Taste is in the Can

The impact of non-alcoholic beer's packaging design on consumers' taste perception and product evaluation

Master Thesis

Robin Branderhorst
S2026945
February 19, 2019

University of Twente
Faculty of Behavioural, Management, and Social Sciences

Master Communication Studies
Specialization Marketing Communication

Supervisors:
Dr. T. J. L. van Rompay
Dr. J. J. van Hoof

Abstract

Purpose - Healthy products are often perceived less rewarding and less tasty as compared to their regular counterparts. Non-alcoholic beer (NAB) is such a relative healthy product that is experienced less tasty as compared to regular beer, though its increasing popularity. However, previous research has shown the possibility to influence consumers' taste perception and product evaluation using the packaging design. Previous findings show that the lack of bitterness and taste intensity are the general factors that discriminate between NAB and regular beer. The current study aimed to affect consumers' taste perception and product evaluation of NAB using the packaging design, focussing on perceived bitterness, taste intensity, taste quality and taste liking.

Method - A 2x2x2 experimental between-subjects design was used in which taste labels (not present vs. present), colour of hops (green vs. brown), and the line orientation (horizontal vs. vertical) were manipulated. Effects on perceived taste characteristics, purchase intention, the perceived difference between NAB and regular beer and the actual amount of consumption were measured. In addition, a correlation analysis was conducted to find correlations between variables. For the main study, respondents (N = 200) were asked to participate in a taste test for a new NAB of a known beer brand in the Netherlands. The manipulated designs were shown prior tasting after which participants had to fill out a questionnaire comprising the measurement variables.

Findings - Results showed no main or interaction effects on perceived bitterness and taste intensity. However, brown hops on the packaging design increased the perceived freshness, taste quality, taste liking, and the amount of consumption as compared to the conditions containing green hops. Furthermore, correlation analysis revealed significant correlations of perceived taste characteristics with variables such as the perceived difference between NAB and regular beer, purchase intention, or the amount of consumption.

Conclusion - This study shows that the packaging design of NAB definitely influences consumers' taste perception and product evaluation. However, at the same time, it can be difficult to achieve predetermined changes in perceived taste characteristics when using subtle manipulations on the packaging design for a brand that already evokes strong associations.

Keywords - non-alcoholic beer, taste experience, taste labels, colour, line orientation, crossmodal correspondence.

1. Introduction

Have you ever realised that the way you experience food or drinks is not only based on its taste? Expectations created by a variety of product extrinsic cues have a major influence on your sensory perception and consumption experience (Piqueras-Fiszman & Spence, 2015). One such extrinsic cue is a product's packaging. Various studies point out the possibility to impact consumers' taste evaluations by adjusting the packaging design (e.g. Fenko, De Vries, & Van Rompay, 2018; Liao, Corsi, Chrysochou, & Lockshin, 2015; Mirabito, Oliphant, Van Doorn, Watson, & Spence, 2017; Van Rompay, Finger, Saakes, & Fenko, 2016). For instance, Fenko et al. (2018) demonstrated that manipulating the packaging design of coffee influenced consumers' expectations of taste strength prior tasting.

This offers an important opportunity for healthy products. Foods or beverages with low salt, fat or sugar content are distinctively healthier but often perceived as less rewarding and less tasty as compared to their regular counterparts (Lee, Shimizu, Kniffin, & Wansink, 2013; Raghunathan, Walker, & Hoyer, 2006; Schuldt, & Hannahan, 2013). These products seem to be less associated with satisfaction and pleasantness (Hamilton, Knox, Hill, & Parr, 2000). However, by adjusting the product's packaging design consumers' taste experience could be manipulated as well (Kähkönen & Tuorila, 1998; Lee et al., 2013; Tijssen, Zandstra, De Graaf, & Jager, 2017; Van Rompay, Deterink, & Fenko, 2016). For instance, Tijssen et al. (2016) demonstrated that warmer, more saturated, and less bright coloured packages made healthy products more appealing to consumers.

A relative healthy product not been studied yet in this particular way, is NAB. NAB is a healthy alternative to alcoholic beverages, since the consumption of alcohol carries a risk of adverse health and social consequences, such as intoxicating and dependence-producing properties (World Health Organization, 2018). Moreover, NAB is a healthy alternative to soda and soft drinks high in sugar content as well. Due to its production and composition, it is free from chemical additives, low in calories, and contains several vitamins and minerals (Sohrabvandi, Mousavi, Razavi, Mortazavian, & Rezaei, 2010). NAB is increasingly popular in countries such as the Netherlands, Italy, Spain, Indonesia, and China (Mintel, 2017; Nederlandse Brouwers, 2018).

Despite its increasing popularity, NAB's volume share remains limited in the vast majority of markets, especially in comparison to regular beer (Euromonitor, 2017; Van der Palen, 2018). The differences between regular beer and NAB in terms of flavour are acknowledged by consumers. Various studies found that regular beer drinkers do not drink NAB because it is perceived less tasty than regular beer (Chrysochou, 2014; Deams & Delvaux, 1997; Porretta & Donaldini, 2008; Silva, Jager, Van Bommel, et

al., 2016). According to Van der Palen (2018), a lot of reasons to avoid NAB come as a result of its image. Silva, Jager, Voss, et al. (2017) confirmed this by finding that the overall taste of NAB was evaluated more favourably when it was presented as regular beer compared to when it was presented as NAB. The Alcohol Expectancy Challenge demonstrated that a great deal of consumers' NAB experience is based on expectancies. During this challenge, non-alcoholic and alcoholic beers were provided to a group of students. After playing party games, students had difficulty evaluating whether other students drank regular beer or NAB (Lau-Barraco, & Dunn, 2008; Lifespan, 2012).

These expectancies translate into consumers' NAB taste perception and suggest the possibility to improve this experience by means of extrinsic properties, as suggested by Piqueras-Fiszman and Spence (2015). Hence, one might question to what extent NAB's packaging design could serve as such an extrinsic cue to impact consumers' expectancies and subsequently their taste perception and product evaluation. Specifically, the central research question in the current study is:
To what extent can the packaging design of non-alcoholic beer influence consumers' taste perception and product evaluation?

Concrete findings in literature point out the perceived difference between NAB and regular beer can be described as a lack of taste intensity and bitterness. Studies by Chaya et al. (2015) and Silva, Jager, Van Bommel, et al. (2016) found that regular beer was rated higher on intensity than NAB. Furthermore, a positive correlation has been found between taste intensity and bitterness (Kaneda, Kobayashi, Watari, Shinotsuka, & Takashio, 2002; Van Rompay et al., 2016). Accordingly, different researches demonstrated NAB has a less bitter taste compared to regular beer (Bierista, 2017; Cramwinkel, Mazijk-Bokslag, Labrijn, & Lam, 1991; Oudejans, & Spits, 2017). Since the perceived differences between regular beer and NAB can differ among beer brands and beer variants, the current study focuses on the regular non-alcoholic variant of the Dutch beer brand Grolsch: Grolsch 0.0. Since a taste test confirmed that Grolsch 0.0 indeed lacks perceived bitterness and taste intensity (see section 3.1), the current research mainly focuses on these taste characteristics. Moreover, when NAB is experienced more bitter and intense, it can be expected that the perceived taste quality and subsequently its taste liking will increase as well. Therefore, these constructs are considered important variables in the current study as well.

The current study has a high professional relevance, since if the packaging design could make consumers' NAB taste experience more favourable, this could result in more satisfied customers. This could contribute to the current rise of NAB consumption. Moreover, this study is relevant for the academic field, since no research such as the current one is conducted yet, particularly not for NAB.

In the following section, a literature review is presented which provides a theoretical basis for the current study. Three manipulations are used to impact consumers' taste perception and product evaluation of NAB: taste labels, colour, and line orientation. This leads to the formulation of the hypotheses. On-going, in the method section, the pre-tests, research design, participant characteristics, procedure, and measurements are discussed. Then, in the results section, the findings of the current study are presented. Lastly, these findings are discussed based on literature, in the discussion section. Furthermore, limitations of the current study are given as well as implications and recommendations for future research.

2. Theoretical Framework

This section provides a literature review for the current study. Research is discussed that points out the possibility to influence consumers' taste experience using the packaging design. The three manipulations used in the current study are discussed: taste labels, colour, and line orientation. This leads to the formulation of the hypotheses.

2.1 Influencing consumers' taste experience using the packaging design

Creuschen and Schoormans (2004) identified six roles a product's packaging design can serve. It can be used to communicate aesthetic, symbolic, functional, and ergonomic product information, draw attention, and for categorization. The current study mainly focuses on the products' packaging design to communicate symbolic product information. That is, elements of the packaging design are linked to the product appearance, because of the associations these elements engender by themselves (Creuschen, & Schoormans, 2004). For instance, the use of bright red and orange colours, which can be linked to the sweetness of fruits, can communicate the fruity taste of yoghurt.

According to various studies, for both food and beverages it is even possible to impact consumers' taste experience by adjusting the product's packaging (e.g. Cardello, 1994; Krisha, Cian, & Aydinoglu, 2017; Piqueras-Fiszman & Spence, 2015; Van Rompay et al., 2016; Wan, Woods, Seoul, Butcher, & Spence, 2015). For instance, Kähkönen and Tuorila (1998) showed that labelling a Bologna sausage as 'Light Bologna (10% fat)' on the product packaging resulted in a lower rating in fattiness, saltiness and juiciness as compared to when the sausage was labelled as 'Regular type of Bologna (20% fat)'.

Schifferstein, Fenko, Desmet, Labbe and Martin (2013) suggested consumers use associations with packaging aspects (i.e., colour, shape, labels) when evaluating products (i.e., taste). In this respect, the associations between tastes and packaging aspects are no associations between features or properties of the same sort of modality. These associations are referred to as 'crossmodal correspondences'. Spence (2011) defines crossmodal correspondences as an "effect between attributes or dimensions of a stimulus (i.e., an object or event) in different sensory modalities" (p. 973). That is, consumers make correspondences between different (crossed) modalities. More scientific, these are pairings between apparently unrelated sensory dimensions and features (Deroy & Spence, 2013; Piqueras-Fiszman & Spence, 2011; Spence, 2011; Spence et al., 2015). Piqueras-Fiszman and Spence (2011) demonstrated an effect of crossmodal correspondences between the colour of packaging and flavour varieties in potato chips. Using an implicit association test, the authors found longer response times and more incorrect responses when packaging colour was 'incongruent' with the taste of the chips (i.e.,

congruent is green with salt & vinegar, incongruent is blue with salt & vinegar). Thereby, the authors showed developed associations between the colour of the packaging and what it conveys about the flavour in consumers' minds.

Previous studies suggested that preferences for beer are, to a large extent, influenced by expectations derived from extrinsic attributes, in addition to intrinsic attributes, such as the taste itself (Carporale & Monteleone, 2004; Carvalho et al., 2016; Lee, Frederick, & Ariely, 2006; Sester et al., 2013). For instance, Mirabito et al. (2017) found that beer served in a glass with curved sides was perceived to be fruitier and more intense than the same beer served in a glass with straight sides. Furthermore, in similar studies, Gates, Copeland, Stevenson, and Dillon (2007) and Allison and Uhl (1964) found overall ratings for beer increased considerably when the product's packaging was presented and, thus, brand identification was possible as compared to a blind condition.

The current study focuses on three manipulations in order to manipulate consumer's perceived bitterness, taste intensity, taste liking and taste quality. Those manipulations are: whether taste labels are present on the packaging or not, colour elements, and the orientation of the lines depicted on the packaging.

2.2 Taste labels

Probably the most intuitive and simplest way packaging can influence consumer experiences is the way it describes its contents. Specifically for food and drink products, consumers cannot reliably or easily define the characteristics or benefits they consider most important before they have experienced them. Moreover, even the experience might provide ambiguous information. People have a remarkable difficulty in discerning one taste from another with just their taste buds. Therefore, consumers often rely on a wide range of associations and beliefs based on the packaging design to form judgments. This process can be referred to as a cue utilization process (Olson & Jacoby, 1972; Steenis, Herpen, Van der Lans, Ligthart, & Van Trijp, 2017). Shankar, Levitan, Prescott, and Spence (2009) showed that people rate M&Ms as tasting more intense (i.e., chocolatey) when labelled as 'dark' rather than 'milk' chocolate. This suggests that no more than a single word is needed to modify people's sensory-related judgments about a product. Without a reliable understanding of what their food or drink experience will be like, consumers tend to be overly dependent on design cues and packaging-based marketing claims (Krisha et al., 2017).

Piqueras-Fiszman and Spence (2015) argued consumers' responses to food and beverages are to a large extent driven by the way in which it is named or labelled and by particular sensory descriptive terms that are used in product-related communications. From a neuroscience perspective, Piqueras-Fiszman and Spence (2015) argued that descriptive labels may influence perception by helping to direct a consumer's attention to one element or flavour in food or beverages. In doing so, that element becomes more salient against the variety of other tastes, flavours, aromas, textures, and in-mouth sensations. Naming a particular flavour can help to make it stand out in the consumers' mind against all other sensations they might be experiencing (or may be competing for their attention) at the same time (Herz & Von Clef, 2001). As it where, the textual cues on the packaging design could function as a nudge or a prime to actual perceive the taste characteristics. Accordingly, when looking to other manufacturers in the Dutch beer industry (e.g. Heineken, Amstel, Erdinger), it is being noticed that those brands indicate taste characteristics of their NAB on its packages using taste labels. For instance, textual cues as 'fresh' or 'bitter' are being used.

Okamoto et al. (2009) demonstrated in their study that different tastes were liked better when they were combined with words that were congruent with these tastes. Further research indicates taste perceptions are typically rated as being more intense when a matching taste or flavour description is presented before a product is tasted (Distel & Hudson, 2001). Notably, Lee et al. (2006) reported that verbal cues have the most pronounced effect when provided shortly before consumption. Indicating descriptive information on the consumption packaging of a product is one way in which this could be accomplished. Hence, the following hypotheses are formulated:

H1a: Presenting bitterness- and intensity-related taste labels on the packaging enhances the perceived bitterness, as compared to when those labels are not present.

H1b: Presenting bitterness- and intensity-related taste labels on the packaging enhances the perceived taste intensity, as compared to when those labels are not present.

As mentioned in the introduction, when NAB's taste is perceived more bitter and intense, it can be expected that its perceived taste quality and subsequently its taste liking will increase as well. Hence,

H1c: Presenting bitterness- and intensity-related taste labels on the packaging enhances the perceived taste quality, as compared to when those labels are not present.

H1d: Presenting bitterness- and intensity-related taste labels on the packaging enhances the taste liking, as compared to when those labels are not present.

2.3 Colour

Colour is an important source of information as much as it is estimated that about 62 to 90 per cent of people's assessments and evaluations is based on colours (Singh, 2006). Accordingly, the colour on the product packaging have been shown one of the features that could impact consumer experiences (Becker, Van Rompay, Schifferstein, & Galetzka, 2011; Cheskin, 1957; Liao et al., 2015; Spence et al., 2015; Van Rompay et al, 2016).

Spence et al. (2015) argued the five basic tastes (sweet, sour, salty, bitter, and umami) are matched to particular colours. For instance, high wavelength colours, such as red and orange, are often associated with sweet tastes (Heller, 1999; Koch & Koch, 2003; Spence et al., 2015; Tomasik-Krótki & Strojny, 2008). The colour brown is frequently and significantly associated with a bitter flavour (Heller, 1999; Spence et al., 2015). Using ingredient-related colours on the packaging design that are associated with a certain taste could impact consumers' taste perception. For instance, Cheskin (1957), as cited by Spence (2016), demonstrated that consumers rated 7-Up as tasting more lemony/limy when drinking from a can that was more yellow in colour.

Hops are used in the brewing process to provide bitterness to the flavour of beer (Arrieta, Rodríguez-Méndez, De Saja, Blanco, & Nimubona, 2010). Those hops are depicted on Grolsch 0.0 cans surrounding the company logo. However, those hops are coloured green, which is the same colour as half of the can. One might expect that when those hops are made more vivid, and when this is done using a colour that is strongly associated with bitterness (e.g. brown), the perceived bitterness of the beverage will increase.

Furthermore, there might be a complex network of correspondences, underlying the associations of any specific colour with any particular taste (Spence et al., 2015). One such matching might exist between more intense tastes and more intense (brighter and more saturated) colours. A study conducted by Liao et al. (2015) demonstrated the perceived taste intensity could be increased by using highly saturated colours on the product packaging. Therefore, one might expect when a bright and highly saturated colour brown is used, this would enhance the perceived taste intensity. Hence, the following hypotheses can be formulated:

H2a: Using the colour brown, rather than the current colour green, for the hops on the packaging enhances the perceived bitterness.

H2b: Using the colour brown, rather than the current colour green, for the hops on the packaging enhances the perceived taste intensity.

H2c: Using the colour brown, rather than the current colour green, for the hops on the packaging enhances the perceived taste quality.

H2d: Using the colour brown, rather than the current colour green, for the hops on the packaging enhances the taste liking.

2.4 Line orientation

Another manipulation that could impact consumers' taste perception is the horizontal vs. vertical orientation of the lines depicted on the packaging design. Verticality is often associated with power-related constructs such as strength, quality and luxury (e.g. Van Rompay, De Vries, Bontekoe, & Tanja-Dijkstra, 2012; Van Rompay, Van Hoof, Rorink, & Folsche, 2019). For instance, consider metaphorical phrases in our everyday language such as 'looking up to someone', 'a high class, or up-scale restaurant', 'a high-end fashion store' or 'an uptown girl'. A great deal of our language is metaphorical. A metaphor is a natural phenomenon. The metaphorical meanings depend on the nature of our bodies, our own physical interactions in and with the environment, and our cultural and social practices (Lakoff & Johnson, 2003). Rising or going up requires effort, since you need to overcome the gravitational forces pushing you down. Think, for instance, of going upwards (as when climbing a mountain or pulling yourself up) which requires strength and perseverance. This results in the fact that we look up at heights with a sense of respect or awe. Consumers' implicit association (an association of which we are usually not aware) between verticality and power-related constructs and its effect on product evaluations have been demonstrated in design research.

For instance, Van Rompay et al. (2012) conducted a study about the effects of the orientation of mascara in an ad (vertical vs. horizontal) and the lines depicted on the background of the ad (vertical vs. horizontal) on participants' evaluation of the product. They found the vertically-oriented mascara received a higher power rating compared to the horizontally-oriented mascara. Moreover, the participants rated the mascara as being more luxurious and powerful when the background stripes were depicted vertically as compared to when they were depicted horizontally. Moreover, Machiels

and Orth (2017) investigated whether the shelf orientation (horizontal vs. vertical) had an effect on consumers' expectations of an energy drink. They found the energy drink was perceived more powerful when it was presented on the vertically-orientated shelf as compared to when it was presented on the horizontally-oriented shelf.

In a similar study, Van Rompay et al. (2019) showed that effects of verticality cues extended from product quality and luxury evaluations to taste strength (intensity) evaluations and taste liking. In their experiment, participants in a Dutch coffee shop rated taste strength and taste liking higher when they were exposed to an ad display depicting vertically-oriented rather than horizontally-oriented background imagery. Furthermore, quality perceptions were enhanced when the coffee was associated with a vertically-oriented, rather than a horizontally-oriented display. It is interesting to study whether the beforementioned findings could be extended to a products' packaging design, thereby causing the same effects. Hence, the following hypotheses can be formulated:

H3a: Depicting vertically oriented, rather than horizontally oriented, lines on the packaging increases the perceived bitterness.

H3b: Depicting vertically oriented, rather than horizontally oriented, lines on the packaging increases the perceived taste intensity.

H3c: Depicting vertically oriented, rather than horizontally oriented, lines on the packaging increases the perceived taste quality.

H3d: Depicting vertically oriented, rather than horizontally oriented, lines on the packaging increases the taste liking.

3. Method

In order to find out whether the lacking bitterness and taste intensity found in literature applies to Grolsch 0.0, a taste test was conducted as pre-test. This pre-test is discussed first. Then, the pre-tests conducted to select the brown colour of hops and the style of vertically-oriented lines are discussed.

3.1 Taste pre-test

In this pre-test, a glass Grolsch 0.0 was handed over to the participants without them being exposed to the packaging design. Then, participants had to indicate to what extent they found Grolsch 0.0's taste equalled to certain taste characteristics. The construct perceived taste intensity was measured using four items (e.g. strong, intense, powerful, full, $\alpha = 0.73$), based on Becker et al. (2011) and Van Rompay et al. (2016). The other perceived taste characteristics (e.g. freshness, bitterness) were measured using one item. The survey used in this pre-test is based on standard taste tests used by Grolsch and can be found in appendix A.

The taste test was filled out by 45 participants with an average age of 25 ($M = 25.04$, $SD = 4.94$). 32 taste tests were completed by men (= 71.1%), and 13 were completed by women (= 28.9%). Seven point Likert-scales were used to indicate whether Grolsch 0.0's taste equalled to certain taste characteristics. The outcomes can be found in table 1. For readability purposes, table 1 only shows the outcomes on the most essential taste characteristics. For the complete table, see appendix B. Table 1 shows outcomes based on all participants ($N = 45$). However, if only participants that drink (non-alcoholic) beer were selected, no significant differences appeared (all p's > .05).

Table 1
Mean scores of Grolsch 0.0 on taste characteristics

Taste characteristic	Mean[a)]	Std. dev.[a)]
Fresh	5.36	1.26
Bitter	3.93	1.63
Taste intensity	3.63	1.07

[a)] 7-point Likert scale (1=not at all, 7=very much)

The freshness is, on average, the strongest association consumers have with Grolsch 0.0's taste. This corresponds with the way Grolsch 0.0 is marketed, since it is marketed as a bitter beverage having a fresh and full taste (Grolsch, 2018). Despite this, the scores on bitterness and taste intensity were below the scale midpoint. Based on this, and the fact that these scores do not correspond with the way Grolsch 0.0 is being marketed, it can be concluded that Grolsch 0.0 indeed lacks bitterness and

taste intensity, as was found in the literature. Based on this finding, a taste label is selected mentioning a 'full and bitter taste'.

3.2 Colour pre-test

To find out what type of brown colour was mostly associated with a bitter and intense taste, five colours of hops were pre-tested (see figure 1). In this pre-test, participants were exposed to five designs differing in the colour of hops. Then, they had to indicate the attractiveness of the designs as well as the taste characteristics they would expect after seeing the designs. The construct expected taste intensity was measured using the same four items as were used in the taste pre-test (α = .89) and the expected taste liking was measured using two items: a good taste and tastiness (α = .76). Other measured expected taste characteristics were: freshness, bitterness, and the expected taste quality. The complete survey used in this pre-test can be found in appendix C.

Figure 1. Pre-tested colours of hops. From left to right: light brown (1) , dark brown (2), brown with a yellow tint (3), brown with a red tint (4), and brown with a grey tint (5).

This pre-test was filled out by 38 participants with an average age of almost 23 years old (*M = 22.8, SD = 2.1*). 22 surveys were completed by men (= 57.9%), and 16 were completed by women (= 42.1%). The scores of each design are displayed in table 2.

Table 2
Pre-test colour: design scores on every item

Design	Attractiveness[a)]		Expected quality[a)]		Expected taste intensity[a)]		Expected bitterness[a)]		Expected taste liking[a)]		Expected freshness[a)]	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
1	4.68	1.36	4.68	1.40	4.51	0.95	4.79	1.09	4.89	1.12	4.63	1.50
2	5.29	1.25	4.71	1.39	4.21	1.15	4.50	1.48	4.76	1.10	5.13	1.34
3	4.71	1.59	4.79	1.21	4.53	0.82	4.61	1.24	4.72	1.09	4.50	1.47
4	4.74	1.61	4.76	1.20	4.52	1.10	4.61	1.14	4.50	1.28	4.63	1.46
5	4.63	1.53	4.58	1.29	4.45	0.98	4.53	1.25	4.72	1.15	4.53	1.47

[a)]Measured on a seven point Likert-scale ranging from 'strongly disagree' to 'strongly agree'

As can be found in table 2, design 1 (light brown) was rated highest on expected bitterness and design 3 (brown with a yellow tint) was rated highest on expected taste intensity. However, no significant differences appeared for any measured variables in this pre-test (all *p*'s > .05). Then, the other variables on which design 1 and 3 were rated highest were checked. Next to expected bitterness, design 1 was

rated highest on the expected taste liking. Next to expected taste intensity, design 3 was rated highest on expected taste quality. The colour manipulation mainly applies to ingredient-related characteristics. Design 1 scores highest on corresponding factors. Therefore, design 1 was selected to be the colour of the hops in the main study.

3.3 Line orientation pre-test

In order to decide on what style of vertical lines could be used in the main study, five variations of vertical lines were tested in a third pre-test (see figure 2). In this pre-test, participants were exposed to five designs differing in the style of the vertically-oriented lines. Then, they had to indicate the attractiveness of the design as well as the taste characteristics they would expect from the NAB after seeing the designs. The expected taste intensity was measured using the same four items that were used in the colour and taste pre-test (α = .89) and the expected taste liking was measured using the same two items as used in the colour pre-test (α = .83). Other measured expected taste characteristics were: freshness, bitterness, and taste quality. The complete survey used in this pre-test can be found in appendix D.

Figure 2. Pre-tested styles of vertical lines. From left to right: thin (1), thick (2), sandglass-like (3), point up (4), and point down (5).

This pre-test was filled out by 38 participants with an average age of almost 23 years old (*M = 22.8, SD = 2.1*). 22 surveys were completed by men (= 57.9%), and 16 were completed by women (= 42.1%). The scores of each design are displayed in table 3.

Table 3

Pre-test line orientation: design scores on every item

Design	Attractiveness[a)]		Expected quality[a)]		Expected taste intensity[a)]		Expected bitterness[a)]		Expected taste liking[a)]		Expected freshness[a)]	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
1	4.82	1.77	4.08	1.55	4.32	1.21	4.53	1.35	4.58	1.32	4.66	1.53
2	4.74	1.69	4.84	1.37	4.59	1.09	4.55	1.42	4.51	1.23	4.63	1.28
3	5.05	1.61	4.87	1.51	4.98	1.10	4.71	1.35	4.66	1.38	4.45	1.61
4	5.13	1.26	5.24	1.08	5.06	0.84	4.92	1.12	4.99	1.02	4.55	1.39
5	4.53	1.62	5.00	1.25	4.90	0.93	4.71	1.25	4.72	1.21	4.66	1.36

[a)]Measured on a seven point Likert-scale ranging from 'strongly disagree' to 'strongly agree'

As can be found in table 3, design 4 (point up) was rated highest on almost all measured variables, except for expected freshness. Here, design 5 (point down) was rated highest. However, ANOVA and Bonferroni analyses showed no significant differences between the scores of design 4 and 5 on expected freshness (p = 1.0). For this reason, design 4 was selected to be the verticality manipulation in the main study. No significant differences appeared between any measured variables after being exposed to the selected designs for the colour and the line manipulation.

3.4 Stimuli

Based on the results of the pre-tests, the stimuli were designed for the main study. Eight different stimuli were developed for the current study. The designs varied in whether or not taste labels were present, the colour of hops (green vs. brown), and the line orientation (horizontal vs. vertical). The stimuli designs can be found in figure 3.

Figure 3. Stimuli designs, varying in colour of hops, taste labels, and line orientation

3.5 Research design

The independent variables in the current study consisted of taste labels, colour, and line orientation. This has led to an experimental 2 (colour of hops: green vs. brown) x 2 (taste labels: present vs. not present) x 2 (line orientation: vertical vs. horizontal) between-subjects design, resulting in eight

different stimuli (see table 4). The conditions shown in table 4 are corresponding to the designs shown in figure 3. Moderating variables were the liking of the beer taste, the attitude towards the beer brand Grolsch and towards NAB, and the consumption frequency of alcoholic drinks and (non-alcoholic) beer.

Table 4
Stimuli Conditions in 2x2x2 Between Subjects-Design

Condition	Colour of hops	Textual cues	Line orientation
1	Green	Not present	Horizontal
2	Green	Not present	Vertical
3	Green	Present	Horizontal
4	Green	Present	Vertical
5	Brown	Not present	Horizontal
6	Brown	Not present	Vertical
7	Brown	Present	Horizontal
8	Brown	Present	Vertical

3.6 Participants and procedure

Nederlandse Brouwers (2018) argued that the increasing consumption of NAB takes place mainly because of the increasing popularity of the beverage among young adults (between 25 and 34 years old). Additionally, in many news articles about the increasing popularity of NAB, the millennial generation is considered the consumer group mainly responsible for this rise (Bremmer & Den Hollander, 2018; Kluivers, 2018). Van der Palen (2018) explained especially this generation sees NAB as a good alternative for regular beer, because millennials are very occupied with living a healthy life. Howe and Strauss (2000) define millennials as being born in or after 1982. The authors set the end date of this generation as 2005 (Howe & Strauss, 2007). Hence, this groups exists of people being 13 to 36 years old in 2018. In the Netherlands, the minimum drinking age people need to have before being allowed to drink alcohol is 18 years old. Since NAB could be seen as a first step into drinking regular beer, the current study considers the target group of participants as being between 18 and 36 years old.

In November and December 2018, a taste test was conducted in the canteen in one of the buildings of the University of Twente in the Netherlands. This setting was chosen in order to create an atmosphere in which NAB is usually consumed. See appendix E for an impression of the setting of the main study. People who were qualified (aged between 18 and 36) were approached and asked whether they were willing to participate in a taste test for a new NAB variant of Grolsch. At the recruitment stage, no information about the specific aim of the study was provided. Upon arrival to the experiment setting, the participants were informed that the research was a taste test of a new NAB variant of Grolsch and

that Grolsch created a new design for this new beverage which was shown. Then, 165 millilitre NAB, cooled down to six degrees Celsius, was handed over to the participants. After eating a toast and drinking a glass of water (i.e., to neutralize the taste), the participants started tasting. With the taste test, there was a questionnaire comprising the measurement variables. After completion of the taste test, participants were thanked for their participation and, if interested, informed about the real purpose of the study. Furthermore, after completion, the amount drunk by the participants was measured by the researcher. The study was reviewed and approved by the institutional ethics committee of the University of Twente.

For each condition, 25 valid participants were gathered resulting in a total of 200 participants. 34 more people were approached, but did not want to take part in the taste test. This can be considered the non-response of the current study. Reasons for not wanting to take part were that people never drink beer, are allergic, do not like the beer taste (in the afternoon), have religious reasons, or that people had no time. One participant had to be excluded, because of an age above 36 years old.

Table 5 shows age and gender distributions over the different conditions. An analysis of variance confirmed that age ($F(7, 189) = 1.26$, $p = .27$) and gender ($F < 1$, *ns*) were equally distributed over the conditions. However, a one sample T-test showed a significant difference between the mean age of the target group (27.5) and the mean age of the participants ($t = -16.43$, $p < 001$). Moreover, ANOVA analysis confirmed that the liking of beer taste, the consumption of alcoholic drinks, regular beer and NAB, the attitude towards Grolsch, and the attitude towards NAB were equally distributed over the conditions as well (all p's > .05).

Table 5
Age and gender distribution over conditions

Condition	N	Age[a)]		Gender	
		Mean	Std. dev.	Male	Female
1	25	24.16	3.17	68%	32%
2	25	22.68	3.51	56%	44%
3	25	23.20	3.62	68%	32%
4	25	23.40	3.19	52%	48%
5	25	24.29	3.77	56%	44%
6	25	23.26	4.19	52%	48%
7	25	24.24	3.54	64%	36%
8	25	22.12	2.67	76%	24%
Total	200	23.42	3.49	61.5%	38.5%

[a)] Self-reported on 18 to 36 scale

3.7 Measurements

This section discusses what measurement scales were used in the main study. All variables were measured on a seven point Likert-scale ranging from 'strongly disagree' to 'strongly agree'. The complete survey can be found in appendix F.

Perceived taste characteristics

The perceived taste characteristics measured in the main study were freshness, bitterness, sweetness, sourness, taste quality, and taste intensity. Perceived freshness, bitterness, sweetness, and sourness were measured using a one-item measure. Taste quality was measured with three items: high quality, exclusive, and premium (α = .70). Based on Becker et al. (2011) and Van Rompay et al. (2016), the perceived taste intensity was measured using four items: strong, full, powerful, and intense (α = .79).

Taste liking

The taste liking was measured using three items (i.e., good, tasty, pleasant), based on Van Rompay et al. (2019) (α = .87).

Purchase intention

The willingness of the participants to buy the NAB after tasting was seen as the purchase intention and was measured using one item: '*When I am in the supermarket, I would consider buying this non-alcoholic beer*'.

Attitude towards Grolsch

The attitude towards Grolsch was measured using four items, based on Yi and Joan (2003) (α = .91). Those items were: '*I like Grolsch more than other beer brands', 'I have a strong preference for the beer brand Grolsch', 'I give prior consideration to Grolsch when I want to buy beer',* and *'I would recommend Grolsch to others'*.

The attitude towards NAB

The attitude towards the product category of NAB was measured using a three-item measure, based on Stuart, Shimp, and Engle (1987) (α = .71). Those items were: *'In general, I like the taste of non-alcoholic beer', 'It leaves me a good feeling when I drink non-alcoholic beer',* and *'I think non-alcoholic beer is a good beer variant'*.

Control variables

First, the extent to which the NAB was perceived to be different from regular beer was measured. A reason to measure this variable was to find out what taste characteristics lead to a bigger or smaller perceived difference with regular beer. Second, the extent to which the NAB was perceived lemonade-like was measured as a control variable for perceived sweetness. It is expected that when a drink is perceived more sweet, it is perceived more lemonade-like as well. Last, the extent to which the NAB was perceived sessionable was measured. 'Sessionability' is a term used by Grolsch in their taste measurements. If a beverage is sessionable, it is easy and pleasant to drink multiple of it in a single 'session' (A. Huizing-Charlak, personal communication, January 29, 2019). The amount consumers drank was measured to find out whether the amount was correlating with the extent to which participants indicated the NAB as sessionable.

4. Results

First, a correlation analysis is presented that shows existing correlations between the measurement variables. Second, a univariate analysis of variance was conducted to analyse the effects of the manipulations on the dependent variables and control variables. In both analyses, an alpha of .05 was used to look for significant effects.

4.1 Correlation analysis

Table 6 presents the correlations between all measurement variables. This table shows significant correlations between several taste characteristics. For instance, as assumed, the perceived bitterness and taste intensity were correlated (r = .33, p < .001). This means, there was a moderately positive correlation between perceived bitterness and taste intensity and that about 10.8 percent (r^2) of the variation of perceived taste intensity could be explained by the perceived bitterness, and vice versa. Furthermore, taste liking was positively correlated with perceived taste intensity (r = .21, p = .003) and freshness (r = .37, p < .001). However, taste liking was negatively correlated with perceived sourness (r = -.25, p < .001). Similarly, purchase intention was correlated with the same taste characteristics in the same direction, but to another extent.

As expected, the control variable perceived lemonade-likeness was significantly correlated to perceived sweetness (r = .35, p < .001). However, remarkably, no significant correlation was found between the control variables quaffable and the amount of consumption (r = .08, p = .26). This means that, in this case, participants did not behave along with what they filled out in the questionnaire. Interestingly, the perceived difference from regular beer was significantly and positively correlated to perceived sweetness (r = .27, p < .001), and negatively to perceived bitterness (r = -.17, p = .02) and taste intensity (r = -.25, p < .001).

Table 6

Correlations between measurement variables

Measure	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*
1. Bitterness	1.00														
2. Taste intensity	.33*	1.00													
3. Freshness	-.20*	.05	1.00												
4. Sweetness	-.28*	.04	.25*	1.00											
5. Sourness	.23*	.03	-.11	-.03	1.00										
6. Perceived taste quality	.06	.37*	.42*	.13	-.01	1.00									
7. Taste liking	-.07	.21*	.37*	.07	-.25*	.55*	1.00								
8. Purchase intention	.03	.18*	.24*	.02	-.21*	.46*	.46*	1.00							
9. Difference from regular beer	-.25*	-.17*	.10	.27*	.01	-.01	-.15*	-.12	1.00						
10. Lemonade-likeness	-.30*	-.07	. 13	.35*	.08	-.04	-.10	-.11	.32*	1.00					
11. Sessionability	-.22*	-.09	.28*	.07	-.24*	.22*	.52*	.26*	.06	.06	1.00				
12. Amount of consumption	.14*	.03	.06	-.06	.15*	.18*	.06	-.01	-.01	-.03	.08	1.00			
13. Attitude towards Grolsch	-.07	.12	.16*	.10	-.02	.19*	.17*	.18*	.15*	-.01	.14	-.03	1.00		
14. Attitude towards NAB	.03	.19*	.16*	-.05	-.12	.41*	.47*	.55*	-.15*	.09	.30*	.11	.07	1.00	
15. Liking beer taste	-.03	.05	.11	.18*	.01	.14*	.08	.00	.21*	.06	.08	.23*	.05	-.04	1.00

* $p < .05$

4.2 Manipulation effects

4.2.1 Perceived taste characteristics

The perceived taste characteristics measured in the current study were bitterness, taste intensity, freshness, sweetness, and sourness.

Bitterness

An ANOVA analysis with bitterness as dependent variable revealed no significant main effect of colour of hops ($F < 1$, *ns*), taste labels ($F < 1$, *ns*), or line orientation ($F(1, 192) = 1.22$, $p = .27$). Similarly, no interaction effects were found either (colour of hops x taste labels: $F < 1$, *ns*; colour of hops x line orientation: $F < 1$, *ns*; taste labels x line orientation: $F(1, 192) = 1.02$, $p = .31$; colour of hops x taste labels x line orientation: $F < 1$, *ns*). As it was expected from the manipulations to have an effect on the perceived bitterness, these findings did not support hypothesis 1a, 2a, and 3a.

Taste intensity

An ANOVA analysis with taste intensity as dependent variable revealed no significant main effect of colour of hops, taste labels, or line orientation (all F's < 1, *ns*). Again, no interaction effects were found either (colour of hops x taste labels: $F < 1$, *ns*; colour of hops x line orientation: $F(1, 192) = 1.21$, $p = .27$; taste labels x line orientation: $F < 1$, *ns*; colour of hops x taste labels x line orientation: $F < 1$, *ns*). Since it was expected from the manipulations to have an effect on the perceived taste intensity, these findings did not support hypothesis 1b, 2b, and 3b.

Freshness

An ANOVA analysis with perceived freshness as dependent variable showed a marginally significant effect of colour of hops on perceived freshness ($F(1, 192) = 3.58$, $p = .06$). This suggests that when the colour of hops was brown, the NAB was perceived more fresh than when the colour of hops was green ($M = 5.76$, $SD = 1.06$, versus $M = 5.46$, $SD = 1.20$). In contrast, no significant main effect of taste labels or line orientation was found (both F's > 1, *ns*). However, an interaction effect of taste labels x line orientation was found (F (1, 192) = 5.15, $p = .02$). A pairwise comparisons analysis showed that a significant difference existed between the line orientation (vertical vs. horizontal) when the taste labels were not present ($p = .04$). When the taste labels were not present, the horizontal line orientation resulted in higher perceived freshness as compared to the vertical line orientation ($M = 5.86$, $SD = .99$, versus $M = 5.40$, $SD = 1.31$, see figure 4). In contrast, as can be seen in figure 4, when taste labels were present, the condition with vertical line orientation resulted in higher perceived freshness as compared to the horizontal line orientation ($M = 5.46$, $SD = 1.25$, versus, $M = 5.72$, $SD = .93$). However, this

difference was not significant (p = .25). No other interaction effects were found (colour of hops x taste labels: $F(1, 192) = 1.02$, p = .32; colour of hops x line orientation: $F < 1$, *ns*; colour of hops x taste labels x line orientation: $F(1, 192) = 2.23$, p = .13).

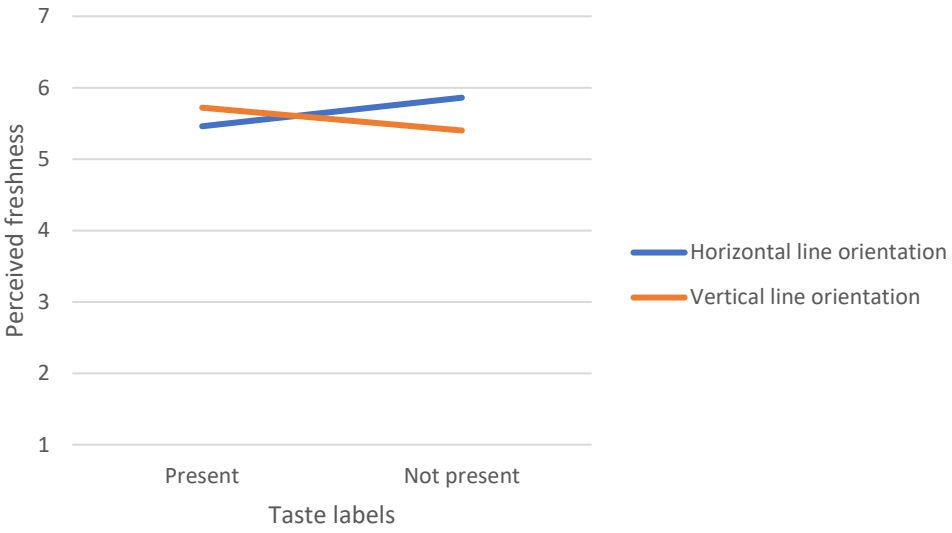


Figure 4. Mean perceived freshness as a function of taste labels and line orientation

Sweetness

An ANOVA analysis with perceived sweetness as dependent variable revealed no significant main effect of colour of hops or line orientation (both F's < 1, *ns*). However, a marginally significant effect of taste labels was found ($F(1, 192) = 3.51$, p = .06). This suggests that when taste labels were present, the NAB was perceived more sweet as compared to when taste labels were not present (M = 4.45, SD = 1.55, versus M = 4.03, SD = 1.59). Since the taste labels indicated an intense and bitter taste, this is a remarkable finding. Further, no significant interaction effects were found (colour of hops x taste labels: $F < 1$, *ns*; colour of hops x line orientation: $F < 1$, *ns*; taste labels x line orientation: $F(1, 192) = 1.35$, p = .25; colour of hops x taste labels x line orientation: $F < 1$, *ns*).

Sourness

An ANOVA analysis with perceived sourness as dependent variable showed no significant main effect of colour of hops ($F(1, 192) = 1.05$, p = .31), taste labels ($F(1, 192) = 1.05$, p = .31), or line orientation ($F < 1$, *ns*). A marginally significant interaction effect was found between colour of hops x taste labels ($F(1, 192) = 3.13$, p = .08). A pairwise comparisons analysis showed that the effect of colour of hops on perceived sourness was significant when taste labels were not present ($F(1, 192) = 3.13$, p = .05). When taste labels were not present, the NAB was perceived significantly more sour when the colour of hops

was brown as compared to when the colour of hops was green (M = 3.36, SD = 1.60, versus M = 2.76, SD = 1.45, see figure 5). In contrast, as can be seen in figure 5, when taste labels were present, the green colour of hops resulted in a slightly higher perceived sourness as compared to the brown hops (M = 2.76, SD = 1.36, versus M = 2.92, SD = 1.63). However, this difference was not significant (p = .60). Further, no significant interaction effects were found (colour of hops x line orientation: F < 1, *ns*; taste labels x line orientation: F < 1, *ns*; colour of hops x taste labels x line orientation: $F(1, 192) = 2.22$, p = .14).

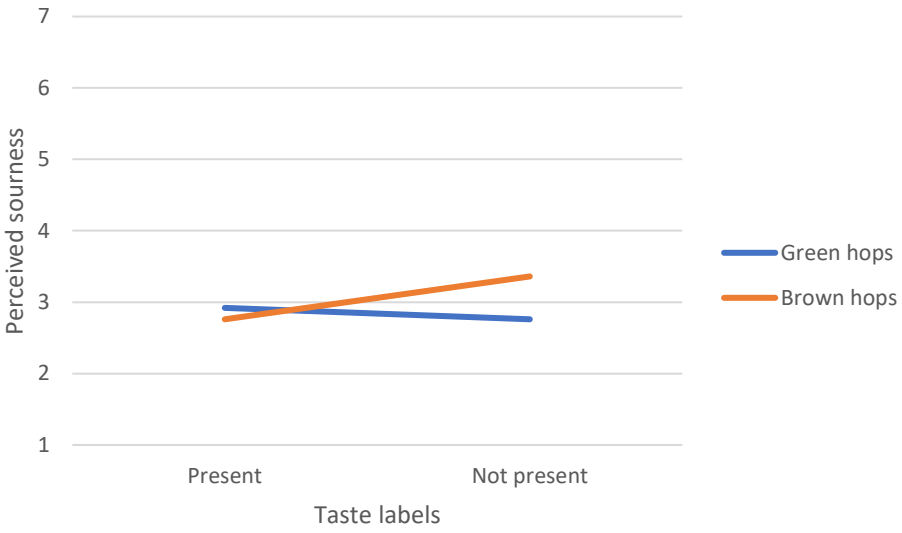


Figure 5. Mean perceived sourness as a function of taste labels x colour of hops

4.2.2 Perceived taste quality

An ANOVA analysis with perceived taste quality as dependent variable revealed a significant main effect of colour of hops ($F(1, 192) = 4.57$, p = .03), showing that the taste quality was perceived significantly higher when the colour of hops was brown as compared to when the hops were green (M = 4.67, SD = .85, versus M = 4.41, SD = .86). This means, hypothesis 2c was supported. Further, no significant main effects were found for taste labels and line orientation (both F's < 1, *ns*). According to these findings, hypotheses 1c and 3c could not be supported. Similarly, no significant interaction effects were found either (colour of hops x taste labels: F < 1, *ns*; colour of hops x line orientation: $F(1, 192) = 1.20$, p = .27; taste labels x line orientation: F < 1, *ns*; colour of hops x taste labels x line orientation: $F(1, 192) = 2.19$, p = .14).

4.2.3 Taste liking

An ANOVA analysis with taste liking as dependent variable revealed no significant main effects for taste labels or line orientation (both F's < 1, *ns*). In contrast, a main effect of colour of hops was found (F (1,

192) = 4.52, p = .04), showing that the taste was significantly more liked when the colour of hops was brown as compared to when this colour was green (M = 5.57, SD = .75, versus M = 5.30, SD = 1.05). For colour of hops, an interaction effect with line orientation was found as well (F (1, 192) = 4.14, p = .04). A pairwise comparisons analysis showed that the effect of the colour of the hops was significant, only when the line orientation was horizontal (p = .004). When the line orientation was horizontal, and the hops were coloured brown, the taste liking was significantly higher than when the colour of the hops was green (M = 5.64, SD = .73, versus M = 5.11, SD = 1.11, see figure 6). In contrast, as can be seen in figure 6, when the line orientation was vertical, no significant difference appeared between the green hop and the brown hop condition (M = 5.49, SD = .96, versus, M = 5.51, SD = .76, p = .94). For this reason, hypothesis 2d was supported, but only when the line orientation was horizontal. The other hypotheses about taste liking (1d, 3d) could not be supported.

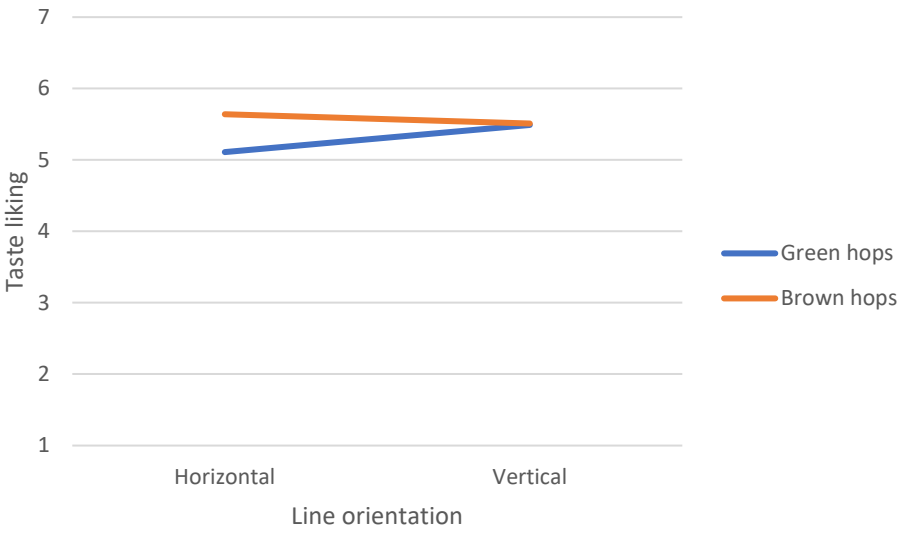


Figure 6. Mean taste liking as a function of line orientation x colour of hops

4.2.4 Purchase intention

An ANOVA analysis with purchase intention as dependent variable revealed no significant main effects of colour of hops, taste labels, or line orientation (all F's < 1, *ns*). Similarly, no interaction effects were found either (colour of hops x taste labels: F < 1, *ns*; colour of hops x line orientation: F < 1, *ns*; taste labels x line orientation: F < 1, *ns*; colour of hops x taste labels x line orientation: F(1, 192) = 1.18, p = .28).

4.2.5 Difference from regular beer

An ANOVA analysis with perceived difference from regular beer as dependent variable revealed no significant main effects of colour of hops, taste labels, or line orientation (all *F*'s < 1, *ns*). However, an interaction effect of colour of hops x line orientation was found (F (1, 192) = 7.08, p = .01). A pairwise comparisons analysis showed that when the line orientation was vertical, the difference between the brown and the green coloured hops was significant (p = .03). When the line orientation was vertical, the NAB was perceived more different from regular beer when the hops were coloured brown than when the colour of the hops was green (M = 5.22, SD = 1.37, versus M = 4.62, SD = 1.50, see figure 7). In contrast, as can be seen in figure 7, when the line orientation was horizontal, no significant difference in the perceived difference between NAB and regular beer appeared between the brown hops and the green hops (M = 4.68, SD = 1.42, versus M = 5.12, SD = 1.22, p = .11). Further, no interaction effects were found (colour of hops x taste labels: F < 1, *ns*; taste labels x line orientation: F < 1, *ns*; colour of hops x taste labels x line orientation: F(1, 192) = 3.03, p=.08), although the three-way interaction is marginally significant.

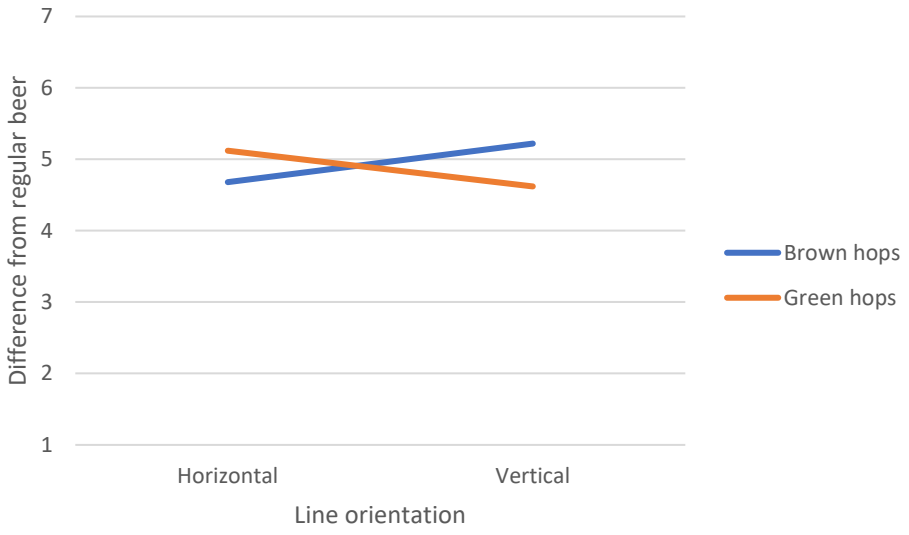


Figure 7. Mean difference from regular beer as a function of line orientation x colour of hops

4.2.6 Lemonade-likeness

An ANOVA analysis with the perceived lemonade-likeness as dependent variable revealed no significant main effects of colour of hops (F(1, 192) = 1.93, p = .17), taste labels (F(1, 192) = 1.93, p = .17), or line orientation (F < 1, *ns*).

No interaction effects were found either (colour of hops x taste labels: F < 1, *ns*; colour of hops x line orientation: F < 1, *ns*; taste labels x line orientation: F < 1, *ns*), except for the three-way interaction

between colour of hops x taste labels x line orientation ($F(1, 192) = 6.77$, $p = .01$). Here, the most pronounced effect occurred when the line orientation was horizontal, and the colour of hops was green between whether taste labels were present or not. In this case, when taste labels were not present, the NAB was perceived more lemonade-like than when taste labels were present ($M = 3.96$, $SD = 1.72$, versus $M = 2.68$, $SD = 1.35$, see figure 8). In contrast, as can be seen in figure 8, with green hops and vertical line orientation, the presence of taste labels resulted in a higher lemonade-like experience of the beverage as compared to when the taste labels were not present ($M = 2.84$, $SD = 1.68$, versus $M = 3.20$, $SD = 1.55$). However, this difference was much less pronounced than the effect with the horizontal line orientation.

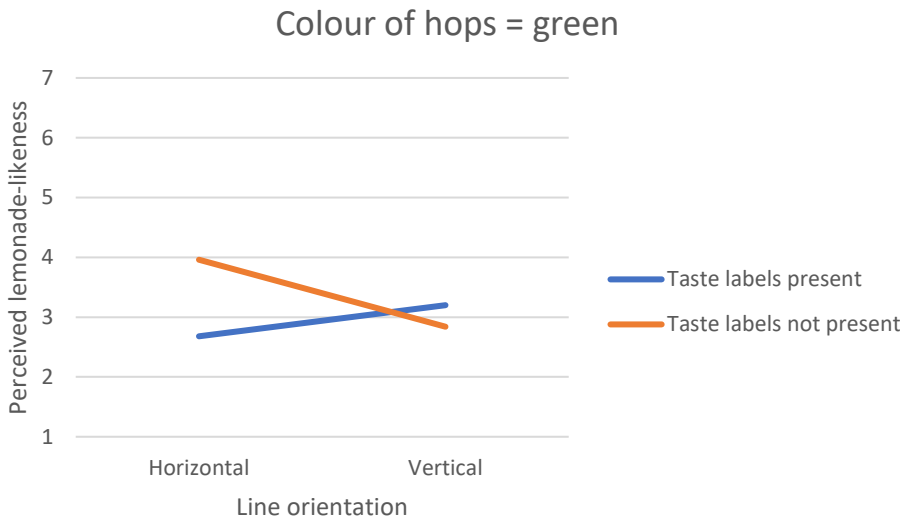


Figure 8. Mean lemonade-like as a function of line orientation x taste labels (green hops)

4.2.7 Sessionablility

As mentioned, the perceived sessionability indicates the extent to which a beverage is pleasant and easy to drink more of it in a single session. An ANOVA analysis with sessionable as dependent variable revealed no significant main effect of colour of hops ($F < 1$, *ns*), taste labels ($F(1, 192) = 1.19$, $p = .28$), or line orientation ($F < 1$, *ns*). Similarly, no interaction effects were found either (colour of hops x taste labels: $F(1, 192) = 1.48$, $p = .23$; colour of hops x line orientation: $F < 1$, *ns*; taste labels x line orientation: $F < 1$, *ns*; colour of hops x taste labels x line orientation: $F < 1$, *ns*).

4.2.8 Amount of consumption

An ANOVA analysis with amount of consumption as dependent variable showed a marginally significant effect of colour of hops ($F(1, 192) = 3.52$, $p = .06$). This suggests that when the colour of hops was brown, the amount the participants drank was higher as compared to when the colour of

hops was green (*M* = 95.25, *SD* = 52.77, versus *M* = 80.85, *SD* = 56.84). Further, no significant main effects were found for taste labels or line orientation (both *F*'s < 1, *ns*). No significant interaction effects were found either (colour of hops x taste labels: $F(1, 192) = 2.09$, $p = .15$; colour of hops x line orientation: $F < 1$, *ns*; taste labels x line orientation: $F < 1$, *ns*), except for the three-way interaction colour of hops x taste labels x line orientation ($F(1, 192) = 6.65$, $p = .01$). Here, the most pronounced effect was the difference between whether or not taste labels were present when the line orientation was vertical and the colour of hops was brown. When this was the case, and taste labels were present, participants drank more than when taste labels were not present (*M* = 110.60, *SD* = 57.12, versus *M* = 74.80, *SD* = 45.47, see figure 9). In contrast, as can be seen in figure 9, when the colour of the hops was brown and the line orientation was horizontal, the presence of taste labels resulted in a reverse effect. In this case, the presence of taste labels resulted in a higher amount of consumption as compared to when the taste labels were not present (*M* = 94.40, *SD* = 55.91, versus *M* = 101.20, *SD* = 48.07). However, this effect was much less pronounced than the effect with the vertical line orientation.

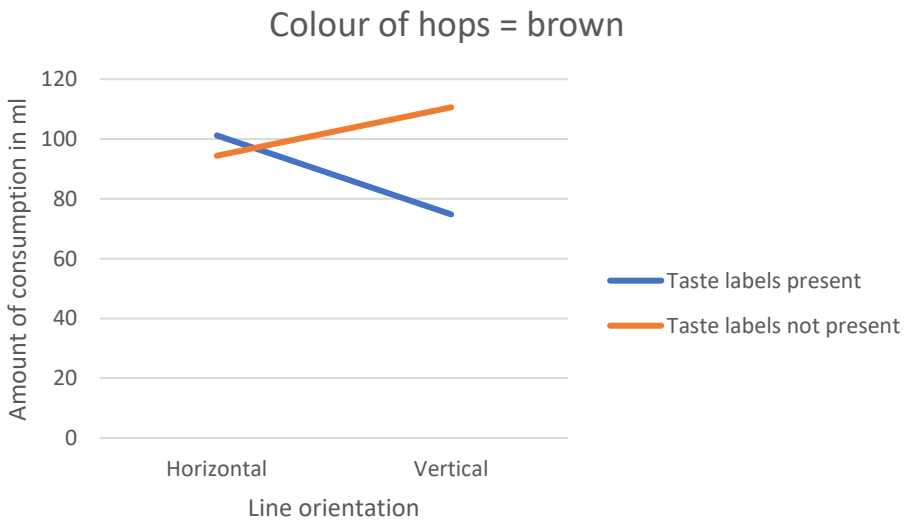


Figure 9. Mean amount of consumption as a function of line orientation x taste labels (brown hops)

4.3 Additional analyses

A marginally significant effect of taste labels was found, suggesting that when taste labels were present, the NAB was perceived more sweet as compared to when taste labels were not present. This is remarkable, since the taste labels indicated an intense and bitter taste, and those taste characteristics were negatively correlated to sweetness (see table 6). Further analysis revealed that the effect of taste labels on perceived sweetness was significant for women ($F(1, 192) = 6.43$, $p = .01$), but not for men ($F(1, 192) = .17$, $p = .68$). Women perceived the taste more sweet when taste labels

were present as compared to when they were not present (*M* = 4.94, *SD* = 1.39, versus *M* = 3.00, *SD* = 1.50).

Another difference in gender was found for perceived taste quality. Further analysis showed that the significant effect of colour of hops on perceived taste quality only appeared for men ($F(1, 192) = 5.16$, $p = .03$), but not for women ($F < 1$, *ns*). This means that men perceived the taste of significantly higher quality when the beverage was served in the can with brown hops as compared to the can with green hops. However, no significant effect appeared. For this reason, hypothesis 2c could be supported, but only for men.

No significant main effects of any manipulations were found for perceived lemonade-likeness. However, for males, a significant main effect of taste labels on perceived lemonade-likeness was found ($F(1, 192) = 8.49$, $p = .004$), meaning that males perceived the NAB more lemonade-like when taste labels were not present than when taste labels were present (*M* = 3.84, *SD* = 1.87, *M* = 2.94, *SD* = 1.49). In contrast, for females, a significant main effect of colour of hops on perceived lemonade-likeness was found ($F(1, 192) = 8.85$, $p = .05$). This effect revealed that females found the NAB more lemonade-like when the colour of the hops was brown as compared to when the colour of the hops was green (*M* = 3.61, *SD* = 1.59, versus *M* = 2.95, *SD* = 1.41).

4.4 Overview of the hypotheses

Table 7 presents an overview of the hypotheses and whether they can be supported or not, based on the study's findings.

Table 7
Overview of the hypotheses

Hypotheses	Supported
H1a: Presenting bitterness- and intensity-related taste labels on the packaging enhances the experienced bitterness, as compared to when those labels are not	Not supported
H1b: Presenting bitterness- and intensity-related taste labels on the packaging enhances the experienced taste intensity, as compared to when those labels are	Not supported
H1c: Presenting bitterness- and intensity-related taste labels on the packaging enhances the perceived taste quality, as compared to when those labels are not	Not supported
H1d: Presenting bitterness- and intensity-related taste labels on the packaging enhances the taste liking, as compared to when those labels are not present.	Not supported
H2a: Using the colour brown, rather than the current colour green, for the hops on the packaging enhances the perceived bitterness.	Not supported
H2b: Using the colour brown, rather than the current colour green, for the hops on the packaging enhances the perceived taste intensity.	Not supported
H2c: Using the colour brown, rather than the current colour green, for the hops on the packaging enhances the perceived taste quality.	Partly supported
H2d: Using the colour brown, rather than the current colour green, for the hops on the packaging enhances the taste liking.	Partly supported
H3a: Depicting vertically oriented, rather than horizontally oriented, lines on the packaging increases the perceived bitterness.	Not supported
H3b: Depicting vertically oriented, rather than horizontally oriented, lines on the packaging increases the perceived taste intensity.	Not supported
H3c: Depicting vertically oriented, rather than horizontally oriented, lines on the packaging increases the perceived taste quality.	Not supported
H3d: Depicting vertically oriented, rather than horizontally oriented, lines on the packaging increases the taste liking.	Not supported

5. Discussion

The aim of this research was to find out what impact the product packaging of NAB has on consumers' taste perception and product evaluation. The focus was mainly on manipulating the perceived bitterness and taste intensity of the beverage, and subsequently the perceived taste quality and taste liking. Based on previous research, it was hypothesized that these taste evaluations would be influenced by taste labels (e.g. Krishna et al., 2017; Piqueras-Fiszman, & Spence, 2015), colour (e.g. Spence et al., 2015), and line orientation (e.g. Van Rompay et al., 2019).

The current study did not find any significant effects for confirmation of the hypotheses due to the taste labels indicating a bitter and intense taste. This is in contrast with findings of Herz and Von Clef (2001) and Shankar et al. (2009). A possible explanation for this is offered by Distel and Hudson (2001). These authors stated that taste characteristics were perceived more intense when a matching taste description was presented before a product was tasted. However, if the taste of NAB is not perceived bitter or intense, this could lead to a contrast effect, as explained by the Social Judgment Theory. This theory argues that when a message falls too far from a person's anchor position, this leads to the rejection of a message (Gass, & Seiter, 2016). In this case, the gap between the expected bitter and intense taste created by the packaging, and the actual taste experience (in terms of bitterness and taste intensity) could have been too large. As a result, participants associated the NAB with a reverse taste (e.g. sweetness).

This clarifies the remarkable finding of the significant increasement of perceived sweetness for women by the presence of taste labels indicating a bitter and intense taste. However, for men taste labels seemed to have had somewhat of the intended effect, since men perceived the NAB significantly less lemonade-like after exposure to the packaging design containing taste labels as compared to when the taste labels were not present. A possible explanation for the differences due to gender was given by Chaya et al. (2015). They found that women rated the pleasure associated with NAB significantly lower than men. This means that the taste perception of men and women is somewhat different and could have affected their taste perception and product evaluation.

The colour manipulation did not have a significant effect on neither perceived bitterness nor taste intensity. These findings are in contrast with findings by Spence et al. (2015), Cheskin (1957), and Liao et al. (2015). However, Cheskin (1957) used ingredient-related colours to impact the taste experience. In the current study, brown is used to colour the hops. However, the brown colour used in the current study does not correspond with the colour hops have in reality. This is more a green colour. In contrast,

significant effects of colour were found on perceived taste quality and taste liking, which were found to be correlated. The taste was perceived of higher quality when the hops were brown as compared to when the colour of hops was green. Accordingly, the taste was more liked in this situation as well. When the colour of the hops was brown, the perceived taste quality and taste liking were not the only variables that were higher than when the colour of hops was green. Similarly, the beverage was perceived more fresh and the amount of consumption was higher.

Based on the current study, it cannot be determined whether the effects found for the colour manipulation were due to the change in colour or because of the fact that the hops were more vivid on the packaging design. This remains a question, which can be investigated in future research.

Further, no significant effects were found due to the line orientation on the packaging design. The current study investigated whether findings by Van Rompay et al. (2012), Machiels and Orth (2017), and Van Rompay et al. (2019) could be extended to the product packaging design, thereby finding the same effects on taste perception and product evaluation. Those studies used line manipulations depicted on an advertisement poster or another context variable. The results of the current study suggest that the effects of line orientation do not apply when this manipulation is depicted on the product packaging. However, not finding any main effects due to the line orientation could have been caused by the subtleness of the manipulations or because of the fact that a known beer brand was used as well. This is discussed in the limitations section.

Different variables were shown to be correlated in this research. In line with previous findings, the difference between regular beer and NAB was negatively correlated with taste intensity (Chaya et al., 2015; Silva, Jager, Van Bommel, et al., 2016) and bitterness (Bierista, 2017; Cramwinkel, Mazijk-Bokslag, Labrijn, & Lam, 1991; Oudejans, & Spits, 2017). Additionally, those two taste characteristics were found to be correlated, as was found by Kaneda, et al., (2002) and Van Rompay et al. (2016). The current study adds to the clarification of the perceived difference between regular beer and NAB that NAB is perceived more sweet. As expected, NAB's perceived taste intensity was positively correlated to both perceived taste quality and taste liking. In contrast, bitterness was not significantly correlated to these variables.

A remarkable correlation of perceived bitterness was found. Bitterness is negatively correlated to the extent to which the NAB was perceived sessionable. This means that when the beverage was perceived more bitter, it was perceived less sessionable. In contrast, a positive correlation was found between

the perceived bitterness and the amount consumers drank. This means that when the NAB was perceived more bitter, a bigger amount was consumed. Those effects seem to contradict.

However, a possible explanation was found, since the perceived bitterness was negatively correlated to the perceived difference between NAB and regular beer. This means that when the NAB was perceived more bitter, it was perceived more similar to regular beer. Then, a negative correlation was found between the perceived difference between NAB and regular beer and taste liking, meaning that when the NAB was perceived more different from regular beer, the taste liking decreased. So, if the beverage was perceived more bitter, the perceived difference from regular beer decreased, and, in turn, the taste liking increased. Accordingly, taste liking was positively correlated to the perceived taste quality.

5.1 Limitations

In this study, there are some limitations noteworthy. First, a known beer brand in the Netherlands was used, meaning participants already had strong associations with the brand. This was especially true in the area of research, since the brand's headquarters is located in the same city as where the experiments were conducted. If the research would have been conducted using an unknown brand or a brand that evoked less strong associations, the results could have differed. Perhaps, in this scenario, the perceived taste characteristics could be influenced by the packaging design more easily.

Second, the current study made use of subtle manipulations on the can of NAB. Although the study was conducted as realistic as possible, the results could have been different if the manipulations would have been more obvious. Third, the packaging design of the NAB was the only medium used in the current study to impact consumers' taste perception and product evaluation. In other studies (Machiels, & Orth, 2017; Van Rompay et al., 2012; Van Rompay et al., 2019), posters or ad displays were used. If more mediums were used to communicate the same message to consumers, effects on taste perception and product evaluation could have been more pronounced. Fourth, often, NAB is consumed during summer. For instance, on a terrace with friends. The current study was conducted during winter months. During this time of the year, it felt unusual to consume NAB, as indicated by several participants. This difference in seasons may have affected consumers' responses.

Lastly, Lee, Fredrick, and Ariely (2006) stated that the product's packaging should have the most pronounced effect on consumers' experience when it would be provided shortly before consumption. In the experiments, the manipulated designs only were shown to the participants before they started

tasting the NAB from another glass. Perhaps, if the participants would have had the opportunity to fill their own glasses with the manipulated cans, the impact of the manipulations would have been more pronounced. However, due to time and cost constrains, it was not possible to create more than one prototype of each design.

5.2 Implications and recommendations for future research

The current research shows manners in which NAB can be perceived differently in terms of taste characteristics as well as it shows ways in which the purchase intension and amount of consumption could be increased and the difference with regular beer could be decreased. This means, the results in this study could be used to contribute to the current rise of NAB consumption. If results in this report are used by beer manufacturers, this could contribute to more satisfied customers and, consequently, lead to more positive attitudes towards NAB. This attitude was found to be positively correlated with important perceived taste characteristics and purchase intention. This means when beer manufacturers can create a more positive attitude towards NAB, eventually, this will lead to higher sales figures.

The current study offers company-specific implications as well. The current packaging design of Grolsch 0.0 has green hops, horizontal line orientation, and no taste labels. Various increasements of perceived taste characteristics were found by changing the colour of hops into brown. This offers implications to improve consumers' taste evaluation and product experience of Grolsch 0.0 only by making small adjustments to the current design of the can.

For future research it is recommended to overcome the limitations of the current study, for instance, by using a brand that evokes less strong associations or a totally unknown brand. Then, the current study made use of a single exposure to impact consumers' taste perception and product evaluation. It would be interesting to investigate the impact of long-term exposure of the manipulations on consumers' responses.

As mentioned in the discussion, the effects found on the occasion of the colour of hops could have been caused by the change in colour from green to brown, or the fact that the hops on the packaging were more vivid when these were depicted in brown. For future research, it is recommended to look into this effect to answer this question. Furthermore, something compelling would be to compare consumer's NAB taste evaluations in summer and in winter.

Another interesting subject for future research is to look into the impact of tactile elements on the consumer experience of NAB, as the current study only focused on visual elements. Studies by Krishna and Morrin (2008), Ludden and Van Rompay (2015), and Piqueras-Fiszman and Spence (2012) showed the impact of tactile elements on consumer responses. With current technological advancements, 3D-printing could offer an opportunity here. Different researches already applied this method to other products, such as Van Rompay et al. (2016). It would be interesting to see whether this applies to NAB as well. Since it is expected that NAB's increasing popularity develops further, NAB could, or should, become a more popular product to do research for. For instance, the current research focused on beer cans. Future studies could focus more on beer glasses (e.g. Mirabito et al., 2017) or bottles to see whether differences occur. Here, tactile elements will be even more interesting.

Conclusion

After this research, it can be concluded that a large perceived difference between regular beer and NAB is associated with a high level of perceived sweetness and a low level of perceived taste intensity and bitterness. However, the packaging design could be used to diminish this difference. The current study shows the impact of taste labels, colour, and line orientation on consumers' taste perception and product evaluation. However, if a beverage is not experienced a certain way, it is hard to let consumers experience it that way only by using the packaging design. Furthermore, it turned out to be difficult to achieve predetermined changes in taste characteristics when using subtle manipulations on the packaging design for a brand that already evokes strong associations. However, in conclusion, the packaging design definitely influences consumers' taste perception and product evaluation for NAB.

6. References

Allison, R. I., & Uhl, K., P. (1964). Influence of beer brand identification on taste perception. *Journal of Marketing Research, 1*(3), 36-39. doi: 10.2307/3150054

Arrieta, A. A., Rodríguez-Méndez, M. L., De Saja, J. A., Blanco, C. A. & Nimubona, D. (2010). Prediction of bitterness and alcoholic strength in beer using an electronic tongue. *Food Chemistry, 123*(3), 642-646. doi: 10.1016/j.foodchem.2010.05.006

Becker, L., Van Rompay, T. J. L., Schifferstein, H. N. J., & Galetzka, M. (2011). Tough package, strong taste: The influence of packaging design on taste impressions and product evaluations. *Food Quality and Preference 22*(1)*,* 17-23. doi:10.1016/j.foodqual.2010.06.007

Bierista. (2017). Alcoholvrij niet meer te onderscheiden van echt pilsener? Retrieved October 12, 2018, from: https://www.bierista.nl/biernieuws/actueel/alcoholvrij-bier-pilsener/

Bremmer, D. & Den Hollander, E. (2018). Waarom alcoholvrij bier nu wél hip en sexy is. Retrieved October 17, 2018, from: https://www.deondernemer.nl/nieuwsbericht/173845/alcoholvrij-hip-sexy

Cambridge Dictionary. (2018). Quaffable. Retrieved November 25, 2018, from: https://dictionary.cambridge.org/dictionary/english/quaffable

Cardello, A. V. (1994). Consumer expectations and their role in food acceptance. In MacFie, H. J., & Thomson, D. M. H. (Eds.), *Measurement of Food Preferences*, 253-297. London: Blackie Academic.

Carporale, G., & Monteleone, E. (2004). Influence of information about manufacturing process on beer acceptability. *Food Quality and Preference, 15*, 271-278. doi: 10.1016/S0950-3293(03)00067-3

Carvalho, F., R., Wang, Q. J., Van Ee, R., & Spence, C. (2016). The influence of soundscapes on the perception and evaluation of beers. *Food Quality and Preference, 52*, 32-41. doi: 10.1016/j.foodqual.2016.03.009

Chaya, C., Eaton, C., Hewson, L., Vázquez, R. F., Fernández-Ruiz, V., Smart, K. A., & Hort, J. (2015). Developing a reduced consumer-led lexicon to measure emotional response to beer. *Food Quality and Preference, 45*, 100-112. doi:10.1016/j.foodqual.2015.06.003

Cheskin, L. (1957). How to predict what people will buy. New York: Liveright.

Chrysochou, P. (2014). Drink to get drunk or stay healthy? Exploring consumers' perceptions, motives and preferences for light beer. *Food Quality and Preference 31*, 156-163. doi:10.1016/j.foodqual.2013.08.006

Cramwinkel, A. B., Mazijk-Bokslag, D. M., Labrijn, J. F., & Lam, R (1991). *Onderzoek naar chemische en sensorische eigenschappen van verschillende merken bier* (Research Report). Retrieved from Wageningen University & Research website: http://library.wur.nl/WebQuery/wurpubs/459772

Creuschen, M. E. H., & Schoormans, J. P. L. (2004). The different roles of product appearance in consumer choice. *Journal of Product Innovation Management, 22*(1), 63-81. doi: 10.1111/j.0737-6782.2005.00103.x

Deams, V., & Delvaux, F. (1997). Multivariate analysis of descriptive sensory data on 40 commercial beers. *Food Quality and Preference, 8*(5/6), 373-380. doi:10.1016/S0950-3293(97)00012-8

Deroy, O., & Spence, C. (2013). Why we are not all synesthetes (not even weakly so). *Psychonomic Bulletin and Review, 20*, 643-664. doi: 10.3758/s13423-013-0387-2

Distel, H., & Hudson, R. (2001). Judgment of odor intensity is influenced by subjects' knowledge of the odor source. *Chemical Senses, 26*(3), 247-251. doi: 10.1093/chemse/26.3.247

Euromonitor. (2017). Non/low alcohol beer: Can it live up to the hype? Retrieved May 8, 2018, from: http://www.euromonitor.com/non-low-alcohol-beer-can-it-live-up-to-the-hype-/report

Fenko, A., De Vries, R., & Van Rompay, T. J. L. (2018). How strong is your coffee? The influence of visual metaphors and textual claims on consumers' flavor perception and product evaluation. *Frontiers in Psychology 53*(9), 1-12. doi:10.3389/fpsyg.2018.00053

Gass, R. H. & Seiter, J. S. (2016). Communicator characteristics and persuadability. In Gass, R. H., & Seiter, J. S., *Persuasion: Social influence and compliance gaining,* 94-120.

Gates, P., Copeland, J., Stevenson, R. J., & Dillon, P. (2007). The influence of product packaging on young people's palatability rating for RTDs and other alcoholic beverages. *Alcohol & Alcoholism, 42*(2), 138-142. doi: 10.1093/alcalc/agl113

Grolsch. (2018). Grolsch 0.0%. Retrieved October 3, 2018, from: https://www.grolsch.nl/bieren/grolsch-0.0.html

Hamilton, J., Knox, B., Hill, D., & Parr, H. (2000). Reduced fat products: Consumer perceptions and preferences. *Britisch Food Journal, 102*(7), 494-506. doi: 10.1108/00070700010336454

Heller, E. (1999). Wie farben wirken. Farbpsychologie, farbsymbolik, kreative farbstaltung. Hamburg: Rowohlt.

Herz, R. S. & Von Clef, J. (2001). The influence of verbal labelling on the perception of odors: Evidence for olfactory illusions? *Perception, 30*, 381-391. doi: 10.1068/p3179

Howe, N., & Strauss, W. (2000). Millennials rising: The next great generation. New York : Knopf Doubleday Publishing Group.

Howe, N. & Strauss, W. (2007). The next 20 years: How customer and workforce attitudes will evolve. *Harvard Business Review, 85*(7-8), 41-52.

Kähkönen, P., & Tuorila, H. (1998). Effect of reduced-fat information on expected and actual hedonic and sensory ratings of sausage. *Appetite, 30*, 13-23. doi: 10.1006/appe.1997.0104

Kaneda, H., Kobayashi, N., Watari, J., Shinotsuka, K. & Takashio, M., & Okahata, Y. (2002). A new taste sensor for evaluation of beer body and smoothness using a lipid-coated quartz crystal microbalance. *Journal of the American Society of Brewing Chemists, 60*(2), 71-76. doi: 10.1094/ASBCJ-60-0071

Kluivers, S. (2018). Millennials dol op alcoholvrij biertje. Retrieved October 17, 2018, from: https://www.telegraaf.nl/nieuws/2364177/millennials-dol-op-alcoholvrij-biertje?utm_source=google&utm_medium=organic

Koch, C. & Koch, E. C. (2003). Preconceptions of taste based on color. *The Journal of Psychology, 137(3),* 233-242. doi: 10.1080/00223980309600611

Krishna, A., Cian, L., & Aydinoglu, N. Z. (2017). Sensory aspects of package design. *Journal of Retailing, 93*(1), 43-54. doi: 10.1016/j.jretai.2016.12.002

Krishna, A., & Morrin, M. Does touch affect taste? The perceptual transfer of product container haptic cues. *Journal of Consumer Research, 34*(6), 807-818. doi: 10.1086/523286

Lakoff, G., & Johnson, M. (2003). Definitions and understanding. In Lakoff, G., & Johnson, M. *Metaphors we live by*, 115-125. Chicago: The University of Chicago Press.

Lau-Barraco, C., & Dunn, M. E. (2008). Evaluation of a single-session expectancy challenge intervention to reduce alcohol use among college students. *Psychology of Addictive Behaviours, 22*(2), 168-175. doi: 10.1037/0893-164X.22.2.168

Lee, L., Frederick, S., & Ariely, D. (2006). Try it, you'll like it. The influence of expectation, consumption, and revelation on preferences for beer. *Psychological Science, 17*(12), 1054-1058. doi: 10.1111/j.1467-9280.2006.01829.x

Lee, W.-C. J., Shimizu, M., Kniffin, K. M., & Wansink, B. (2013). You taste what you see: Do organic labels bias taste perceptions? *Food Quality and Preference, 29*, 33-39. doi: 10.1016/j.foodqual.2013.01.010

Liao, L. X., Corsi, A. M., Chrysochou, P., & Locksin, L. (2015). Emotional responses towards food packaging: A joint application of self-report and physiological measures of emotion. *Food Quality and Preference 42*, 48-55. doi: 10.1016/j.foodqual.2015.01.009

Lifespan. (2012). Curbing college binge drinking: What role do 'alcohol expectancies' play? Retrieved September 23, 2018, from: https://www.sciencedaily.com/releases/2012/04/120418112045.htm

Ludden, G. D. S., & Van Rompay, T. J. L. (2015). How does it feel? Exploring touch on different levels of product experience. *Journal of Engineering Design, 26*(4-6), 157-168. doi: 10.1080/09544828.2015.1036011

Machiels, C. J. A., & Orth, U. R. (2017). Verticality in product labels and shelves as a metaphorical cue to quality. *Journal of Retailing and Consumer Services, 37*, 195-203. doi: 10.1016/j.jretconser.2017.02.009

Mintel. (2017). Non-alcoholic beer sheds its stigma: One in four Germans say low/no alcohol beer tastes just as good as regular beer. Retrieved September 23, 2018, from: http://www.mintel.com/press-centre/food-and-drink/non-alcoholic-beer-sheds-its-stigma

Mirabito, A., Oliphant, M., Van Doorn, G., Watson, S., & Spence, C. (2017). Glass shape influences the flavour of beer. *Food Quality and Preference 62*, 257-261. doi: 10.1016/j.foodqual.2017.05.009

Nederlandse Brouwers. (2018). Alcoholvrij bier is ingeburgerd. Retrieved April 26, 2018, from: https://www.nederlandsebrouwers.nl/nieuws/actueel/alcoholvrij-bier-is-ingeburgerd/

Okamoto, M., Wada, Y., Yamaguchi, Y., Kimura, A., Dan, H., Masuda, T., Singh, A. K., Clowney, L., & Dan, I. (2009). Influences of food-name labels on perceived tastes. *Chemical Senses, 34*, 187-194. doi: 10.1093/chemse/bjn075

Olson, J. C., & Jacoby, J. (1972). Cue utilization in the quality perception process. In Venkatesan, M. *Proceedings of the Third Annual Conference of the Association for Consumer Research*, 167-179. Chicago: Association for Consumer Research

Oudejans, S. & Spits, M. (2017). Alcoholvrij bier – eindelijk popular? *Verslaving, 13*(2), 145-147. doi: 10.1007/s12501-017-0123-0

Piqueras-Fiszman, B., & Spence, C. (2011). Crossmodal correspondences in product packaging. Assessing color-flavor correspondences for potato chips (crisps). *Appetite, 57*, 753-757. doi: 10.1016/j.appet.2011.07.012

Piqueras-Fiszman, B. & Spence, C. (2012). The influence of the feel of product packaging on the perception of the oral-somatosensory texture of food. *Food Quality and Preference, 26*(1), 67-73. doi: 10.1016/j.foodqual.2012.04.002

Piqueras-Fiszman, B., & Spence, C. (2015). Sensory expectations based on product-extrinsic food cues: An interdisciplinary review of the empirical evidence and theoretical accounts. *Food Quality and Preference, 40*(A), 165-179. doi: 10.1016/j.foodqual.2014.09.013

Porretta, S., & Donaldini, G. (2008). A preference study for no alcohol beer in Italy using quantitative concept analysis. *Journal of the Institute of Brewing, 114*(4), 315-321. doi: 10.1002/j.2050-0416.2008.tb00775.x

Raghunathan, R., Walker, R., E. & Hoyer, W. D. (2006). The unhealthy = taste intuition and its effects on taste inferences, enjoyment, and choice of food products. *Advances in Consumer Research, 33*, 450-451. doi: 10.1509/jmkg.70.4.170

Schifferstein, H. N. J., Fenko, A., Desmet, P. M. A., Labbe, D., & Martin, N. (2013). Influence of package design on the dynamics of multisensory and emotional food experience. *Food Quality and Preference, 27*, 18-25. doi: 10.1016/j.foodqual.2012.06.003

Schuldt, J. P., & Hannahan, M. (2013). When good deeds leave a bad taste. Negative inferences from ethical food claims. *Appetite, 62*, 76-83. doi: 10.1016/j.appet.2012.11.004

Sester, C., Deroy, O., Sutan, A., Galia, F., Desmarchelier, J-F., Valentin, D., & Dacremont, C. (2013). "Having a drink in a bar": An immersive approach to explore the effects of context on drink choice. *Food Quality and Preference, 28*, 23-31. doi: 10.1016/j.foodqual.2012.07.006

Shankar, M. U., Levitan, C. A., Prescott, J., & Spence, C. (2009). The influence of color and label information on flavour perception. *Chemical perception, 2*, 53-58. doi: 10.1007/s12078-009-9046-4

Silva, A. P., Jager, G., Van Bommel, R., Van Zyl, H., Voss, H.-P., Hogg, T., Pinitado, M., & De Graaf, C. (2016). Functional or emotional? How Dutch and Portuguese conceptualise beer, wine and non-alcoholic beer consumption. *Food Quality and Preference 49*, 54-65. doi: 10.1016/j.foodqual.2015.11.007

Silva, A. P., Jager, G., Voss, H.-P., Van Zyl, H., Hogg, T., Pintado, M., & De Graaf, C. (2017). What's in a name? The effect of congruent and incongruent product names on liking and emotions when consuming beer or non-alcoholic beer in a bar. *Food Quality and Preference, 55,* 58-66. doi: 10.1016/j.foodqual.2016.08.008

Singh, S. (2006). Impact of color on marketing. *Management Decision, 44*(6), 783-789. doi: 10.1108/00251740610673332

Sohrabvandi, S., Mousavi, S., M., Razavi, S. H., Mortazavian, A. M., & Rezaei, K. (2010). Alcohol-free beer: Methods of production, sensorial defects, and healthful effects. *Food Reviews International, 26*(4), 335-352. doi: 10.1080/87559129.2010.496022

Spence, C. (2011). Crossmodal correspondences: A tutorial review. *Attention, Perception, & Psychophysics, 73*, 971-995. doi: 10.3758/s13414-010-0073-7

Spence, C. (2016). Multisensory packaging design: Color, shape, textue, sound, and smell. In Burgess, P. (Eds.), *Integrating the Packaging and Product Experience in Food and Beverages: A Road-Map to Consumer Satisfaction*, 1-22. Cambridge: Woodhead Publishing.

Spence, C., Wan, X., Woods, A., Velasco, C., Deng, J., Youssef, J., & Deroy, O. (2015). On tasty colours and colourful tastes? Assessing, explaining, and utilizing crossmodal correspondences between colours and basic tastes. *Flavour, 4*(23), 1-17. doi: 10.1186/s13411-015-0033-1

Steenis, N. D., Van Herpen, E., Van der Lans, I. A., Ligthart, T. L., & Van Trijp, H. C. M. (2017). Consumer response to packaging design: The role of packaging materials and graphics in sustainability perceptions and product evaluations. *Journal of Cleaner Production*, *162*, 286-298. doi: 10.1016/j.jclepro.2017.06.036

Stuart, E. W., Shimp, T. A., & Engle, R. W. (1987). *Journal of Consumer Research, 14*(3), 334-349. doi: 10.1086/209117

Tijssen, I., Zandstra, E. H., De Graaf, C., & Jager, G. (2017). Why a 'light' product package should not be light blue: Effects of package colour on perceived healthiness and attractiveness of sugar- and fat-reduced products. *Food Quality and Preference, 59*, 46-58. doi: 10.1016/j.foodqual.2017.01.019

Tomasik-Krótki, J., & Strojny, J. (2008). Scaling of sensory impressions. *Journal of Sensory Studies, 23*(2), 251-166. doi: 10.1111/j.1745-459X.2008.00153.x

Van der Palen, R. (2018). *An oral interview with Raymon van der Palen/Interviewer: Robin Branderhorst*.

Van Rompay, T. J. L., De Vries, P. W., Bontekoe, F, & Dijkstra K. (2012). Embodied product perception: Effects of verticality cues in advertising and packaging design on consumer impressions and price expectations. *Psychology & Marketing, 29*(12), 919-928. doi: 10.1002/mar.20574

Van Rompay T. J. L., Deterink, F., & Fenko, A. (2016). Healthy package, healthy product? Effects of packaging design as a function of purchase setting. *Food Quality and Preference, 53*, 84-89. doi: 10.1016/j.foodqual.2016.06.001

Van Rompay, T. J. L., Finger, F., Saakes, D., & Fenko, A. (2016). See me, feel me: Effects of 3D-printed surface patterns on beverage evaluation. *Food Quality and Preference, 62*, 332-339. doi: 10.1016/j.foodqual.2016.12.002

Van Rompay, T. J. L., Van Hoof, J. J., Rorink, J., & Folsche, M. (2019). Served straight up: Effects of verticality cues on taste evaluations and luxury perceptions. *Appetite, 135*, 72-78. doi: 10.1016/j.appet.2019.01.002

Wan, X., Woods, A., T., Seoul, K.-H., Butcher, N., Spence, C. (2015). When the shape of the glass influences the flavour associated with a coloured beverage: Evidence from consumers in three countries. *Food Quality and Preference, 39*, 109-116. doi: 10.1016/j.foodqual.2014.07.004

World Health Organization. (2018). Alcohol. Retrieved October 20, 2018, from: https://www.who.int/topics/alcohol_drinking/en/

Yi, Y., & Joan, H. (2003). Effects of loyalty programs on value perception, program loyalty, and brand loyalty. *Journal of the Academy of Marketing Science, 31*(3), 229-240. doi: 10.1177/0092070303031003002

Appendices

Appendix A Taste Pre-Test

Appendix B Complete Table Taste Pre-Test

Appendix C Colour Pre-Test

Appendix D Line Orientation Pre-Test

Appendix E Questionnaire Main Study

Appendix F Setting Main Study

Appendix A: Questionnaire Taste Pre-Test (in Dutch)

Introduction text

Welkom bij deze smaaktest!

U gaat een alcoholvrij bier proeven. Ik ben benieuwd naar uw mening hierover. De smaaktest zal ongeveer zes minuten van uw tijd in beslag nemen. Er zal betrouwbaar met de gegevens om worden gegaan en de resultaten worden geheel anoniem verwerkt.

Alvast hartelijk bedankt voor uw deelname!

Questions

Wilt u meewerken aan deze smaaktest?

- Ja
- Nee

Voordat u begint met proeven, wil ik u eerst een aantal algemene vragen stellen.

Wat is uw leeftijd?

_____

Wat is uw geslacht?

- Man
- Vrouw

Welke dranken drinkt u wel eens (minimaal een keer in de afgelopen twee maanden)? Meerdere antwoorden mogelijk

- Water
- Thee
- Koffie
- Melk
- Frisdrank
- Energy
- Sapjes

- Bier
- Alcoholvrij bier
- Radler
- Radler 0.0
- Speciaal bier
- Wijn
- Likeur
- Sterke drank

Hoe vaak drinkt u gemiddeld alcoholvrij bier?

- Vaker dan een keer in de week
- Een keer in de week
- Twee keer in de maand
- Een keer in de maand
- Minder dan een keer in de maand
- Nooit (sla volgende vraag over)

Wat is voor u een reden om alcoholvrij bier te drinken?

Meerdere antwoorden mogelijk

- Om verantwoordelijk om te gaan met alcohol
- Om toch mee te doen met de rest, maar geen alcohol te drinken
- Omdat ik later nog moet rijden
- Als dorstlesser, wanneer ik geen alcohol wil drinken
- Omdat ik minder calorieën/suiker binnen wil krijgen
- Om te variëren in de drankjes die ik drink
- Vanwege geloofsovertuiging
- Anders, namelijk _____

Wat is voor u een reden om geen alcoholvrij bier te drinken?

- Niet van toepassing
- Ik drink nooit bier
- Ik vind het niet lekker
- Ik vind het niet gezellig
- Ik vind het te vrouwelijk
- Anders, namelijk _____

Voordat u begint met proeven, eet even een crackertje en drink een slokje water om uw smaak te neutraliseren.

U mag het bier nu proeven. Neem nu eerst een of twee slokken en geef aan wat uw eerste ingeving is.

HERE, THE PARTICIPANTS DRANK THE NON-ALCOHOLIC BEER

Geef aan in hoeverre u het met de onderstaande stelling eens bent.

Ik vind dit alcoholvrije bier lekker.
Helemaal mee oneens O O O O O O O Helemaal mee eens

Wat vindt u aangenaam aan dit alcoholvrije bier?

_____

Wat vindt u onaangenaam aan dit alcoholvrije bier?

_____

U mag nu meer drinken. U hoeft niet het hele glas leeg te drinken, maar het is wel belangrijk dat u tot aan de helft drinkt, zodat u het goed kunt proeven. U kunt meer drinken indien u dat wenst. Als u tijdens het beantwoorden van de vragen de behoefte heeft nogmaals te proeven, neem dat gerust nog een slokje.

Houd er wel rekening mee dat er niet meer geserveerd zal worden, dan de hoeveelheid die zich al in het glas bevindt.

Er wordt een aantal vragen gesteld over de smaak van het alcoholvrije bier. Geef aan op een zevenpuntschaal in hoeverre u het smaak bij het alcoholvrije bier vindt passen.

Ik vind de smaak van dit alcoholvrije bier…

	Zeer mee oneens	Mee oneens	Enigszins mee oneens	Neutraal	Enigszins mee eens	Mee eens	Zeer mee eens
… sterk							
… zout							
… natuurlijk							
… hoppig							
… intens							
… zoet							
… fris							

Geef nogmaals aan op een zevenpuntschaal in hoeverre u de smaak bij het alcoholvrije bier vindt passen.

Ik vind de smaak van dit alcoholvrije bier…

	Zeer mee oneens	Mee oneens	Enigszins mee oneens	Neutraal	Enigszins mee eens	Mee eens	Zeer mee eens
… zuur							
… krachtig							
… licht							
… vol							
… bitter							
… kruidig							
… fruitig							

Als laatst leg ik u nog een drietal stellingen voor, waarbij ik u wil vragen aan te geven in hoeverre u het met de uitspraken eens bent.

	Zeer mee oneens	Mee oneens	Enigszins mee oneens	Neutraal	Enigszins mee eens	Mee eens	Zeer mee eens
Dit alcoholvrije bier is van hoge kwaliteit.							
Dit alcoholvrije bier is dorstlessend.							
Ik ben positief over dit alcoholvrije bier.							

Closing text:

We zijn nu aan het einde gekomen van de vragenlijst. Hartelijk bedankt voor uw waardevolle mening!

Appendix B: Complete Table Taste Pre-Test

Table 8

Mean scores of Grolsch 0.0 on taste characteristics (complete table)

Taste characteristic	Mean[a)]	Std. dev.[a)]
Fresh	5.36	1.26
Light	4.93	1.42
Natural	4.62	1.15
Sweet	4.40	1.54
Hoppy	4.00	1.37
Bitter	3.93	1.63
Fruity	3.91	1.50
Intense	3.63	1.07
Spicy	3.51	1.52
Sour	2.84	1.59
Salt	2.40	1.40

[a)] 7-point Likert scale (1=not at all, 7=very much)

Appendix C: Questionnaire Colour Pre-Test (in Dutch)

Introduction text:

Welkom,

Bedankt voor je deelname aan mijn onderzoek naar alcoholvrij bier en smaakverwachting. Achtereenvolgens krijg je tien designvarianten te zien die ontwikkeld zijn in het kader van een nieuw Grolsch 0.0 biervariant. Ik ben benieuwd naar jouw verwachting van het bier na het zien van deze designs en naar wat je van deze designs vindt.

Het invullen van de vragenlijst zal ongeveer 10 minuten duren. Er zal betrouwbaar met je gegevens worden omgegaan en de resultaten worden geheel anoniem verwerkt.

Bedankt,

Robin Branderhorst

Questions:

Wil je meewerken aan dit onderzoek?

- Ja
- Nee

Je krijgt nu een aantal designs te zien, waarna ik je vraag naar je verwachting over het alcoholvrije bier en naar wat je van deze designs vindt. Bekijk de designs goed. Geadviseerd wordt om de helderheid van je computer, tablet of telefoon hoog te zetten.

HERE, THE RESPONDENTS WERE EXPOSED TO THE FIVE DESIGNS IN RANDOM ORDER

Questions per design:

Wat vind je van dit design?

	Zeer mee oneens	Mee oneens	Enigszins mee oneens	Neutraal	Enigszins mee eens	Mee eens	Zeer mee eens
Ik vind dit een mooi blik.							
Ik denk dat dit bier van hoge kwaliteit is.							

Wat zijn je verwachtingen van de smaak van de nieuwe Grolsch 0.0 biervariant na het zien van dit design?

	Zeer mee oneens	Mee oneens	Enigszins mee oneens	Neutraal	Enigszins mee eens	Mee eens	Zeer mee eens
Ik verwacht een sterke smaak.							
Ik verwacht een bittere smaak.							
Ik verwacht een volle smaak.							
Ik verwacht een goede smaak.							
Ik verwacht een intense smaak.							
Ik verwacht een frisse smaak.							
Ik verwacht een krachtige smaak.							

Ik verwacht een lekkere smaak.							

At the end, two demographic questions:

Als laatst wil ik je nog twee algemene vragen stellen.

Wat is je leeftijd?

_____

Wat is je geslacht?

- Man
- Vrouw

Closing tekst:

We zijn aan het einde gekomen van de vragenlijst. Je antwoorden zijn geregistreerd. Hartelijk bedankt voor je tijd en je waardevolle mening!

Appendix D: Questionnaire Line Orientation Pre-Test (in Dutch)

Introduction text:

Welkom,

Bedankt voor je deelname aan mijn onderzoek naar alcoholvrij bier en smaakverwachting. Achtereenvolgens krijg je tien designvarianten te zien die ontwikkeld zijn in het kader van een nieuw Grolsch 0.0 biervariant. Ik ben benieuwd naar jouw verwachting van het bier na het zien van deze designs en naar wat je van deze designs vindt.

Het invullen van de vragenlijst zal ongeveer 10 minuten duren. Er zal betrouwbaar met je gegevens worden omgegaan en de resultaten worden geheel anoniem verwerkt.

Bedankt,

Robin Branderhorst

Questions:

Wil je meewerken aan dit onderzoek?

- Ja
- Nee

Je krijgt nu een aantal designs te zien, waarna ik je vraag naar je verwachting over het alcoholvrije bier en naar wat je van deze designs vindt. Bekijk de designs goed. Geadviseerd wordt om de helderheid van je computer, tablet of telefoon hoog te zetten.

HERE, THE RESPONDENTS WERE EXPOSED TO THE FIVE DESIGNS IN RANDOM ORDER

Questions per design:

Wat vind je van dit design?

	Zeer mee oneens	Mee oneens	Enigszins mee oneens	Neutraal	Enigszins mee eens	Mee eens	Zeer mee eens
Ik vind dit een mooi blik.							
Ik denk dat dit bier van hoge kwaliteit is.							

Wat zijn je verwachtingen van de smaak van de nieuwe Grolsch 0.0 biervariant na het zien van dit design?

	Zeer mee oneens	Mee oneens	Enigszins mee oneens	Neutraal	Enigszins mee eens	Mee eens	Zeer mee eens
Ik verwacht een sterke smaak.							
Ik verwacht een bittere smaak.							
Ik verwacht een volle smaak.							
Ik verwacht een goede smaak.							
Ik verwacht een intense smaak.							
Ik verwacht een frisse smaak.							
Ik verwacht een krachtige smaak.							

Ik verwacht een lekkere smaak.							

At the end, two demographic questions:

Als laatst wil ik je nog twee algemene vragen stellen.

Wat is je leeftijd?

_____

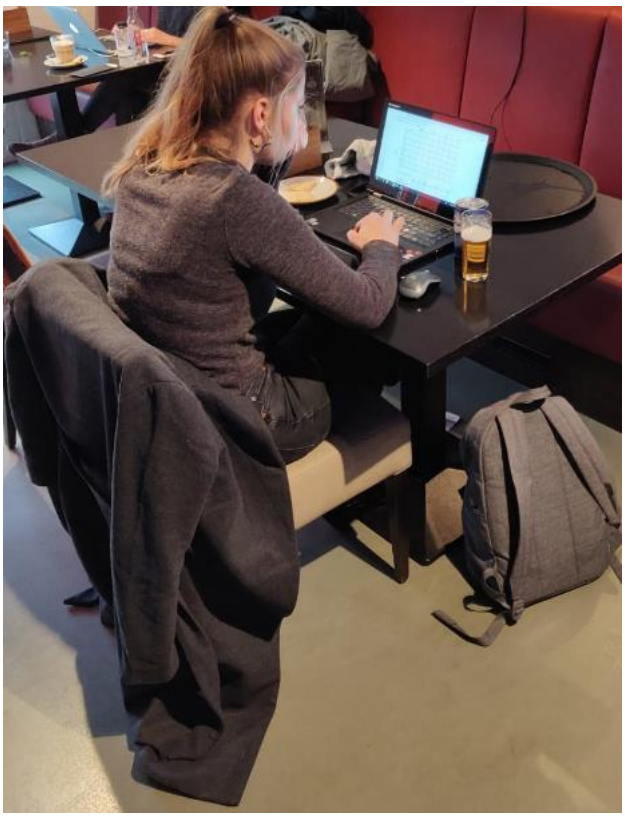
Wat is je geslacht?

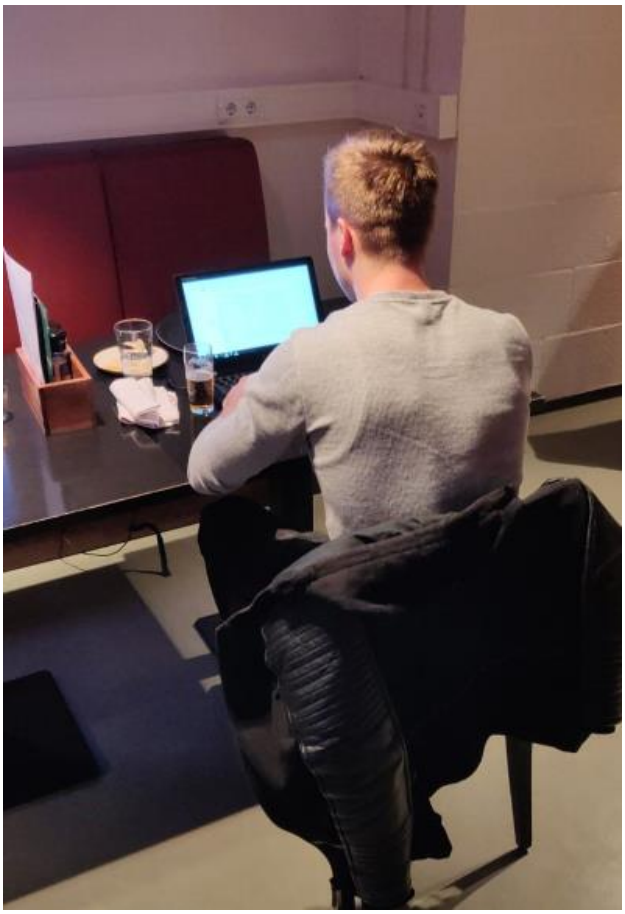
- Man
- Vrouw

Closing tekst:

We zijn aan het einde gekomen van de vragenlijst. Je antwoorden zijn geregistreerd. Hartelijk bedankt voor je tijd en je waardevolle mening!

Appendix E: Setting Main Study





Appendix F: Questionnaire Main Study

Introduction text:

Welcome to this taste test!

Non-alcoholic beer is increasingly popular in the Netherlands. Grolsch has been working on a new non-alcoholic variant: the new Grolsch 0.0. In this taste test, the new Grolsch 0.0 beer variant will be tested and I would like to know what you think of its taste.

This questionnaire takes approximately five minutes of your time and your participation is completely anonymous.

Many thanks in advance for your participation,

Robin Branderhorst

Questions:

Are you willing to participate in this taste test?

- Yes
- No

What is your age?

_____

What is your gender?

- Male
- Female

The design of the new Grolsch 0.0 can stands in front of you. Please, view this design well.

Before we start tasting, please eat a toast and drink some sips of water to neutralise your taste.

Now, you may start tasting.

Please, indicate to what extent you agree with the statements about the taste of the new non-alcoholic beer variant.

I think the taste of the new Grolsch 0.0 beer variant is...

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
... of high quality	○	○	○	○	○	○	○
... strong	○	○	○	○	○	○	○
... bitter	○	○	○	○	○	○	○
... full	○	○	○	○	○	○	○
... good	○	○	○	○	○	○	○
... intense	○	○	○	○	○	○	○
... fresh	○	○	○	○	○	○	○
... powerful	○	○	○	○	○	○	○
... tasty	○	○	○	○	○	○	○
... sweet	○	○	○	○	○	○	○
... exclusive	○	○	○	○	○	○	○
... premium	○	○	○	○	○	○	○
... pleasant	○	○	○	○	○	○	○
... sour	○	○	○	○	○	○	○

I think this new Grolsch 0.0 is...

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
... lemonade-like	○	○	○	○	○	○	○
... different from alcoholic beer	○	○	○	○	○	○	○
... quaffable (if a drink is quaffable, it is easy and pleasant to drink a lot of it)	○	○	○	○	○	○	○

If I am walking in the supermarket and I see this non-alcoholic beer variant, I would buy it.

Strongly disagree	○ ○ ○ ○ ○ ○ ○	Strongly agree

Now, I want to ask you a few general questions.

I think this new Grolsch 0.0 is...

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
... lemonade-like	○	○	○	○	○	○	○
... different from alcoholic beer	○	○	○	○	○	○	○
... sessionable (if a drink is sessionable, it is easy and pleasant to drink multiple of it in a single session)	○	○	○	○	○	○	○

Please, indicate to what extent you agree with the following statement.

I like beer. (Here, normal alcoholic beer is meant. Special beer variants are excluded.)

Strongly disagree	○ ○ ○ ○ ○ ○ ○	Strongly agree

Please, indicate to what extent you agree with the four statements below.

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I like Grolsch more than other beer brands.	○	○	○	○	○	○	○
I have a strong preference for the beer brand Grolsch.	○	○	○	○	○	○	○
I give prior consideration to Grolsch when I want to buy beer.	○	○	○	○	○	○	○
I would recommend Grolsch to others.	○	○	○	○	○	○	○

Please, indicate to what extent you agree with the three statements below.

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
In general, I like the taste of non-alcoholic beer.	○	○	○	○	○	○	○
It leaves me a good feeling when I drink non-alcoholic beer.	○	○	○	○	○	○	○
I think non-alcoholic beer is a good beer variant.	○	○	○	○	○	○	○

Closing text:

We are at the end of the taste test. Thanks a lot for your time and your valuable opinion.