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Short Communication

Assessing the influence of colour and glass type on beer expectations

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ABSTRACT

We evaluated how beer colour and glass type interact when it comes to forming beer expectations. Following previous research, we predicted that, given that colour is a dominant feature in food and beverage expectations, it would modulate the effects of glass type on beer expectations. One hundred and ninety-five participants from the United Kingdom took part in the experiment, which followed a 6 × 7 within-participants experimental design, with factors glass type (Pilsner, Pint, Tulip, Chalice, Weissbier, and Mug) and colour (yellow, blue, brown, orange, black, red, and green). Our results revealed that whilst colour influenced the expectations-based sensory-discriminative, hedonic, and willingness to pay (WTP) ratings, glass type influenced all variables but intensity and WTP. Importantly, all the variables for which glass type had a main effect were followed by a significant interaction. The results indicate that, the extent to which an extrinsic beer element, namely glass, influences expectations, depends on the associations that people have with colour, an intrinsic beer property closely related to beer type. We discuss the implications of our results for the design of beer expectations.

1. Introduction

Consumers rely on vision, in particularly colour, to identify food sources and make predictions about their characteristics (Cardello, 1994, Hutchings, 2003, Spence, 2015; Spence & Velasco, 2018). Indeed, colour is one of the most crucial factors influencing people's flavour expectation, categorisation, search, and perception (Garber et al., 2000, Spence, 2015, Spence & Piqueras-Fiszman, 2016, Velasco et al., 2015). Hence, colour is used by food brands in one way or another to convey the flavour of the products they offer (Garber et al., 2000, Velasco et al., 2015, Van Doorn et al., 2019).

Colour, though, is typically not the only visual cue that people rely on when developing expectations. In beverages, packaging and more broadly containers are ubiquitous. They not only protect the product and serve as a means to consume it but are also branding means that can influence expectations (Velasco & Spence, 2019). For instance, certain glass types are considered more appropriate for certain beers, and brands sometimes even design their own glasses (e.g., Delirium or Asahi Super Dry beer glasses) to enhance their experiences (Van Doorn et al., 2019). It is not clear, though, whether glass types will influence beer expectations throughout the beer colour palette. Beer colour is an intrinsic cue that conveys specific information about the beer's type and sensory properties, and as such, it might be key in mediating how glass type influences expectations. Importantly, though, previous research has studied glass type and colour influences on beer expectations separately (Reinoso-Carvalho et al., 2017, Reinoso-Carvalho et al., 2019, Ribeiro et al., 2020, Blackmore et al., 2020, 2021). However, most beer glass types are transparent and therefore see-through, which makes the interaction between colour and glass type likely and key to beer expectations.

Given the popularity of beer and beer experiences,[1] both researchers and practitioners alike have been interested in the determinants of beer expectations and experiences, namely, intrinsic (e.g., flavour, colour, complexity, taste, smell) and extrinsic factors (e.g., brand, packaging, labelling, container type, see Betancur et al., 2020, for a review). Here, we focus on studying how two ubiquitous cues associated with beer, that is, colour and glass type, and their interaction, influence beer expectations. These are essential attributes for premium and craft beer, where both cues are used to differentiate in the market. In particular, we aimed to understand how colour and glass types interact during sensory-discriminative and hedonic expectations formation in beer, as well as WTP. We begin by presenting the literature on glass type and colour

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[1] In Europe, the cradle of modern brewing, with an estimated 80 beer styles and 50 000 different beer brands, people consume approximately 385.5 million hl of beer annually (The Brewers of Europe, 2022).

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influences on beer expectations and then present an experiment to evaluate their interaction.

2. Multisensory beer expectations

2.1. Expectations based on glassware

The format in which beer is presented can influence expectations of a variety of beer dimensions (Van Doorn et al., 2019). For example, Barnett et al. (2016) provided evidence to suggest that people expect beer to be tastier when presented in bottles than in cans. What is more, studies conducted by Wan et al. (2015) suggest that the shape of the glass can affect the expectations of the drink (see also Spence and Van Doorn, 2017, for a review). They demonstrated that the beer is liked more and rated as more familiar and as having more body, when presented in a mug relative to a shallow glass or a wine glass, although when presented in the shallow glass the beer received higher scores on bitterness and sourness.

In another study, Ribeiro and colleagues (2020) evaluated how glass types influence craft beer expectations. Their results suggest that the expectations about specific sorts of beers are affected by the shape of the glass. For example, the beers Dunkel Weizen (SRM 26) and Red Ale (SRM 20) were associated with the Beer Mug, the Chalice glass, and the Long Drink glass.

Considering these findings, Mirabito et al. (2017) have suggested that beer breweries, bars and restaurants, and glass manufacturers should consider the shape of glassware in beer experience design. Notably, a recent literature review by Van Doorn et al. (2019) suggested that the type of glassware also influenced the amount people were willing to pay for beer.

Since glass is related to the style of beer (Smith, 2014), in the present research we evaluated how common glass types used in the beer industry, namely, Pilsner, Pint, Tulip, Chalice, Weissbier, and Mug, influence beer expectations. For example, certain glasses such as Pint and Mug glasses appear more common for black beers and Pilsner and Weissbier glasses for blond beers, which may influence the expectations of bitterness and intensity. In addition, participants may, for example, expect more sweetness in rounder glasses (such as a Tulip glass or Weissbier glass) than in more angular ones (like a Mug glass, see Velasco et al., 2016, for a review on the crossmodal correspondence between taste and shape).

2.2. Expectations based on colour

According to Van Doorn et al. (2019), consumers seem to have an expectation about the sort of colour that goes with certain types of beer. For instance, yellow seems to be associated with lager or pilsner beers instead of dark black alternatives like Stout. Therefore, colour guides consumers' categorization of beer types. Nevertheless, colour is not only important because it can convey the beer-specific information, it also appears to be a fundamental property of foods and beverages that can guide people's expectations about their sensory and hedonic characteristics before consumption (Shankar, et al., 2010; Spence, 2015).

Beer expectations and experience based on colour were evaluated by Reinoso-Carvalho et al. (2017, 2019) and they found that, before tasting, the participants expected: a) to like the blond beer more than the dark beer, b) the dark beer to be more bitter than the pale beer, c) the dark beer to be stronger and more robust as compared to pale beer, d) the dark beer to be more expensive than pale beer, e) and the pale beer to be more pleasant than the dark beer. Therefore, we expected that colours would affect beer expectations. For example, beers with atypical colours such as blue, may be evaluated as sweeter than say green, because the latter may be associated with a sour and/or bitter taste, instead (Saluja & Stevenson, 2018).

2.3. Possible interactions between glass and beer colour in expectations formation

It is clear from previous studies that both colour and glass type can influence expectations concerning sensory and hedonic aspects of the beer. However, how do these features interact when forming expectations? And how do they influence market-oriented metrics like WTP? Previously, studies have mostly focused on one of them at a time (for example, Reinoso-Carvalho et al. 2017, 2019). Here, we studied them together and expected that when the colour of the beer was different from usual beer tones used in the market (e.g., blue, green), glass type would influence expectations. However, when the colour was common to a specific beer type (e.g., Lager pale with yellow pale) the glass type would have little room to influence expectations, considering that expectations may be strongly attached to the type of beer (thus, providing a semantic context to disambiguate expectations, see Velasco et al., 2016).

3. Materials and methods

3.1. Participants

One hundred and ninety-five participants (33.5 $\pm$ 9.8 years on average, ranging from 18 to 73 years; 96 females and 99 males) from United Kingdom took part in this study online via the Qualtrics software package (https://www.qualtrics.com/). The participants were recruited from Prolific Academic (https://prolific.ac/) in exchange for £2.00. Only those participants whose first language was English, were allowed to take part in the study. The study was carried out in accordance with the World Medical Association (WMA, 2013) Helsinki Declaration. All participants provided informed consent prior to taking part in the study. The means frequency of beer consumption from participants was 3.46 (SD = 1.18), which indicates that the participants usually drank beer between once a week to once a month.

3.2. Apparatus and materials

The experiment used 'full-screen mode'. The different beers varied in terms of colour and shape (see Fig. 1). The colours of beers consisted of yellow, blue, brown, orange, black, red, and green and the glass types of Pilsner, Pint, Tulip, Chalice, Weissbier, and Mug. Note that, the Pint, Tulip, Chalice, and Weissbier glasses are seemingly rounder than Mug and Pilsner glasses. There were a total of 42 (7 colour $\times$ 6 shapes) images (fit to a 300 $\times$ 300-pixel frame) of beers.

3.3. Design and procedure

The experiment followed a 6 $\times$ 7 within participants experimental design, with factors glass type (Pilsner, Pint, Tulip, Chalice, Weissbier, and Mug) and colour (yellow, blue, brown, orange, black, red, and green). We focused on six colours since colour perception is categorical and people appear to manage with no more than a dozen colour names (Chapanis, 1965, Falomir, et al., 2015), and because the chosen colours are typically associated with beers. While yellow, brown, and black are common colours in beers, orange and red, are perhaps a little less common. In the case of blue and green colours, the beer industry has tried to innovate through brands like Salitus blue, Okhotsk Blue, and

Fig. 1. Beer stimuli including seven glass types (Pilsner, Pint, Tulip, Chalice, Weissbier, and Mug) and six colours (yellow, blue, brown, orange, black, red, and green).

Table 1
The main effects glass types, colour, and the interaction between glass type and colour.

Variable	Glass			Colour			Glass * colour		
	F	p	η2	F	p	η2	F	p	η2
Bitterness	5.44	**< 0.001**	0.027	155.79	**<0.001**	0.445	1.89	**0.005**	0.010
Sourness	3.55	**0.004**	0.018	49.98	**<0.001**	0.205	1.57	**0.037**	0.008
Sweetness[2]	10.49	**< 0.001**	0.052	90.07	**<0.001**	0.327	2.15	**0.001**	0.011
Intensity	0.88	0.488	0.005	46.62	**<0.001**	0.194	1.29	0.157	0.004
Alcohol level	5.63	**< 0.001**	0.028	20.93	**<0.001**	0.097	1.74	**0.013**	0.009
Liking	9.82	**< 0.001**	0.048	122.61	**<0.001**	0.387	3.25	**<0.001**	0.016
WTP	1.71	0.185	0.009	4.13	**0.018**	0.021	1.08	0.341	0.006

[2] The analysis took into consideration gender and frequency of beer consumption as between-participants factors. Only gender had an effect on sweetness. Hence, the table reports the main effects between shape and colour using gender as the between-participants factor. Appendix D contains two figures showing the effect of gender on the shape of the glass and the colour of the beer. In addition, according to Figs. 9 and 10, women rate glass and colour as lower in sweetness than men in each of the colours and glasses but follow the same trend as the men.

Olive green beer, yet, they remain relatively uncommon.

The survey followed three steps. First, the participants were presented with the purpose of the study and were required to respond to a standard consent form. Second, the 42 stimuli were then shown to the participants in a random order, one image at a time. Upon seeing each image, they were required to respond to two types of questions (the first set was randomised). The participants rated each stimulus in terms of expected bitterness, sourness, sweetness, intensity, alcohol, and liking of the beer. All questions were responded to in 7-point Likert Scales. The participants then responded to an open question about how much money they would be willing to pay for a glass of the beer (in British Pounds). Finally, the participants were asked demographic questions (age, gender, country) and their beer drinking frequency ("How often do you drink beer?") using a 5-point scale (never, once a year, once a month, once a week, every few days).

3.4. Data analysis

Repeated measure analyses of variance (ANOVAs) were conducted to analyse the ratings. Whenever significant effects were observed, pairwise comparisons were conducted, using the Holm-Bonferroni correction.

4. Results

The main results are shown in Table 1. Significant main effects of glass type were observed for all variables except to WTP and intensity and significant main effects of colour were observed for all variables (note that the effect of colour was always larger than the effect of glass tipe). Importantly, a significant interaction between glass type and colour was also observed for the bitterness, sourness, sweetness, alcohol level, and liking ratings. The analyses associated with the interactions are given in Table 2 of Appendix C.

The results presented in the following sections are summarized and presented in Tables 1, 2, and Figures in the appendices A, B, and D.

4.1. Beer colour

The participants expected the black and brown beers to be more bitter than any of the other beers ($p \leq 0.001$), though the black beers were also expected to be more bitter than the brown ones ($p \leq 0.001$). The blue beers were expected to be less bitter than any of the other beers ($p \leq 0.001$). Moreover, the participants expected the orange beers to be more bitter than yellow, red, and green beers ($p \leq 0.025$), and the yellow beers more bitter than the red beers ($p \leq 0.029$).

The green and blue beers were expected to be sourer than any of the other beers ($p \leq 0.018$), though the green beers were also expected to be sourer than the blue ones ($p \leq 0.001$). The participants also expected the yellow beers to be less sour than the red and brown beers ($p \leq 0.018$), and the orange beers to be less sour than the red, brown, and black beers ($p \leq 0.001$).

The red and blue beers were expected to be sweeter than the black, brown, yellow, orange, and green beers ($p \leq 0.001$). In addition, the participants expected the black and brown beers to be less sweet than the green, orange, and yellow beers ($p \leq 0.001$), and the orange beers to be sweeter than the yellow beers ($p \leq 0.008$).

The black and brown beers were expected to be more intense than any of the other beers ($p \leq 0.006$), though the black beers were also expected to be more intense than the brown ones ($p \leq 0.001$). The participants also expected the yellow and blue beers to be less intense than the black, brown, orange, red, and green beers ($p \leq 0.007$). Furthermore, the participants expected the orange and red beers to be more intense than green beers ($p \leq 0.004$).

The black and brown beers were expected to have more alcohol than the blue, green, and yellow beers ($p \leq 0.001$). The participants also expected the orange beers to have more alcohol than blue, green, yellow, and red beers ($p \leq 0.001$), and the blue beers to have less alcohol than red beers ($p \leq 0.001$). Besides, the green beers were expected to have less alcohol than the red beers ($p \leq 0.005$).

The participants expected to like the orange beers more than the other beers ($p \leq 0.001$). They also expected to like the green beers less than the yellow, red, and blue beers ($p \leq 0.002$), and expected to like the black and brown beers less than the yellow, and red beers (both $p \leq 0.001$). What is more, the participants expected to like the yellow and red beers more than the blue beers ($p \leq 0.001$).

The participants expected to be willing to pay more for the orange beers than the blue, green, and brown beers ($p \leq 0.001$), and to be willing to pay less for the blue beers relative to the orange and yellow beers (both $p \leq 0.028$).

4.2. Glass type

The beers in the Pilsner glass were expected to be less bitter than those in the Pint and Mug glasses (both $p \leq 0.002$) and the beers in the Pint glass to be less sour than the ones in the Tulip and Weissbier (both $p \leq 0.033$) glasses.

The beers in the Mug glass were expected to be less sweet than the beers in the Tulip, Pilsner, and Weissbier ($p \leq 0.001$) glasses. In addition, the beers in the Tulip glass were expected to be sweeter than the those in the Pint and Chalice glasses ($p \leq 0.004$).

The participants expected the beers in the Pint glass to have more alcohol than in the Weissbier or Mug glasses (both $p \leq 0.017$) and the beers in the Mug glass to have less alcohol than in the Pint and Tulip (both $p \leq 0.009$) glasses.

The beers in the Tulip glass were expected to be liked more than those in the Mug, Chalice, Weissbier, and Pilsner glasses ($p \leq 0.009$) and the beers in the Pint glass more than those in the Mug glass ($p \leq 0.001$). The participants were less willing to pay for the beers in the Chalice glass than the in the Pint glass ($p \leq 0.048$).

4.3. The interaction between glass and colour

The brown beer in the Pint glass was expected to be more bitter than in the Weissbier and Chalice glasses (both $p \leq 0.016$). The green beer was considered to be more bitter in the Mug glass than in the Weissbier and Pilsner glasses (both $p \leq 0.042$). As for the orange beer, the participants expected it to be less bitter in the Pilsner glass than the beer in Pint and Chalice (both $p \leq 0.006$) glasses.

The yellow beer was expected to be sourer in the Weissbier glass than in the Pint, Pilsner, and Mug glasses ($p \leq 0.031$). Additionally, the participants expected the orange beer to be sourer in the Mug glass than in the Pint, Weissbier, Tulip, and Pilsner glasses ($p \leq 0.050$).

The brown beer in the glass Mug was expected to be less sweet than in the Pilsner glass ($p = .013$). The participants also expected the green beer in the Mug glass to be less sweet than in the Tulip, Weissbier, Chalice, and Pilsner glasses ($p \leq 0.007$). The orange beer in the Tulip glass was expected to be sweeter than in the Chalice glass ($p \leq 0.018$) and the blue beer in the Mug glass to be less sweet than in the Weissbier and Pint glasses (both $p \leq 0.038$). The participants also expected the brown beer in the Pint glass to have more alcohol than in the Pilsner, Weissbier, and Mug glasses ($p \leq 0.014$).

The participants expected to like the orange beer less in the Mug glass than the beer in the Tulip, Weissbier, and Pint glasses ($p \leq 0.005$). They also expected to like more the orange beer in the Tulip glass than in the Mug, Chalice, and Pilsner glasses ($p \leq 0.002$). Furthermore, the participants expected to like the orange beer in the Chalice glass less than in Tulip, Weissbier, and Pint glasses ($p \leq 0.022$). The participants expected to like the brown beer less in the Mug glass than in the Pint and Tulip glasses (both $p \leq 0.005$). They also expected to like the brown beer more in the Pint glass than in the Mug and Chalice (both $p \leq 0.032$) glasses. Finally, the participants expected to like the blue beer less in the Mug glass than in the Weissbier glass ($p \leq 0.035$) and to like the yellow beer less in the Weissbier glass than in the Pint, Pilsner, and Tulip glasses ($p \leq 0.004$).

5. Discussion

In the present study, we evaluated whether beer expectations are influenced by colour, glass type, and their interaction. Interestingly, our results revealed that whilst colour influenced the sensory-discriminative, hedonic linking, and WTP ratings, glass type influenced all variables but intensity and WTP. Importantly, all the variables for which glass type had a main effect were followed by a significant interaction. In other words, the effect that glass type had on the bitterness, sourness, sweetness, alcohol level, and liking ratings was influenced by the colour of the beer, as well. We suggest that colour (which also exerted a larger effect on expectations that glass type), as a key intrinsic cue of beer, with strong beer category associations, acts as a boundary for the sort of influence that glass type can have on beer expectations.

5.1. Why would colour and glass type influence beer expectations?

The results on the role of colour on beer taste expectations are relatively consistent with the literature on colour–taste associations (e.g., Velasco et al., 2016). Our results associated with intensity, alcohol, liking, and WTP are like previous research conducted by Reinoso-Carvalho et al. (2019), Donadini et al. (2016), and Blackmore et al. (2020, 2021).

Our study is also consistent with the literature studying the role of glass features and taste expectations (Spence & Van Doorn, 2017). For instance, the participants expected the beers in the Pint and Mug glasses to be more bitter than the beers in the Pilsner glass. It is worth noting that the first two glasses are wider than the latter. Moreover, the participants expected the beers presented in Tulip, Weissbier, and Chalice glasses (which seem rounder) are expected to be sweeter than the Mug glass (seemingly more angular). The shape of the glass varies in terms of curvature, which might affect taste expectations in different ways. In our results, the participants expected the beer in the Tulip glass (a seemingly rounder glass) to have more alcohol and to be liked more than the beer in the Mug glass (seemingly more angular). This finding is consistent with the research conducted by Velasco et al. (2016), whereby people consistently associated sweetness with rounder shapes and bitterness, salty, and sourness with more angular shapes instead.

Unique to the present study, we found an interaction between glass type and colour for all the tastes evaluated in this study; for example, the participants expected the brown beer in the Pint glass to be more bitter than in the Weissbier and Chalice glasses. Therefore, our results support our argument that the influence of glass type on beer taste expectations is mediated by the colour of the beer.

The interaction may provide some hints at the interaction between crossmodal correspondences and semantic congruency in expectations (Velasco et al., 2016). The first refers to associations between features across the senses (e.g., shape and taste), whereas the latter refers to associations between the senses that occur as a function of a common identity or meaning (e.g., dark beers are typically dark and more bitter). In our results, colour appears to dominate when it represents a specific beer subcategory, whereas when the colour is more ambiguous in terms of meaning, it may seem as if crossmodal correspondences would guide expectations. Whereas we did not test this specifically in our study, future research may look into it; that is, when and how does crossmodal correspondences and semantic congruence interact during expectations formation.

We suggest that colour modulates the effect of glass type on expectations because colour is an intrinsic feature of the beer, strongly related to the beer type. In contrast, the glass in which a drink is served is an extrinsic cue, not necessarily a determinant of the drink itself. Importantly, there are different beer categories such as blond and dark beers; blond ones strongly correspond with yellow and black ones with dark ones (Reinoso-Carvalho, et al. 2019). However, when the beer colour is orange, blue, or brown, the colour is not necessarily strongly attached to a specific beer category. Hence, the glass type (e.g., shape, roundness, angularity, and width) might provide additional information to form sensory-discriminative and hedonic expectations (bitter, sour, sweet, liking and alcohol).

6. Conclusion, limitations, and managerial implications

The present research does not come without limitations. For example, the colours and glass types selected were only a subset of the possible alternatives found in the market, and as such, future research may expand on studying additional colour variations (not only hue) and

glass types. Moreover, we did not control for the volume of glass, something which could have influenced our results. Given that in naturalistic environments the different glass types typically come in different sizes and volumes, we decided to keep their proportions. It would be necessary, though, to also evaluate how these variables influence experience, assuming specific expectations, in future research. Furthermore, the relative exploratory nature of our research requires further replication and study. However, our main conclusions stand. The influence of glass type on beer expectation is modulated by on colour, at least, when only these two cues are considered. Therefore, there are many questions remaining for future research. For example, do glasses with rounder features evoke sweeter expectations of beer than the angular glasses across the beer colour palette? What role does familiariy play in this?

The brewery industry and glassware manufacturers are concerned with people's expectations and customer drinking experience. Due to the highly competitive market, brands want to differentiate from one another in the marketplace (Betancur et al., 2020). The designer of glassware and brewers can design glass with features that improve the properties of beer. In addition, they should know the types of beer and different glass types that go well together.

We suggest that colour, as a fundamental intrinsic cue associated with beer, but more broadly beverages, with sometimes strong corresponding associations, works as a criterion for the type of impact that glass type (and perhaps other extrinsic cues) can have on beer expectations. Hence, understanding how these two cues (but also others) interact, is a better way to inform decisions that may have implications in naturalistic environments in which beverages are sold and consumed. Our research contributes to the understanding of how intrinsic and extrinsic variables can influence beverage expectations, highlighting that their impact depends on several variables like the colour and glass type, and the sort of beverage that is evaluated.

CRediT authorship contribution statement

Vicente Casales-Garcia: Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing – review & editing, Project administration. **Luis Gonzalez-Abril:** Writing – original draft, Writing – review & editing, Supervision. **Nina Veflen:** Writing – original draft, Writing – review & editing. **Carlos Velasco:** Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing – review & editing, Supervision, Funding acquisition.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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Appendix A. Taste Expectations: Bitter, sour and sweet

See Figs. 2–4.

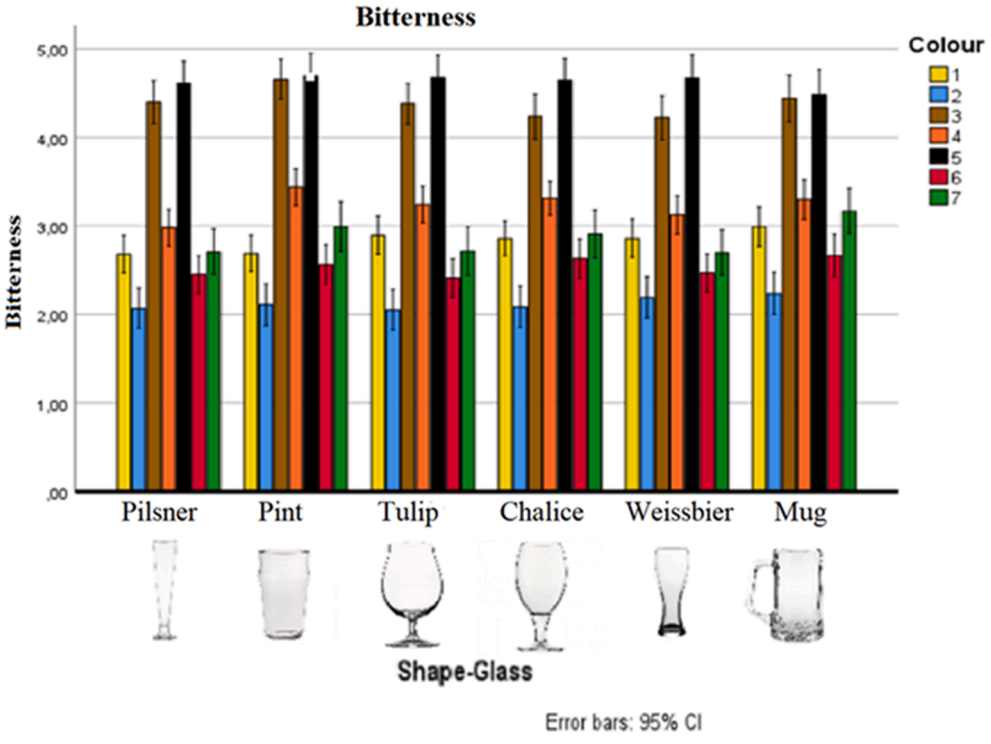

Fig. 2. Bitterness; Mean bitterness ratings as a function of colour and glass type.

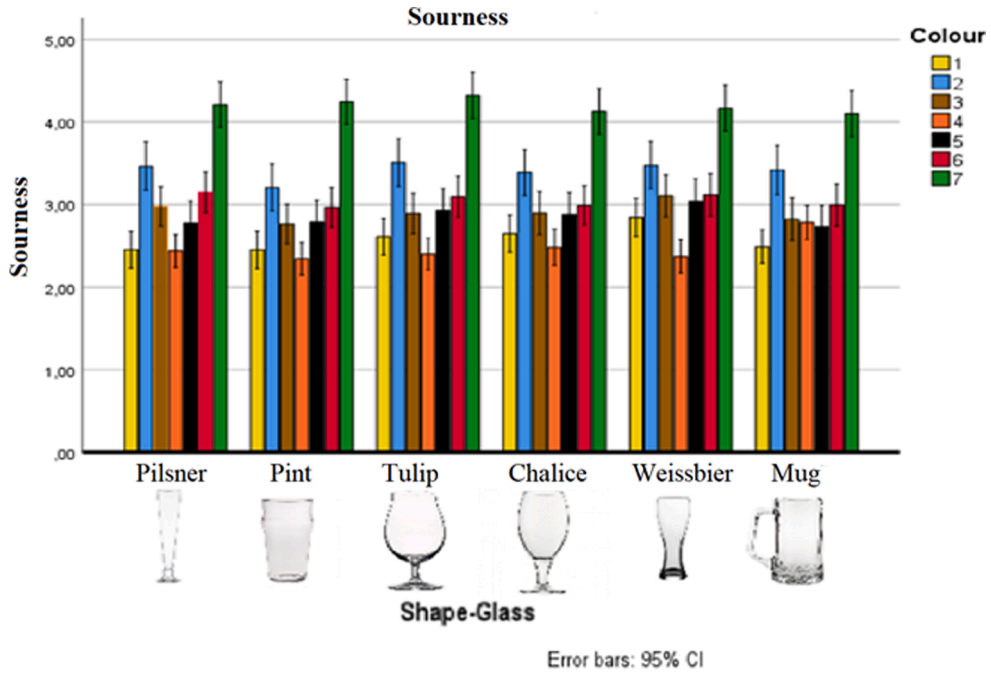

Fig. 3. Sourness; Mean sourness ratings as a function of colour and glass type.

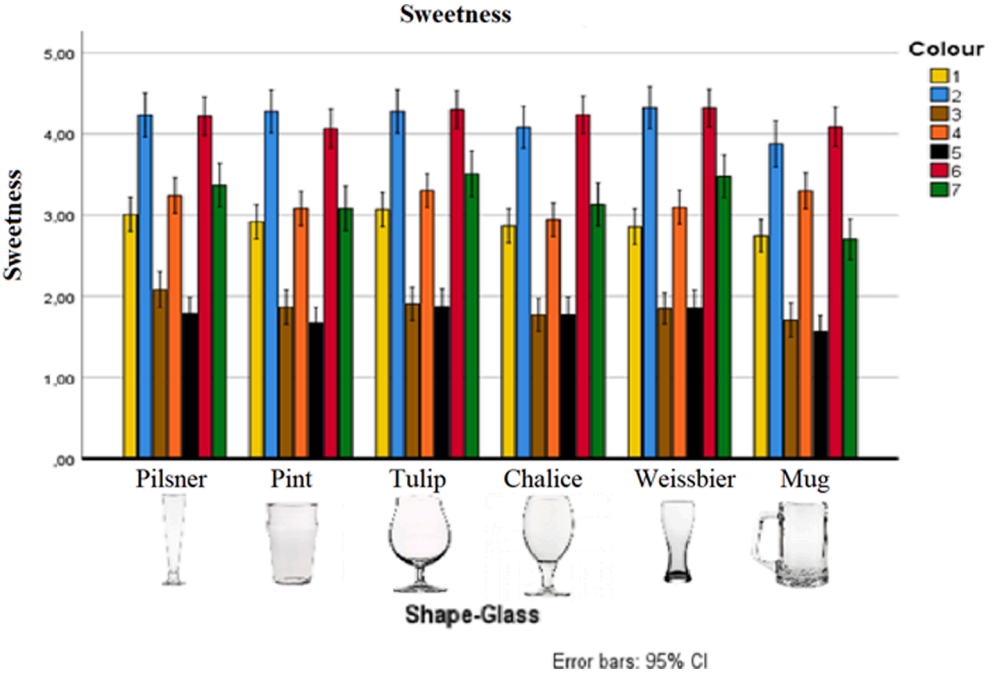

Fig. 4. Sweetness; Mean Sweetness ratings as a function of colour and glass type.

Appendix B. Hedonic expectations: Intensity, liking, alcohol level, and WTP

See Figs. 5–8.

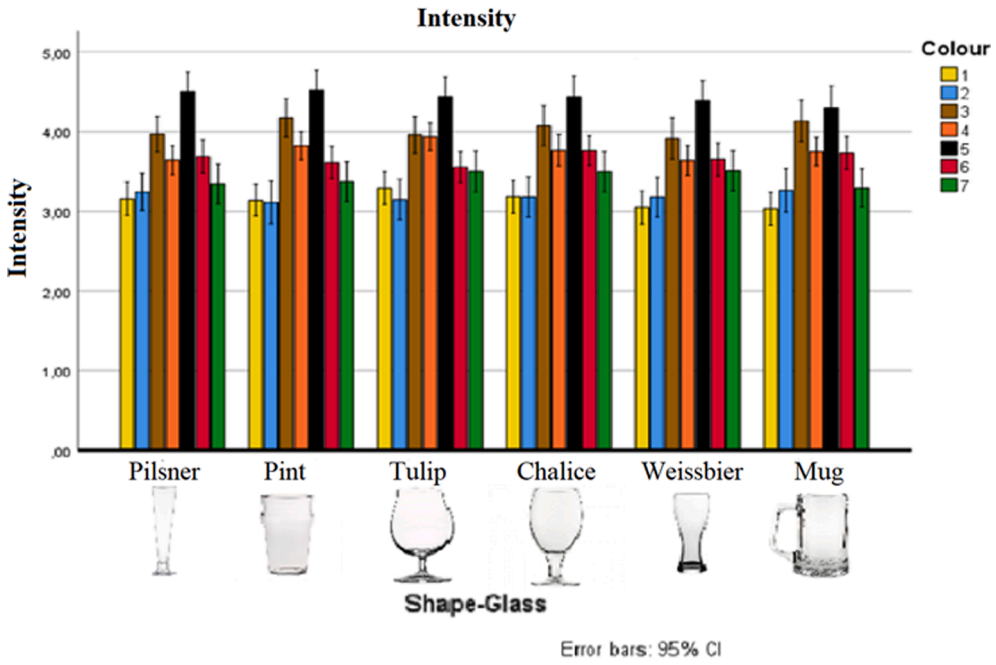

Fig. 5. Intensity; Mean intensity ratings as a function of colour and glass type.

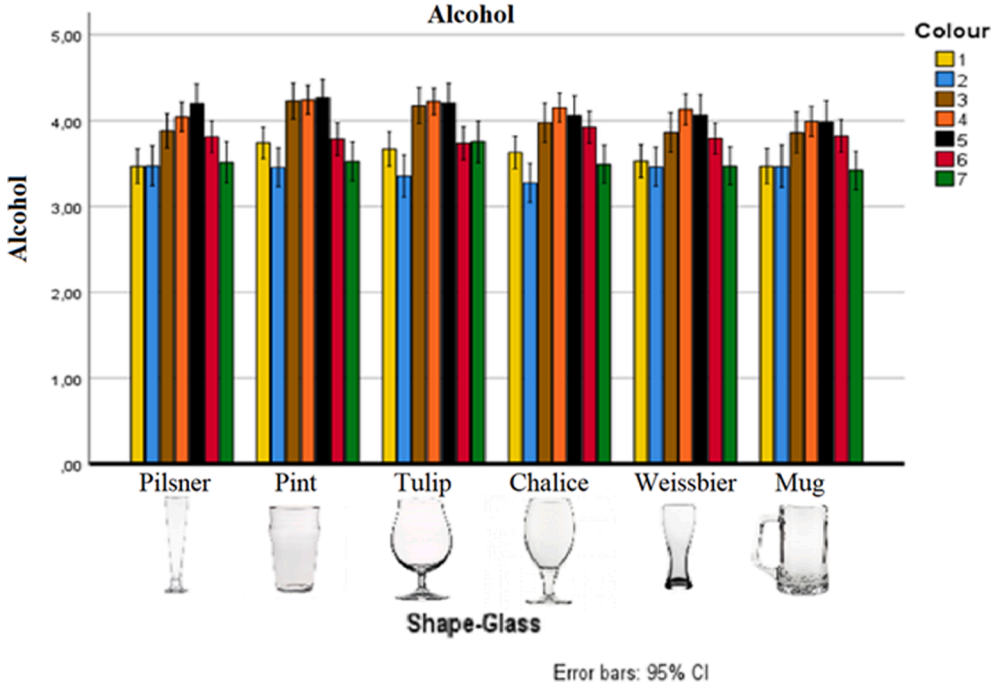

Fig. 6. Alcohol; Mean alcohol ratings as a function of colour and glass type.

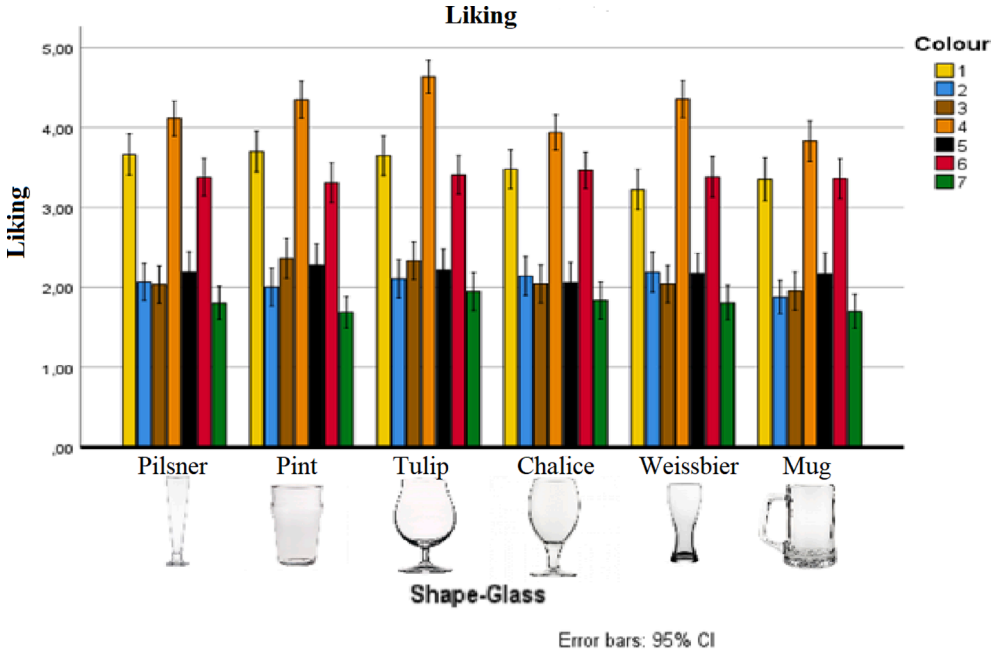

Fig. 7. Liking; Mean liking ratings as a function of colour and glass type.

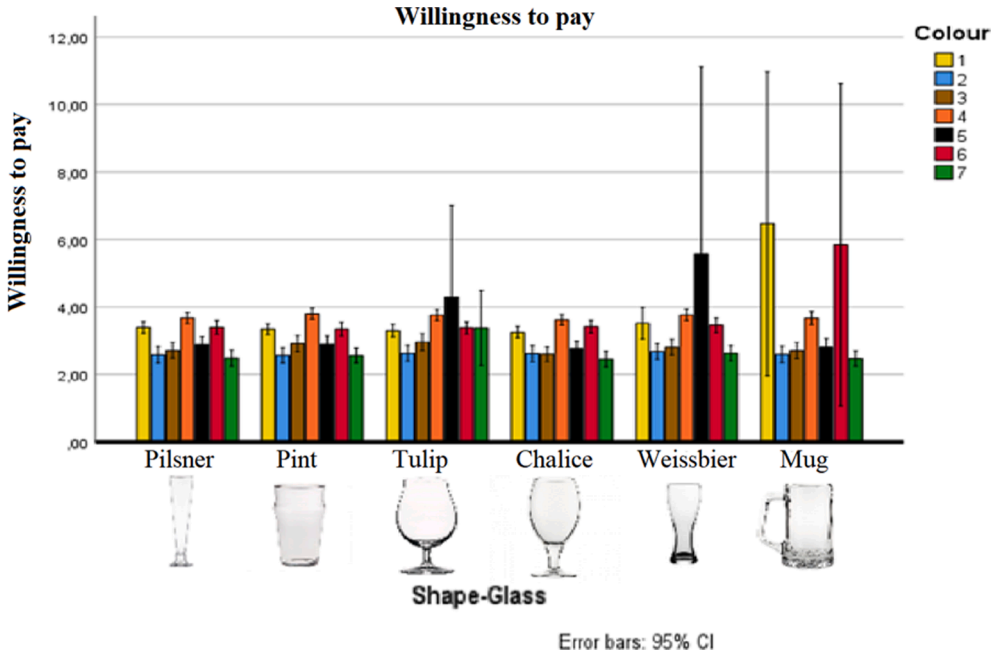

Fig. 8. Willing to pay; Mean willing to pay ratings as a function of colour and glass type.

Appendix C. Differences between glasses as a function of colour

See Table 2.

Table 2
This table presents the differences between glasses as a function of colour.

Variable	Yellow			Blue			Brown			Orange			Black			Red			Green		
	F	p	η2	F	p	η2	F	p	η2	F	p	η2	F	p	η2	F	P	η2	F	p	η2
Bitterness	2.20	0.057	0.011	0.85	0.512	0.004	3.16	**0.010**	0.016	4.30	**<0.001**	0.022	0.80	0.542	0.004	1.61	0.160	0.008	3.54	**<0.004**	0.018
Sourness	3.16	**0.009**	0.016	1.38	0.230	0.007	1.75	0.122	0.009	4.30	**<0.001**	0.022	1.51	0.185	0.008	0.77	0.569	0.004	0.87	0.494	0.004
Sweetness	1.91	0.092	0.010	3.61	**0.004**	0.018	2.70	**0.021**	0.014	3.03	**0.011**	0.015	2.77	**0.019**	0.014	1.50	0.190	0.008	9.84	**<0.001**	0.048
Alcohol level	2.49	**0.032**	0.013	1.30	0.261	0.007	4.64	**<0.001**	0.023	2.32	**0.045**	0.012	2.20	0.054	0.011	0.93	0.455	0.005	2.17	0.057	0.011
Liking	5.00	**<0.001**	0.025	2.76	**0.020**	0.014	4.86	**<0.001**	0.024	11.36	**<0.001**	0.055	0.95	0.447	0.005	0.42	0.828	0.002	1.57	0.170	0.008

Appendix D. Effect of gender on sweetness

See Figs. 9 and 10.

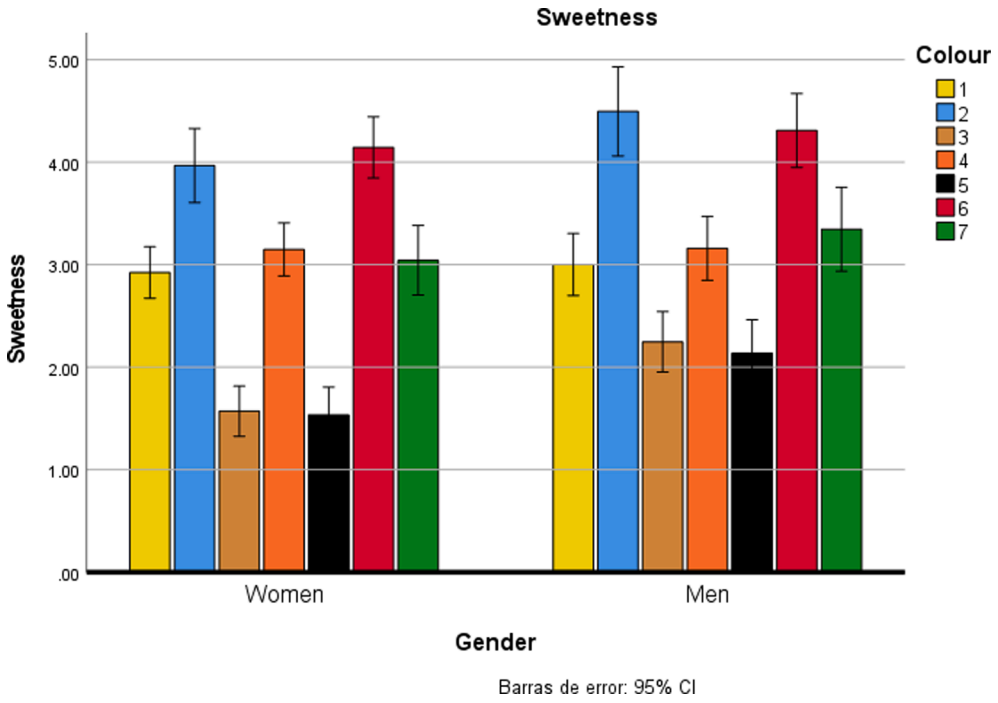

Fig. 9. Effect Gender on Sweetness and Colour; Mean Sweetness ratings of women and men as a function of colour.

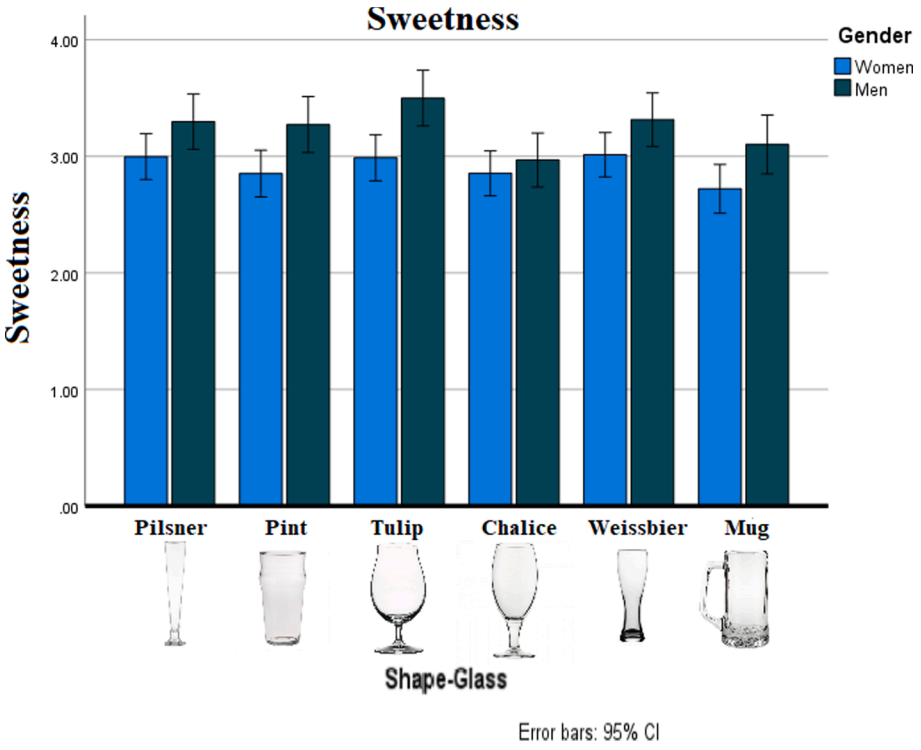

Fig. 10. Effect Gender on Sweetness and Glass; Mean Sweetness ratings of women and men as a function of glass type.

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