* (in this case *cold*) and *clean* (in this case *dirty*). Thus, in terms of multivocity, as defined in this paper, *calm* has the highest degree of multivocity (58%), while *heavy*, *hot*, *clean* have the lowest degree of multivocity (0%). Taken in isolation, the word *calm* evidently does not immediately make a group of people all think of the same context. In other words, the context is key to the identification of the relevant dimension.

In the present study, the context was somehow "defined" (the instructions asked to think of red wine or white wine, separately). Of course, each individual participant may be influenced by their preferences with regard to the many different types of red or white wines or they might have mentally referred to the wines they were more familiar with and this would result in a certain degree of variability. Another reason may have been due to the difficulty they had in interpreting certain technical terms (such as *tannic* or *tart*), but most of the terms used in the study were nontechnical and therefore easily applicable beyond the context of wine. It is interesting to note the properties which turned out to be more univocal and those which were more problematic for the Australian and Italian samples and to observe the extent to which they overlap. The results of the previously described cluster analysis give us an overview of this aspect. First, consider the properties that turned out to be the "most challenging" (i.e., with a higher level of multivocity and a greater number of "I don't know" responses): these are the 19 properties falling in cluster 2 in the present paper and the 7 properties grouped in cluster 3 in the study carried out with Italian participants (Bianchi et al., 2021). *Tannic* (It. tannico), *full bodied* (It. *di corpo*), *enveloping aroma* (It. *avvolgente*), *astringent* (It. *astringente*), *harmonious* (It. *armonico*), *focussed* (It. *franco*) were the properties which presented the most difficulties in both samples; the only other term that belonged to the same cluster for the Italian participants was *off dry* (It. *abboccato*), which in the Australian study is in cluster 1—that is, among the descriptors which were considered to be relatively easier to define. Conversely the other terms that belong to cluster 2 for the Australian participants (and were therefore multivocal, eliciting more uncertainty), that is, *flabby* (It. *molle*), *viscous* (It. *viscoso*), *with a robust consistency* (It. *consistente*) and *fine* (It. *fine*), were in the two clusters with descriptors that had a higher level of agreement between the Italian participants. These differences between the two samples suggest an at least partially different degree of familiarity in the use of these specific terms.

Let us now look at the 19 properties falling in cluster 3 in the present paper, that is, the cluster that groups the properties that the Australian participants found less problematic (i.e., with a lower number of different opposites, a higher level of convergence on the same opposite and a significantly lower number of "I don't know" responses as compared to the other clusters). Except for 3 of these 19 properties, all of the other properties fall into clusters 1 or 4 in the study carried out with the Italian sample, that is, the clusters characterized by a

greater level of convergence between the standard consumers. This applied to *big* (It. *pieno*), *bright* (It. *cristallino*), *complex* (It. *complesso*), *deep* (It. *carico*), *dry* (It. *secco*), *good* (It. *buono*), *hazy* (It. *velato*), *heavy* (It. *pesante*), *immature* (It. *immature*), *light* (It. *leggero*), *mature* (It. *maturo*), *old* (It. *vecchio*), *salty* (It. *salato*), *short* (It. *corto*) and *soft* (It. *morbido*). Conversely, *thick* (It. *pastoso*), *crisp* (It. *asciutto*) and *exciting* (It. *entusiasmante*) were included in a cluster with descriptors that were somewhat ambiguous and problematic for the Italian sample (i.e., cluster 2).

The terms that turned out to be more consistently identified by both samples of participants are, for the most part, quite generic properties. In contrast, the problematic terms are either more technical terms, which are however commonly used in descriptions of wine such as *astringent* (It. *astringente*), *tannic* (It. *tannic*), and *full bodied* (It. *di corpo*), or terms that refer to the general gustatory properties of wine, such as *harmonious* (It. *armonico*) and *with an enveloping aroma* (It. *avvolgente*). The fact that both the Italian and Australian samples found these terms more challenging is an interesting outcome which is certainly relevant for wine producers given the ample use of these terms and the relatively well developed tradition of drinking wine in these two countries.

(c) *Has any difference been observed between participants with a higher or lower level of expertise*?

All participants in the study were wine consumers—this was asked in recruitment phase—but frequency of consumption was not captured. The fifth question of the survey ("what is your level of knowledge and experience in the world of wine?") was meant to define the participant level of expertise about wine language. The question of comparing the impact of various levels of expertise on the terms chosen as opposites is certainly an interesting question, but it was not among the goals of our study (it would have required a different experimental design and a different selection of the participants to ensure they were balanced across the various levels of expertise). The question addressed in our study was simply whether *nonexpert* people can benefit from using opposites; information about expertise was therefore included essentially to ensure that the sample did not include too many experts among the participants.

However, in exploratory analyses, we examined whether differences emerged between participants with a higher or lower level of expertise, and we defined these two general levels by grouping participants reporting (in the fifth question of the survey) that they had followed some kind of training (either medium-low level, or medium-high level) and those reporting no training experience or no specific interest in wine.

As shown by the percentages in Table 6 (and confirmed by three GLMMs, conducted on each of the three types of responses, separately, to support the qualitative comments presented here), for all three samples of participants, having had some training experience about wine was associated with a higher number of different opposites identified. Participants with no training experience converged on a more limited set of opposites, that is, 17.3–20.5%, as compared to participants with a training, that is, 42.8–94.1% (main effect of training on multivocity: $\chi^2 = 2{,}264.89$, $df = 1$, $p < .0001$). This result

TABLE 6 Descriptive table presenting a comparison between participants' responses in terms of multivocity (i.e., number of different opposites), "I don't know" and negations of the target property, based on participants' level of expertise, in the three samples: Australian (present study), Italian (Bianchi et al., 2021) and Vietnamese (Truong et al., 2021) participants

		Level of expertise (grouped)	
Sample	**Types of response**	**Training**	**No training**
Australian	Multivocity	50.1%	20.5%
	I don't know	16.7%	10.6%
	Negation	7.5%	6.3%
Italian	Multivocity	42.8%	18.1%
	I don't know	11.1%	13.1%
	Negation	2.1%	1.8%
Vietnamese	Multivocity	94.1%	17.3%
	I don't know	0%	0.5%
	Negation	15.1%	12.7%

Note: The percentages express the number of different opposites (Multivocity), "I don't know" responses and negations, out of the total number of participants. Two levels of expertise were defined, by grouping together participants with a medium-low or medium high training on wine, and participants with no training or no specific interest on wine (despite being wine consumers). Percentages are not expected to sum to 100% within the table, as each type of response is its own variable.

suggests that increasing knowledge about wine at nonprofessional level is associated with thinking about a larger variety of dimensions. Sommeliers and oenologists (who were not among the sample of participants in any of the three studies) reach an advanced technical knowledge of wine sensorial dimensions. From this knowledge, experts can use lexicon that convergence on the meaning of the terms; but for nonexperts, training experience seems to lead to a higher ambiguity of the terms used, in the sense of multiplicity of meaning. This seems particularly true for Vietnamese participants, possibly due to their very low familiarity with grape wine, as compared to Italians and Australians.

Conversely, level of expertise does not seem to affect the percentage of negation responses, in any of the three samples (Main effect of training on negation: $\chi^2 = 3.19$, $df = 1$, $p = .073$); the use of negation remains overall significantly higher for Vietnamese participants, but this may be due to purely linguistic reasons. Only for the Australian sample, "I don't know" responses were more frequent for trained participants, than nontrained participants (effect of training on the Interaction between "I don't know" responses and sample: $\chi^2 = 82.30$, $df = 2$, $p < .001$). For the other two samples no effect of training was found.

The macroscopic results emerging from this comparison is that training (at this nonprofessional level) seems to impact more on the number of different opposites identified, where indeed in all three samples the trend is in the same dimension, that is, increasing multiplicity, than on the other two type of responses. If this increased number consists of synonymic terms, this would not mean a substantial increase in

ambiguity, but instead an increase in the "nuances" of dimensions. This is a possibility that, to be tested, would require a careful analysis of the specific words used not so much based on dictionary definitions, but on a direct assessment of the meaning attributed to those words by the participants themselves (in relation to the wine context)—that is a new study to be conducted, which should be carried out on a more balanced sample of trained versus nontrained participants.

3.1 | Limitations and strengths

The present study was conducted on a sample of respondents who were part of an existing research panel, and therefore may not be representative of the general population. However, this research may not require a representative sample as we were interested in relationships between variables, rather than prevalences per se. The use of online convenience samples for such research is common and may not necessarily be a limitation. Because the survey was conducted online, some participants may have looked up opposites for each property, reducing the number of "don't know" responses. We do not have any evidence to suggest that this was the case, but note that it was possible for participants to do this. A strength of this study is that it is the first of the three replications of this study to be conducted in the English language, in an English-speaking wine-producing country.

3.2 | Conclusions

We consider that further investigation is needed in order for the understanding of standard consumers of these terms to match that of experts. It cannot be taken for granted that the terms selected more frequently by the participants in these studies are consistent with the interpretation of an expert and with the dimension that an expert would identify. On the contrary, in the Italian study, a preliminary assessment of the gap between the most frequently chosen opposites in Italian and the dimension that expert sommeliers associated with the same properties revealed that good agreement was reached in only 1/3 of the dimensions identified by standard consumers.

Analyzing the nature of this gap represents an important basis for developing more effective communication between standard consumers and experts. It would provide information, on the one hand, about the terms which are understood in a similar way by both groups and on the other hand, the terms that risk being understood differently and are therefore better to avoid as descriptors. In the case of these latter terms, for which misinterpretation is highly probable, wine producers and experts may need to find alternative terms to describe their product. Obviously, standard consumers cannot be expected to enroll in sommelier courses in order to understand the label on a wine bottle. And it would be more reasonable for wine producers and experts to be willing to adapt their language to make it more accessible to nonexperts. Similarly, it would be extremely useful for them to invest in research into how standard consumers conceptualize and categorize the properties of wine. This is not only an interesting issue for basic research, but would also have a clear impact on the efficacy of the marketing and advertising of wine.

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CONFLICT OF INTEREST

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are openly available in https://dx.doi.org/10.21227/e2p8-ez56 at https://ieee-dataport.org/documents/testing-australian-standard-consumers%E2%80%99-understanding-language-used-describe-wine.

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