

Article

# Assessing the Impact of Closure Type on Wine Ratings and Mood

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**Abstract:** We report on a preliminary study designed to assess the impact of the sound of the closure on the taste of wine. Given that people hold certain beliefs around the taste/quality of wines presented in bottles having different closure types, we expected that the sound of opening might influence people's wine ratings. In particular, if participants hear a cork being pulled vs. the sound of a screw-cap bottle being opened then these two sounds will likely set different expectations that may then affect people's judgment of the taste/quality of the wine that they are rating. In order to test this hypothesis, 140 people based in the UK (and of varying degrees of wine expertise) rated two wine samples along four scales, three relating to the wine and one relating to celebratory mood. The results demonstrated that the sound of a bottle being opened did indeed impact ratings. In particular, the quality of the wine was rated as higher, its appropriateness for a celebratory occasion, and the celebratory mood of the participant was also higher following the sound of the cork pop. These results add to the literature demonstrating that the sounds of opening/preparation of food and beverage products can exert a significant influence over the sensory and hedonic aspects of people's subsequent tasting experience.

**Keywords:** closure type; opening sounds; wine perception; expectations; packaging

## 1. Introduction

A growing body of empirical research demonstrates that the sensory properties of the packaging in which drinks are presented can exert a significant influence over the ensuing tasting experience. This turns out to be true both when products are consumed direct from the packaging, but also when the product is first poured into a drinking vessel such as a glass, cup or mug [1]. Branding obviously plays a role here [2], but beyond that researchers have assessed the impact of everything from packaging/label color [3–5], through weight and other material properties [6,7]. One factor that has, until recently, received less empirical interest, though, relates to the sound of opening. It is our belief that auditory cues provide information that may help set certain expectations and hence color the subsequent tasting experience [8].

The general framework for interpreting such findings, showing as they do that the sensory aspects of the packaging influence the tasting experience, has been in terms of expectations and sensation transference. According to the former account, we normally generate expectations prior to tasting [9]. In terms of the expectations account, it is worth noting that expectations can be triggered by what we see, but also by what we hear, feel, smell, read etc. Those expectations, both sensory and hedonic, can then anchor the subsequent tasting experience. According to the sensation transference account, what we feel about the packaging, e.g., that it is high quality, weighty, traditional, etc. is then transferred to, or biases our ratings of, the contents [10].

In the present study, we were particularly interested in whether changing what people hear prior to tasting a wine would influence their sensory and hedonic expectations and hence their experience of

a wine. In this regard, one of the most iconic opening sounds is the pop of the cork being removed from a wine bottle. According to Hallgarten [11], cork bottle stoppers made from the cork oak tree were first introduced towards the end of the 18th Century. Apocryphally, Dom Perignon, the cellar master at the Abbey of Hautvilliers, was one of the first to plug his bottles with cork bark. For those wine drinkers who believe that wine from cork-stoppered bottles tastes better [12], we hypothesized that they would give a wine a higher quality rating after hearing the pop of a cork, compared to after hearing the crack of the screw cap bottle [13]<sup>1</sup>. In the present study, we therefore investigated whether the sound of a cork-stoppered bottle being opened (i.e., the popping sound) versus the sound of a screw-cap bottle being opened would influence people's ratings of a wine, and/or their celebratory mood. The experiment was conducted in two parts. Initially, the participants heard only the sound of bottle opening and rated two separate glasses of wine. In the second part of the study, the participants actually opened the cork/screw-cap bottle and poured themselves a glass of wine from each bottle type before rating them. This aspect of the experimental design allowed us to assess the multisensory contributions of actually opening and pouring the wine from either type of bottle (cork-closure vs. screw-cap) rather than just hearing the sound. Product experience is typically multisensory (involving sight, sound, touch, haptics, etc. [14]), and one might expect that the very action of pulling the cork would have more of an effect on ratings than merely hearing the sound. By contrast, however, if it is just the knowledge (or, better said, belief) that a certain wine came from a bottle with a particular type of closure that is doing the work, it may not matter whether that belief is based on unisensory (i.e., auditory) or multisensory (auditory plus haptic) cues.

The ratings were separated into questions concerning the quality of the wine (How intense? How would you rate the quality?) and the context/situation/mood around consumption (How appropriate is the wine for celebration? How much of a celebratory mood do you feel in right now?). The reason being that previous research suggests that the impact of product-extrinsic sounds such as sonic seasoning (i.e., musical compositions selected to accentuate a certain taste in a food) may be mediated, at least in part, by emotional valence [8,15]. Hence, in the present study, we wanted to try and ascertain by which route(s) people's ratings of the wines may have been affected.

## 2. Methods

*Participants.* A convenience sample of 140 participants was tested in the experiment (92 male and 47 female, 1 non-response). There were 115 right-handers, 19 left-handers, and 6 non-response. The participants indicated which age bracket they fell into (see Table 1). The participants also rated their knowledge of wine on a 1–5 scale (see Table 2) from 1—Novice to 5—Expert.

**Table 1.** The age distribution of participants.

Age Bracket	Number of Participants
18–25	22
26–35	61
36–45	29
45+	25

<sup>1</sup> It is worth noting here, that people's associations around the quality of screw-top bottles has changed in recent years, with some New World producers starting to change people's mind-set, no longer necessarily associating screw-cap with a lower quality product. Note that there has been something of a similar battle raging in the craft beer market between bottle and can format [1].

**Table 2.** The wine knowledge distribution of participants.

Wine Knowledge	Number of Participants
1 (Novice)	8
2	36
3	67
4	17
5 (Expert)	10

*Design and Procedure.* The experiment was split into two parts. In each part, the participants were given two wines to taste and rate sequentially. In the first part of the experiment, the participants rated one glass of wine after hearing the sound of a cork popping out of the bottle, and the other after hearing the sound of a screw-top bottle being opened. In the second part of the study, the participants actually opened a screw-top bottle themselves and rated the wine from that bottle and then pulled the cork on a stoppered wine bottle and rated the other wine. The bottle labels were obscured. In total, the participants gave ratings on four scales (see Table 3) for each of the four wines that they tasted. The two wines were *Terrazas de los Andes, Malbec 2015, Argentina* and a *Catena, Malbec 2015, Argentina*. Each wine was associated with the same closure type in each part of the study. Though, to be absolutely clear, the wine-closure pairing was counterbalanced across days/participants. The two wines were chosen to be similar but not identical and hence to make sure that there was a meaningful difference between the wines in each of the two parts of the experiment. The wine that was associated with each opening sound/opening action was counterbalanced across participants on the different days on which the study was conducted. For 91 of the participants (39 Press (including journalists and wine industry reporters) plus 52 participants on Day 1), the cork opening sound and the cork bottle opening were associated with the *Terrazas de los Andes* wine while the sound of the screw-cap opening and the action of opening and pouring from a screw-top bottle with the *Catena*. This wine-condition match was reversed for the remaining 49 participants (who participated on Day 2). The cork opening always preceded the screw-cap opening. Finally, the participants were asked “Do you prefer to buy a bottle of wine sealed with a cork or a screw cap?” The whole experiment took approximately 5–10 min to complete per person.

**Table 3.** The four ratings that participants were asked to give for each wine.

	Least				Most
How do you rate the intensity of the wine?	1	2	3	4	5
How do you rate the quality of the wine?	1	2	3	4	5
How appropriate do you think this wine is for a celebration?	1	2	3	4	5
How much of a celebratory mood do you feel in right now?	1	2	3	4	5

### 3. Results

In response to the question, “Do you prefer buying a bottle of wine sealed with a cork or a screw cap?” 113 responded ‘cork’, 13 responded ‘screw-cap’, and 14 failed to respond. A Chi squared test of goodness of fit revealed a significant preference for cork closures,  $X^2(3140) = 142.89$ ,  $p < 0.001$ . This result is perhaps not surprising given that Argentine Malbec, and red wines in general, are typically sealed with a cork closure in the UK, where the study was conducted.

Pearson’s correlations were calculated between the four measures of intensity, quality, celebration appropriateness, and celebratory mood. There were significant positive correlations between all pairs of measures (see Table 4). Consequently, a multivariate analysis of variance (MANOVA) was conducted with experimental condition (sound only or sound + touch), wine type (*Terrazas de los Andes* or *Catena*), and closure type (cork or screw-cap) as the between-participant factors. See Table 5 for average values of the four measures.

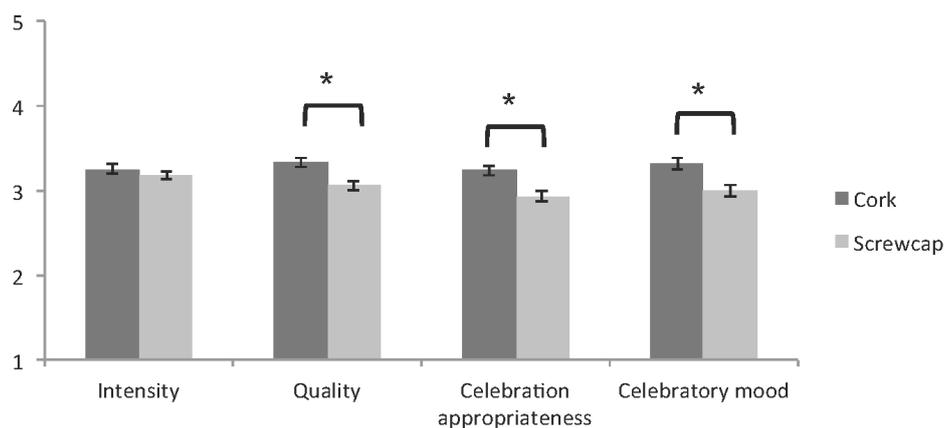
**Table 4.** Pearson correlation coefficients between wine ratings, over all conditions. \* Indicates correlations that were significant at  $p < 0.01$ .

	Intensity	Quality	Celebration Appropriateness	Celebratory Mood
Intensity	1	0.34 *	0.19 *	0.15 *
Quality		1	0.62 *	0.31 *
Celebration appropriateness			1	0.49 *
Celebratory mood				1

**Table 5.** Mean ratings of Bonferroni-corrected pairwise comparisons between conditions (standard error in parentheses). Bold typeface indicates significant difference between cork and screw-cap conditions ( $p < 0.05$ ).

INTENSITY		
SOUND ONLY	cork	screwcap
Terrazas de los Andes	3.50 (0.09)	3.49 (0.12)
Catena	3.14 (0.12)	3.07 (0.09)
SOUND + TOUCH	cork	screwcap
Terrazas de los Andes	3.41 (0.09)	3.27 (0.13)
Catena	2.98 (0.13)	2.89 (0.09)
QUALITY		
SOUND ONLY	cork	screwcap
Terrazas de los Andes	3.30 (0.09)	3.25 (0.13)
Catena	<b>3.35</b> (0.13)	<b>2.90</b> (0.09)
SOUND + TOUCH	cork	screwcap
Terrazas de los Andes	3.29 (0.09)	3.10 (0.13)
Catena	<b>3.40</b> (0.13)	<b>2.98</b> (0.09)
CELEBRATION-APPROPRIATE		
SOUND ONLY	cork	screwcap
Terrazas de los Andes	3.04 (0.10)	3.02 (0.14)
Catena	<b>3.31</b> (0.14)	<b>2.86</b> (0.11)
SOUND + TOUCH	cork	screwcap
Terrazas de los Andes	3.25 (0.10)	3.04 (0.14)
Catena	<b>3.35</b> (0.14)	<b>2.80</b> (0.11)
CELEBRATORY MOOD		
SOUND ONLY	cork	screwcap
Terrazas de los Andes	<b>3.32</b> (0.11)	<b>2.86</b> (0.15)
Catena	3.31 (0.15)	2.99 (0.11)
SOUND + TOUCH	cork	screwcap
Terrazas de los Andes	3.37 (0.11)	3.10 (0.15)
Catena	3.25 (0.15)	3.03 (0.11)

Overall, there was a significant main effect of closure type ( $F(4542) = 4.83, p = 0.001, Wilk's \lambda = 0.97$ ; see Figure 1). Further univariate tests revealed that closure type significantly influenced the perceived quality of the wine ( $F(1542) = 12.44, p < 0.0005, \eta_p^2 = 0.022$ ), celebration appropriateness ( $F(1542) = 12.27, p < 0.0005, \eta_p^2 = 0.022$ ), and the celebratory mood of the participant ( $F(1542) = 11.86, p = 0.001, \eta_p^2 = 0.021$ ). More specifically, wines with cork closures (or merely accompanied by the sound of a cork-stoppered bottle being opened) were rated as higher in quality ( $M_{cork} = 3.33, SE = 0.06, M_{screwcap} = 3.06, SE = 0.06$ ), more appropriate for celebrations ( $M_{cork} = 3.24, SE = 0.06, M_{screwcap} = 2.93, SE = 0.06$ ), and induced more of a celebratory mood ( $M_{cork} = 3.31, SE = 0.06, M_{screwcap} = 3.00, SE = 0.06$ ). However, there were no significant effect of closure type on ratings of wine intensity ( $F(1542) < 1, n.s.$ ).



**Figure 1.** Mean values of wine intensity, wine quality, celebration appropriateness, and celebratory mood for wines with cork versus screw-cap enclosures. Error bars indicate standard error of means, and asterisks (\*) indicate significant differences at  $p = 0.05$ . The y-axis reflects mean ratings on the 5-point scale.

In addition, there was a main effect of wine type ( $F(4542) = 6.67, p < 0.0005, Wilk's \lambda = 0.95$ ). Further univariate tests revealed the effect of wine type on ratings of intensity ( $F(1542) = 26.00, p < 0.0005, \eta_p^2 = 0.046$ ), with the *Terrazas de los Andes* wine being perceived as more intense than the *Catena* ( $M_{Terrazas} = 3.43, SE = 0.05, M_{Catena} = 3.00, SE = 0.05$ ). This latter result may help to explain why larger differences were seen in ratings of quality for *Catena* than for the *Terrazas de los Andes* wine (i.e., there was more room for improvement in the former case).

Finally, it is worth noting that there was no effect of experimental condition ( $F(4542) = 1.48, p = 0.21$ ). In other words, it did not seem to matter whether the knowledge of wine enclosure was based on unisensory (hearing alone) or multisensory (hearing plus touch) cues.

#### 4. Discussion and Conclusions

The vast majority of those questioned in the present study reported that they preferred the taste/ flavor of the wine from a cork-stoppered bottle. One explanation for this preference emerges from the analysis of the results of the wine ratings: On average, the 140 participants tested in the present study rated the wine that they themselves served from a cork-stoppered bottle, or that they heard being poured from a cork-stoppered bottle, as being of higher quality, as more appropriate for celebrations, and as inducing a greater celebratory mood [16]. By contrast, there was no significant effect of closure type on ratings of wine intensity. These results are consistent with the view that the effect on mood—rather than any changes in the perception of the wine itself—might be driving part of the change in the ratings elicited by the sound of the cork, as opposed to the screw-cap closure [15,17]. The results of the present study further suggest that it is knowledge about the closure type, rather than how that knowledge was acquired (i.e., just from sound versus from sound plus touch—sight and action of opening and pouring the wine) that led to the ratings differences reported here. The suggestion is that distinctive packaging sounds, just as for the other aspects of the packaging, can set expectations in the mind of the consumer.

In future research, it would be interesting to try and replicate these findings using a between-participants experimental design (rather than just a mixed-participants design, as conducted here). This would help address one potential concern associated with the latter design, namely, that it draws attention to the closure type in a way that might not necessarily be observed in everyday life. If possible, it may also be worth conducting future research under conditions that are more naturalistic (ecologically valid) and more conducive to celebration than the experimental setup used here. It may also be advantageous to randomize the order in which ratings are made in order to prevent any

order/sequential effects from coloring the results. Beyond that, it would obviously be beneficial to randomize the order in which the cork and screw-cap bottle sounds/actions were presented.

Of course, it should be noted that the effect size of the closure type differences on various ratings—as reported by partial eta squared values—are small [18,19]. In a practical sense, therefore, the decision to go with cork or screw-cap on the part of the manufacturer may not be expected to result in a drastic change in the tasting experience. Nevertheless, the fact that an overwhelming proportion of participants (113 vs. 13) reported preferring to buy a cork-sealed bottle of wine over a screw-cap bottle implies that small differences in perceived attributes of a wine may nevertheless still shape buying decisions [20].

Finally, it is important to note that there is also a temporal aspect to people's feelings about different closure types: That is, people's views likely changes over time. Indeed, as the years pass, there is a sense that screw-top bottles are starting to be associated with a better quality of product than they once were. There may also be relevant cross-cultural variations in this regard too; for instance, people from regions where screw-cap enclosures are more prevalent (e.g., Australia or New Zealand) might not necessarily show a preference for corks over screw-caps. Hence, the present results (showing a clear preference for wines served from a cork-stoppered bottle) should not, at least for the moment, be generalized beyond the mostly UK-based participants<sup>2</sup> who took part in the present study in 2017 and who rated two Argentinian red wines.

Nevertheless, having raised these various caveats/concerns, the key point remains that these results provide the first empirical demonstration that one and the same wine is rated more highly in terms of its quality, it may be rated as more appropriate for celebrations, and also induces a greater celebratory mood when served in a cork-stoppered rather than a screw-cap closure bottle. While such claims are certainly not new, the original part of this study resides in showing the effects can be elicited by nothing more than the sound of the closure. These results help to emphasize the importance of the packaging, and 'the image mold', to our experience of the contents [14].

Ultimately, though, these psychological benefits to the tasting experience associated with the cork closure should be weighed against the cork taint that affects some small proportion of cork-stoppered bottles. Cork taint is associated with the presence of 2,4,6-trichloroanisole (TCA), which occurs as a reaction between a penicillium mold present in the cork and the chlorinated sterilants [21–23]. Here, there are several important points to note. First, sensitivity to this fault varies widely across the population [24]; it also varies as a function of the style of wine [25]. Second, innovations in enology mean that the incidence of this problem is much lower today than it has been in the past [12]. Third, it is important to note that cork taint also affects other closure types too [12] and can be transmitted to a wine via contaminated winery equipment other than cork [21]. Nevertheless, despite any potential technical limitations, it is clear that the sound of a cork-stoppered wine bottle being opened conveys a psychological impact that can help to enhance the ratings and experience of anyone who hears it.

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**Conflicts of Interest:** C.S. has worked with APCOR and Clarion Communications on the psychological associations with cork closures. Q.W. declares no conflict of interest.

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<sup>2</sup> Although US-based participants showed a similar preference for cork [14].

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