WHAT IS MORE EFFECTIVE: IMPLICIT OR EXPLICIT PRODUCT CUES?

An experimental study into the effects of colour saturation and the type of label on the perceived healthiness and taste liking of the consumer.

Master Thesis

Sylvana Louwes

S1353292

Faculty of Behavioural, Management and Social Sciences

Communication Studies

First supervisor: Dr. I. van Ooijen

Second supervisor: Dr. T. J. L. van Rompay.

Date: 29–01–2020

UNIVERSITY OF TWENTE.

Abstract

Aim. This research focusses on how to influence healthy food choices by means of product packaging. Package design raises certain expectations about the product because consumers base product inferences on multiple packaging cues. Knowledge of how the interaction between implicit and explicit packaging cues affects product inferences helps in the understanding of consumers' food choices. Also, it remains unclear how consumers will react to the interaction of these cues when there is a possibility to taste the product. Therefore, the aim of this study is to experimentally investigate the interaction effect of colour saturation and type of label on the perceived healthiness and the taste liking of the consumer, including a taste test. Additionally, the moderating effect of general health interest is tested.

Method. An experimental 2 (the level of colour saturation: high vs. low) x 3 (the type of label: hedonic vs. health vs. control) between-subjects factorial design was conducted among 162 participants. The respondents were exposed to one of the six conditions.

Findings. Findings of this study show a significant effect of colour saturation on perceived healthiness. High colour saturation results in a lower perceived healthiness and low colour saturation results in a higher perceived healthiness. No significant effects were found between colour saturation on taste liking. Also, the expected interaction effect of colour saturation and the type of label on perceived healthiness was not found. These results are not in line with the Cue Consistency Theory, stating that if product cues are congruent both cues will be used in the product evaluation. Additionally, a trend effect was found between the interaction of colour saturation and general health interest on perceived healthiness. Lastly, no mediation effect of perceived healthiness on taste liking was found.

Conclusion. This research shows that packaging cues such as colour saturation can influence the perceived healthiness of the consumer. If package designers want to communicate the healthiness of the product, a low saturated colour would be a better choice. It seems that a healthy product package does not affect the taste liking negatively. Perceptions about healthy products not being tasty become less effective when there is the possibility to taste the product. Package designers need to keep in mind that food choices are complex behaviours that are influenced by many interacting factors.

Keywords: packaging design, product cues, cue consistency, perceived healthiness, taste liking, general health interest.

Table of Contents

1. Introduction

Obesity and overweight continue to be a serious public health concern and can lead to several health issues (Malik, Popkin, Bray, Després, & Hu, 2010). One of the factors that contribute to this weight gain is the consumption of sugary goods (Ludwig, Peterson, & Gortmaker, 2001), which can lead to various health issues. Results of various studies have shown that people who regularly consume sugar-sweetened beverages have a greater risk for overweight (Dubois, Farmer, Girard, & Peterson, 2007; Malik et al., 2010; Ludwig et al., 2001). As a consequence, during the past years, the negative impacts of sugar have gained more attention and awareness among the general public. The World Health Organization (WHO) has recommended implementing taxes to reduce the consumption of unhealthy food and beverages. Along with the implementation of sugar taxes in several countries, the consumer has become more aware of the negative impact that sugar can have on their health (Pula, Parks, & Ross, 2014).

However, awareness of the risks of sugar does not immediately result in making healthy purchase choices. Consumers tend to make most purchase choices on a subconscious level and that makes it hard to change certain purchase habits and therefore food habits (Malik et al., 2010; Pula et al., 2014). In addition to that, healthier foods (e.g. with low salt, fat or sugar) are often experienced as less tasty in comparison to the same regular food product (Lee, Shimizu, Kniffin, & Wansink, 2013; Raghunathan, Naylor, & Hoyer, 2006). Raghunathan et al. (2006) call this phenomenon the unhealthy = tasty intuition (UTI), which means that the consumer intrinsically assumes that healthier food products are less rewarding and tasty in comparison with the same regular products.

Product packaging can influence how healthy a product is being perceived and also the taste liking of a product. For that reason, food manufacturers could help in making healthier food choices. For instance, Becker, Van Rompay, Schifferstein and Galetzka (2011) and Huang and Lu (2016) show that package design raises certain expectations about the product because consumers base product inferences on implicit package cues (e.g. colour, form, colour saturation) and explicit package cues (e.g. claims, labels, brands).

For example, an implicit cue such as colour saturation may also influence the taste perception and perceived healthiness of a product (Tijssen, Zandstra, de Graaf, & Jager, 2017).

A study of Velasco, Woods, Petit, Cheok and Spence (2016) demonstrates that packages with a highly saturated colour are perceived as unhealthy and packages with a low saturated colour are perceived as healthy. Even slight colour changes can have a substantial effect on the sweetness rating of a product and therefore the taste perception in general as well. Besides implicit package cues, such as colour saturation, explicit package cues also have an influence on the taste perception and perceived healthiness of a product. Health labels increase the perceived healthiness of a healthy product, while hedonic labels have a positive effect on taste evaluations for hedonic products (Fenko, Kersten, & Bialkova, 2016).

Since implicit and explicit product cues almost always occur together on a product package it is important to examine the interaction effects of implicit and explicit product cues. Previous research mainly focussed on the effects of either explicit packaging cues or implicit packaging cues (Mead & Richerson, 2018; Tijssen et al., 2017). A few studies examined the interaction effect of implicit and explicit cues. For example, a study by Van Ooijen, Fransen, Verlegh and Smit (2017) looked at the effect of packaging colour and price and their interaction on quality inferences and found that implicit packaging cues affect quality inferences independently from explicit packaging cues. This research will focus on perceived healthiness instead of quality inferences. In addition to that, the interaction effect of implicit and explicit product cues was not measured before by means of an experimental taste test of the product itself. Therefore, this research will be an experimental study where implicit and explicit product cues will be combined, and a taste test is included.

Subsequently, knowledge about how the interaction between implicit and explicit cues affects the perceived healthiness and the taste perception of a product can be helpful in understanding food choices and can offer new input to theory and practice. Therefore, the aim of this study is to experimentally investigate the interaction effect of colour saturation (high vs. low) and type of label (health vs. control vs. hedonic) on perceived healthiness and taste liking. In line with this reasoning, the following research question is formulated:

RQ1: What is the effect of combining implicit product cues (colour saturation) and explicit product cues (the type of label) on the perceived healthiness and taste liking of the consumer?

2. Theoretical framework

This chapter contains the most important theoretical concepts that are relevant to this study. First, there will be elaborated on consumer decision-making. Second, implicit product cues and colour saturation will be discussed. Third, explicit product cues will be discussed. Thereafter, the Cue Consistency Theory will be explained. Furthermore, the influence of general health interest will be explained and lastly, the research model will be presented.

2.1 Consumer decision-making

Consumers' food choices are determined by a large number of interacting factors (Köster, 2009). One of these factors is the type of involvement of the consumer. There are two dimensions in the decision-making process, namely low involvement versus high involvement choices (Cohen & Babey, 2012; Dijksterhuis, Smith, Van Baaren, & Wigboldus, 2005). Low involvement choices are choices for which the cognitive effort in decision making is low and high involvement choices are choices for which the cognitive effort in decision making is high (Tijssen et al., 2017). Food choices are often considered as low involvement choices because food choices tend to be an automatic, non-effortful way of decision-making (Dijksterhuis et al., 2005; Pula et al., 2014). According to Dijksterhuis et al. (2005), the reason that food choices are often considered as low involvement choices is highly dependent on the supermarket environment.

The way people process information is also important in relation to food choices. The dual-process theory (DPT) addresses the way people process information and enables understanding of human decision-making patterns (Evans & Stanovich, 2013). The dual-process theory states that humans make use of one of two distinct systems of processing information (Alter, Oppenheimer, Epley, & Eyre, 2007; Kahneman, 2003). *System 1* is intuitive, non-conscious and effortless. *System 2* is conscious decision-making and takes effort to consider different options before making the best choice given the circumstances. Making use of *system 1* implies fast and automatic response using heuristics to guide decisions. Making use of *system 2* implies slow and deliberate choices. Which system a person will use is determined by the context and different variables.

In addition to that, Dijksterhuis et al. (2005) explain that a grocery store is considered an overstimulating environment that requires a great deal of decision-making.

The number of products to choose from in a supermarket has increased substantially in the past few decades (Cohen & Babey, 2012) and as a result, people are faced with tons of choices during a shopping trip. Since it takes too much cognitive effort to continuously make use of *system 2* in such an environment, consumers are therefore more inclined to use *system 1*. Due to this overstimulating environment, consumers are very susceptible to non-conscious influences, such as *heuristics* and in-store marketing techniques like product packaging (Dijksterhuis et al., 2005; Köster, 2009). A heuristic can be defined as a ‘’rule of thumb’’ or an easy to access cue that leads to fast decision-making (Shah & Oppenheimer, 2008). Heuristic cues, such as shapes, familiar images, brands, sizes, and logos are used when people are making food choices (Cohen & Babey, 2012). These cues allow individuals to make food choices without much cognitive effort (Scheibehenne, Miesler, & Todd, 2007).

2.1.1 Factors influencing healthy food choices

Since the supermarket environment is designed to make use of heuristics and *system 1* processing (Cohen & Babey, 2012; Dijksterhuis et al., 2005), initiatives to change unhealthy food choices should aim on influencing behaviour via methods that focus on influencing choices on a subconscious level (Köster, 2009; Tijssen et al., 2017). This can be done by a phenomenon called nudging. A nudge can be defined as a subtle and tiny change in the environment to influence the consumer’s choice in a predictable and desired way while leaving the freedom of choice of the consumer unaffected (Selinger & Whyte, 2011). A nudge can be used as a subtle push into the desired direction and to make the desired way the easy way (Tijssen et al., 2017). In this case, the desired way is making a healthy food choice. Thus, in order to make the desired way the easy way, the nudge should enhance the salience of important food choice determinants (Tijssen et al., 2017), such as product packaging.

Product packaging features namely affect consumers’ perception of the product (Chandon, Hutchinson, Bradlow, & Young, 2009). Consumers draw inferences about the content of a product based on packaging features (Schifferstein, Fenko, Desmet, Labbe, & Martin, 2013). The package is the first thing consumers notice and that makes visual characteristics important and leading determinants at the moment of food choice (Gidlöf, Anikin, Lingonblad, & Wallin, 2017; Schifferstein et al., 2013). These visual characteristics cause certain expectations about for example the taste liking of a product and therefore influences the perception of the product.

Healthier foods (e.g. with low salt, fat or sugar) are often experienced as less satiating and hedonic in comparison to the same regular food product (Lee et al., 2013; Raghunathan et al., 2006). Raghunathan et al. (2006) call this phenomenon the *unhealthy = tasty intuition* (UTI), which means that the consumer intrinsically assumes that healthier food products are less rewarding and tasty in comparison with the same regular products. However, when a person has the possibility to taste the product the UTI is less present (Tijssen et al., 2017). Tijssen et al. (2017) tested effects of packaging colour on sensory expectations of a low-sugar dairy drink and a low-fat sausage and the results showed that if participants had the option to taste the product, the effects of packaging colour were less effective.

When it comes to product packaging, there is a distinction between explicit product cues (e.g. price, nutrition labels, claims, logos) and implicit product cues (e.g. shape, colour) (Van Ooijen et al., 2017). Previous research focused on the effects of either explicit packaging cues or implicit packaging cues (Kiesel & Villas-Boas, 2013; Mead & Richerson, 2018; Tijssen et al., 2017; Van Rompay, Deterink, & Fenko, 2016). However, little research has been done on the interaction effects of combining implicit product cues and explicit product cues on the perceived healthiness and taste liking of the product by means of an experimental setting. Therefore, this research will focus on the interaction effect of implicit and explicit product cues in relation to the taste liking of the product by means of a taste test.

2.2 Implicit product cues

Implicit product cues are cues that are not purposely recognized by the consumer as a product cue (Karjalainen, 2007) because these cues often go unnoticed by the consumer. Examples of implicit product cues are packaging shape, size, colour and colour saturation (Tijssen et al., 2017; Van Ooijen, Fransen, Verlegh, & Smit, 2017). Karjalainen (2007) explains that implicit product cues do not stand out explicitly as a product cue and are more subconsciously influencing the consumer, even though these types of cues are not consciously noted as persuasive by the consumer. This research will focus on the colour saturation of the package, but before discussing the associations of colour in relation to packaging material there will be elaborated the relation of colour and taste and colour associations.

As explained by Huang & Lu (2016) certain reactions to colours are deeply rooted in our minds. People learned responses towards colours, where red objects require attention (e.g. red light, stop signs) and green objects are associated with motion and safety (e.g. green light) (Huang & Lu, 2016; Koenigstorfer, Groeppel-Klein, & Kamm, 2014).

Individuals developed specific associations with colour, that are triggered by our environment as a result of associative learning (Mai, Symmank, & Seeberg-Elverfeldt., 2016). Associative learning means that a person learned a certain response (e.g. standstill) towards a specific stimulus (e.g. red light) (Labrecque, Patrick, & Milne, 2013). In addition to that, Spence, Wan, Woods, Velasco, Deng, Youssef and Deroy (2015) explain that the association between colour and taste is not a semantic association. For instance, the colour red is often associated with sweetness, but it is not only characteristic of sweet products and ingredients. This is called *crossmodal correspondences*. The relation of taste and colour is not an association between the same features, but a pairing between unrelated sensory features. Knowledge about associative learning and crossmodal correspondences help in the understanding of the relation between colour and taste and therefore in the understanding of the relation between packaging material and product perception.

Colours of packaging material are very important in the field of consumer decision-making. The effect of colour on consumers' product perception is demonstrated by multiple studies (Huang & Lu, 2016; Van Rompay et al., 2016; Mai et al., 2016; Tijssen et al., 2017; Velasco et al., 2016). Velasco et al. (2016) mention that even slight colour changes can have a substantial effect on the sweetness rating of a product and therefore taste perception in general as well. That sweetness is affected by packaging colour is also proven by Tijssen et al. (2017). Results showed that red, highly saturated packages were associated with increased perception of sweetness and intensity of flavour. Next to taste perception, perceived healthiness is also affected by colour. Blue-coloured packages are perceived as healthier than red-coloured packages (Huang & Lu, 2016; Van Rompay et al., 2016).

2.2.1. Colour saturation

Besides colour hue, colour saturation also contributes to the perception of a product. Mead and Richerson (2018) studied the effect of overall colour saturation in relation to consumer perceptions of a food item. Results showed that vivid and highly saturated colours are related to unhealthy products. For example, consumers always see chips, candies, and sodas displayed in highly saturated packages and as a result of associative learning, consumers are linking vivid, highly saturated colours to unhealthy and food. However, in the context of fruits and vegetables, vivid and highly saturated colours are related to high nutritional value (Goldman, 2003). Therefore, if the food item itself is displayed in vivid, highly saturated colours when the rest of the package is less saturated, it may be perceived as more healthful (Mead & Richerson, 2018).

Another research by Tijssen et al. (2017) showed that low saturated colours are associated with product healthiness. The effect of package hue, brightness and saturation on perceived healthiness and attractiveness of a low-sugar dairy drink and sausage was examined. Especially low saturated packages were linked to healthiness and high saturated packages with attractiveness. In addition to that, high saturated packages enhanced perceived sweetness as well, for the low-fat dairy drink. A study by Mai et al. (2016) showed similar outcomes. Namely, light and pale colours are often associated with the healthiness of a product. However, lower saturated packages are perceived healthier, but also less tasty (Mai et al., 2016; Tijssen et al., 2017). This effect is caused by the *unhealthy = tasty intuition* since people tend to make inferences about healthy products not being tasty (Raghunathan et al., 2006). One way to compensate for the perceives taste decreases could be to add darker tones (Mai et al., 2016).

These studies showed the effects of overall colour saturation on perceived healthiness and taste liking of the product. In line with this reasoning, this study predicts that colour saturation affects the perceived healthiness and the taste liking of the consumer. It is also predicted that perceived healthiness affects the taste liking. Based on previous research, the following hypotheses are formulated:

H1: Low (vs. high) colour saturation results in a low (vs. high) taste liking.

H2: Low (vs. high) colour saturation results in high (vs. low) perceived healthiness.

H3: The effect of colour saturation on taste liking is mediated by perceived healthiness.

2.3 Explicit product cues

Contrary to implicit product cues, explicit product cues do have the intention to be recognized deliberatively by the consumer (Karjalainen, 2007). Explicit product cues are perceived by the consumer as persuasive and intended to communicate certain characteristics to the consumer. Examples of explicit product cues are claims and labels.

Claims and labels can also influence how consumers perceive and evaluate the food product (Kiesel & Villas-Boas, 2013). The chosen labelling on a product can affect consumers' evaluation of the product (Cohen & Babey, 2012). Kiesel and Villas-Boas (2013) examined the influence of nutrient labels on microwave popcorn. Low-fat labels resulted in a negative effect on the purchase intention of consumers, while low-calorie labels resulted in a positive effect on the purchase intention of consumers. This effect may occur because low-fat labels can generate negative taste expectations (Raghunatan et al., 2006; Yeomans, Lartamo, Procter, Lee, & Gray, 2001).

Surprisingly this effect did not occur with the low-calorie label and consumers seem to have less negative taste perceptions with the low-calorie label than the low-fat label. Another study by Fenko et al. (2016) showed that health labels increased the perceived healthiness of a healthy product, while hedonic labels had a positive effect on the taste evaluation of a hedonic product. In addition to that, a hedonic food product in combination with a health label had a negative effect on the taste evaluation and decreased the perceived healthiness of the product. Outcomes can be explained by the moderating effect of congruency of the label and the product.

2.4 Cue Consistency Theory

As mentioned before, there are two distinct systems of processing information, where a person will use one of the two systems. In some cases, the slow and deliberate system (*System 2*) can overrule or undo the automatic response system (*System 1*). A study by Alter et al. (2007) explains that when information is disfluent a person is more inclined to use *System 2* instead of *System 1*. This has to do with an effect called *disfluency*. When disfluency occurs during the reasoning process, the systematic *System 2* processing is activated. In other words, when the implicit product cue is communicating different information than the explicit product cue, the explicit cue will overrule or undo the effect of the implicit cue. This happens because incongruent cues suggest that *System 1* reasoning might be faulty.

The Cue Consistency Theory (CCT) of Maheswaran and Chaiken (1991) elaborates further on the concept of information processing in the presence of both implicit and explicit cues. According to the CCT, there are two ways of processing information when both, explicit and implicit cues are present. When both cues are incongruent, so if both are processing disfluent information, an *attenuation effect* will occur. When this happens, the consumer will rely less on implicit cues and systematic processing will be enhanced. As a result, the implicit heuristic cue will be ignored. Disfluency explains why such an attenuation effect may occur during the decision-making process. Looking at the CCT, it is expected that the effect of colour saturation (the implicit product cue) will be ignored when it is incongruent with the type of label (the explicit product cue).

The other way of processing information occurs when both cues are congruent, so if both cues are processing the same information. This is called an *additive effect*. In other words, when a product package is displayed in a low-saturated colour (the implicit product cue) in combination with a health label (the explicit product cue), both cues communicate the same information, which enhances the effect of perceived healthiness.

The same implies for a product package with a high-saturated colour in combination with a hedonic label because both cues are then processing the same information as well, namely taste liking. To conclude, when an additive effect occurs, the consumer makes use of both cues in their product evaluation.

A study by Van Ooijen et al. (2017) examined the interaction effect of implicit cues (lighter versus darker colours) and explicit cues (i.e., price or brand) on product quality inferences. In line with the Cue Consistency Theory, it was expected beforehand that the implicit cue would only affect the product quality-related inferences in case of congruency with the explicit cue. However, outcomes showed that implicit cue affected quality-related inferences independently from the explicit cue. Lower colour value had a positive effect on product quality inferences. These results were in contradiction with the Cue Consistency Theory.

Another research by Huang and Lu (2016) examined the effect of an implicit cue (e.g. packaging colour) in the presence of an explicit cue (e.g. claim) in relation to the perceived healthiness and the purchase intention of the consumer. In line with the Cue Consistency Theory, an interaction effect was expected in case of congruency. Outcomes of the study showed that when both cues were congruent an additive effect occurred. These results were in line with the Cue Consistency Theory. In addition to that, the found effect was the strongest for the healthiness condition. Huang and Lu (2016) describe that the stronger effect for the healthiness condition can be explained by the fact that people nowadays are more inclined to eat healthier products.

This study will examine the effect of colour saturation and the type of label (health or hedonic) and their interaction on perceived healthiness and taste liking. Based on the Cue Consistency Theory, the following hypotheses are proposed:

H4: When low colour saturation is congruent with the explicit food cue an additive effect will occur and both cues will be used for (a) health-related inferences or (b) hedonic-related inferences.

H5: When colour saturation is incongruent with the explicit food cue, an attenuation effect will occur and the implicit cue (colour saturation) will be ignored.

2.5 General health interest

What food a consumer tends to buy is also related to certain motives, such as sensory appeal and healthiness of a product (Pula et al., 2014). Consumers' general health interest also contributes to the choices made in the supermarket (Roininen, Lähteenmäki & Tuorila, 1999). General health interest is the natural interest of a person who prefers eating healthy products, so products with low concentrations of fat and high nutritional value, thus with a high concentration of minerals (Roininen et al., 1999). When individuals score high on the general health scale it means that this person gives the preference to natural and light products.

As already explained in chapter 2.1, paragraph 2.1.3, one heuristic that comes up when making food choices is the *unhealthy = tasty intuition* (UTI). According to Raghunathan et al., (2006) this heuristic influences food choices since there is an implicit association between tastiness and unhealthy food. However, people who score high on the general health interest scale are the exception in this case. According to Zandstra, De Graaf and Van Staveren (2001) a high general health interest is correlated with a positive attitude towards healthy food products. Individuals with a high general health interest thus prefer healthy products over unhealthy products. Therefore, it can be expected that the effect of a high general health interest results in the opposite effect of the UTI.

In addition to that, Mai et al. (2016) and Mead and Richerson (2018) explain that the UTI is less present by health-conscious consumers. This is caused by the fact that health-conscious consumers have more knowledge about nutritional facts and are therefore less likely to categorise food by heuristic cues, such as colour saturation (Mai et al., 2016; Mead & Richerson, 2018). Therefore, it is expected that the effect of implicit cues is less present by people who score high on general health interest, which leads to a smaller effect of colour saturation. This leads to the following two hypotheses:

H6: The effect of colour saturation on perceived healthiness is moderated by general health interest, such that a high general health interest leads to a smaller effect of colour saturation on perceived healthiness, compared with a low general health interest.

H7: The effect of perceived healthiness on taste liking is moderated by general health interest, such that a high general health interest results in the opposite effect of the UTI and therefore a high perceived healthiness results in a high taste liking.

2.6 Research Model

Based on the literature and hypotheses a research model is developed. The visualisation of the research model is displayed in Figure 1.

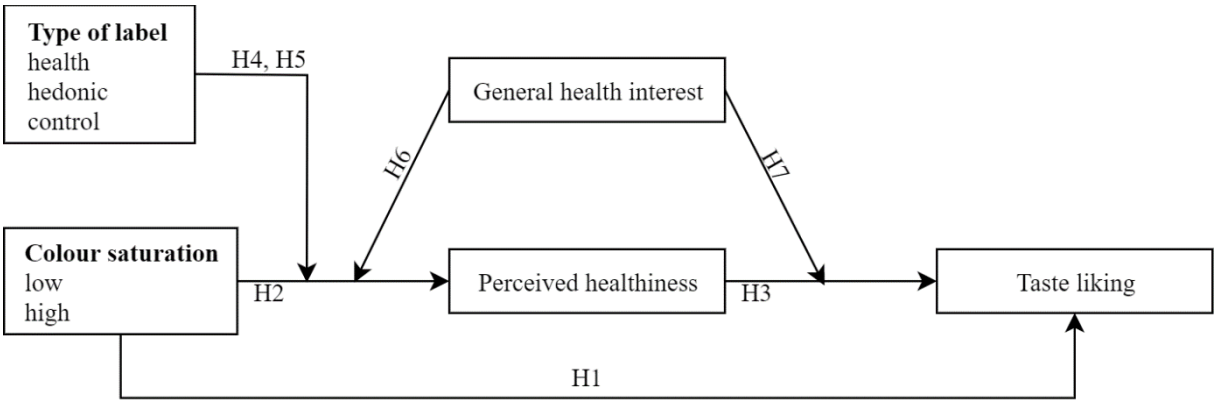


Figure 1. Research model.

3. Method

The aim of this study was to examine the influence of implicit and explicit packaging cues on the perceived healthiness and taste liking of the consumer. A quantitative research was conducted. The research consisted of a questionnaire and a taste test.

3.1 Research design

An experimental 2 (colour saturation level of the package: high vs. low) x 3 (the type of label: hedonic vs. health vs. control) between-subjects factorial design was conducted. Perceived healthiness and taste liking served as dependent variables. The research consisted of six conditions as shown in Table 1.

Table 1

Research conditions

		Label	
Saturation level	Hedonic	Health	Control
High saturation	Condition 1	Condition 3	Condition 5
Low saturation	Condition 2	Condition 4	Condition 6

3.2 Pre-test 1

3.2.1 Objective

To determine if the designed product packages were suitable for the main study a pre-test was conducted. There were two purposes of this pre-test. One was to see if the designed manipulation was perceived as intended. The second one was to measure if other aspects of the package (e.g. brand name, aesthetic aspects) are limited enough and not overrule the intended manipulation. The designs used in this pre-test are shown in Figure 2.

Figure 2. Packaging designs (left: low-saturation (healthy); right: high-saturation (unhealthy)).

3.2.2 Method

In order to measure if the packages were perceived as intended (the high saturated package as unhealthy and the low saturated package as healthy) a questionnaire was developed. A total of 50 people participated in the pre-test, of which 17 men and 33 women. The age of the participants varied between 18 and 59 years. The questionnaire started with a short introduction about the content of the pre-test. After the introduction, participants were shown either the high saturated package or the low saturated package. Subsequently, the two constructs; perceived healthiness and aesthetics, were measured. Perceived healthiness was measured on a 7-point Likert scale developed by Fenko, Lotterman and Galetzka (2016). Four items were adapted from this scale: 'I expect this product to be healthy', 'This product looks healthy', 'This product seems low on calories', 'This drinking yogurt looks healthier than similar variants of drinking yogurt' and one item was added to this scale: 'This product looks natural'. The construct aesthetics was measured by two items on a 7-point Likert scale: 'I think this package looks beautiful' and 'I think this drinking yogurt is of high quality'.

Following that, the participants were exposed to three different brand names. The names that were conducted for this pre-test were: 'Skola', 'Yovavit' and 'Ayrane'. This part of the questionnaire was intended to measure which brand name was experienced as the most neutral brand name and most suitable for a drinking yogurt. Participants indicated to what extent the different types of brand names sounded healthy or tasty.

Several items were used to measure the participants' association with healthiness and taste liking: '[brand name] sounds healthy' '[brand name] sounds full of flavour' and '[brand name] sounds delicious'. Also, an item was added to measure if the name is fitting as a drinking yogurt brand: '[brand name] is a fitting brand name for drinking yogurt'. An overview of the used items can be found in Appendix A.

3.2.3 Results

Univariate analyses of variance (ANOVA) were executed with saturation as the independent variable and perceived healthiness and aesthetics as dependent variables., a reliability test was conducted, and the items form a reliable scale
($\alpha = .87$). Table 2 shows the mean and standard deviation of the perceived healthiness scale of the two conditions. The mean shows to what extent the participants agreed with the statements. The higher the score, the healthier the package was experienced. The results of the analysis showed a significant difference between the two conditions ($p = .001$). The high saturated package is perceived as unhealthy ($M = 2.89$, $SD = 0.94$), and the low saturated package is perceived as healthy ($M = 3.86$, $SD = 1.06$), which means that the manipulations were experienced as intended.

Table 2

Means and standard deviations perceived healthiness

Variables	N	N-items	*M*	*SD*
High Saturation [a]	25	5	2.89	0.94
Low Saturation [a]	25	5	3.86	1.06

[a] 7-point Likert scale (1=strongly disagree / 7=strongly agree)

As for aesthetics, the items used to measure this construct form a reliable scale ($\alpha = .86$). Table 3 shows the mean and standard deviation on the aesthetics scale of the two conditions. The mean shows to what extent the participants agreed with the statements. The higher the score, the more beautiful the package was experienced. The high saturated package ($M = 2.70$, $SD = 1.36$) scores lower than the low saturated package ($M = 3.04$, $SD = 1.62$). No significant differences were found between the averages ($p = .426$).

Table 3

Means and standard deviations aesthetics

Variables	N	N-items	*M*	*SD*
High Saturation [a]	25	2	2.70	1.36
Low Saturation [a]	25	2	3.04	1.62

[a] 7-point Likert scale (1=strongly disagree / 7=strongly agree)

In addition to that, Appendix B shows several tables including all results for the different items used to measure the participants' associations per brand name. The means and standard deviations were calculated to examine to what extent the brand names were experienced as neutral and suitable. The association with healthiness, taste liking, and flavour were measured. The mean shows to what extent the participants agreed with the statements. The higher the score, the higher the association with healthiness, taste liking, and the flavour was experienced. Table B1 shows that brand name 2 (*Yovavit*) (*M* = 5.12, *SD* = 1.30) has the highest average score on the construct healthiness, which means that this brand name is experienced as least neutral on the construct healthiness. Table B2 shows that brand name 3 (*Ayrane*) (*M* = 3.02, *SD* = 1.49) has the lowest average score on the construct taste liking, which means that this brand name is experienced as least neutral on the construct taste liking. Table B4 shows the mean and standard deviation for the most fitting brand name. The table shows that brand name 2 (*Yovavit*) (*M* = 5.40, *SD* = 1.18) is considered as the best suitable name for a drinking yogurt. Although, brand name 2 is significantly the least neutral brand name considering the construct healthiness. Brand name 1 (*Škola)* (*M* = 4.34, *SD* = 1.73) is experienced as most suitable name after brand name 2. When comparing all three constructs, overall brand name 1 is experienced as the most neutral brand name and therefore will be used as a brand name in the main study.

3.3 Pre-test 2

3.3.1 Objective

A second pre-test was conducted to find a suitable drinking yogurt. The purpose of this pre-test was to find a drinking yogurt that was neutral in flavour. The reason for this was to make sure that the flavour itself did not overrule the intended manipulations of the main study. Two types of vanilla drinking yogurt were selected from the supermarket: 'Campina drinkyoghurt met een vleugje vanille' and 'Jumbo magere drinkyoghurt vanille'.

3.3.2 Method

To find a suitable drinking yogurt, the participants tasted both types of drinking yogurt in random order. A total of 15 people participated in the tasting pre-test. The questionnaire consisted of five different items, each measuring a different construct. Sweetness was measured with the item ‘The taste of this product is very sweet’ and sugar content with the item ‘I think this product contains a lot of sugar’. Taste liking was measured with the item ‘I like the taste of this product’. Following that, healthiness was measured with the item ‘This product tastes healthy’. Lastly, the participants judged how chemical the product tasted with the item ‘This product has a chemical taste’. The items were measured on a seven-point Likert scale. An overview of the items can be found in Table 4.

Table 4

Items used in pre-test 2

Items
The taste of this product is very sweet
I think this product contains a lot of sugar
I like the taste of this product
This product tastes healthy
This product has a chemical taste

3.3.3 Results

A paired sample T-test was executed. Table 5 shows the means and standard deviations for all measured items on both types of drinking yogurt. The mean shows to what extent the participants agreed with the statements. The higher the score, the sweeter, the higher the perceived sugar content, the tastier, the healthier and the higher the chemical taste was experienced. The results of the analysis showed no significant difference on the construct chemical taste between the two conditions ($p = .208$). The rest of the constructs showed a significant difference between the two conditions: sugar content ($p = .004$); tastiness ($p = .016$); sweetness ($p < .001$); and lastly, healthiness ($p < .001$). Campina is experienced as most neutral on every construct and will, therefore, be used as the drinking yogurt in the main study.

Table 5

Means and standard deviations drinking yogurt

Variables	N	*M*	*SD*
Campina			
Sweetness	15	3.47	1.41
Sugar content	15	3.53	1.46
Taste liking	15	4.27	1.62
Healthiness	15	4.67	1.35
Chemical taste	15	3.80	1.26
Jumbo			
Sweetness	15	5.53	1.06
Sugar content	15	5.33	1.29
Taste liking	15	5.40	1.24
Healthiness	15	2.87	1.36
Chemical taste	15	4.53	1.51

[a] 7-point Likert scale (1=strongly disagree / 7=strongly agree)

3.4 Stimuli

Based on the results of the pre-test, the stimuli were designed for the main study. Six packages were developed for this study. The designs varied in colour saturation and type of label. A complete overview of the designed stimuli is shown in Figure 3.

Figure 3. Stimuli Material (from the upper left to the lower right: LS-Control, HS-Control, HS-Health, LS-Health, HS-Hedonic, LS-Hedonic).

Note: LS = Low saturation; HS = High saturation.

3.5 Participants

The population of this research consisted of both men and women above 18 years. In total 162 people participated in the study and their age varied from 18 to 40 (M = 22.02, SD = 3.19). The participants were randomly assigned over the six different conditions. A total of 75 men and 87 women participated in this study. See Table 6 for an overview of the participants' characteristics.

Table 6

Participants' characteristics per condition

	Participants	Age		Gender		Completed education level					Consumes drinking yogurt				
				Male	Female	HAVO	VWO	HBO	WO-B	WO-M	A	B	C	D	E
Condition	*N*	*M*	*SD*	*N*	*N*	*N*	*N*	*N*	*N*	*N*	*N*	*N*	*N*	*N*	*N*
High Saturation															
Health Label	27	22.22	2.28	11	16	2	9	5	10	1	0	4	16	1	6
Hedonic Label	27	21.93	3.17	12	15	2	13	4	7	1	1	4	15	0	7
None	27	22.89	2.81	12	15	1	12	2	11	1	2	3	13	0	9
Low Saturation															
Health Label	27	23.07	5.16	14	13	2	11	7	7	0	0	7	12	1	7
Hedonic label	26	20.85	2.31	10	16	3	16	4	3	0	1	1	13	2	9
None	28	21.14	1.90	16	12	3	17	3	5	0	1	4	15	1	7
Total	162	22.02	3.19	75	87	13	78	25	43	3	5	23	84	5	45

Note: HAVO = higher general secondary education; VWO = pre-university education; HBO = higher vocational education; WO-B = WO-Bachelor; WO-M = WO-Master; A = Every day; B = Every week; C = Sometimes; D = Rarely; E = Never

3.6 Procedure

Participants were recruited at the University of Twente by approaching them and asking if they wanted to participate in a study. When participants agreed to take part in the study they were accompanied to the room where the study took place. The study took place in a quiet room to make sure that the participants did not feel rushed or pressured during the experiment. Participants received a brief introduction about the experiment and after the introduction participants started with the experiment. The participants were asked to taste some drinking yogurt and to fill in an online survey about the product. Participants started the survey and after the demographical questions, the stimuli material was presented. Participants were randomly assigned to one of the six different conditions. Thereafter, the participants received the tasting sample of the researcher in a paper cup and tasted the drinking yogurt. After tasting the product, the participants continued with the questionnaire. The package was continuously visible at the top of the screen during the survey. After completing the survey, the participants returned to the researcher and were thanked for their participation.

3.7 Measures

The survey included demographic questions of the participants (e.g. age, gender, and education). Personal questions about the participants' favourite type of drinking yogurt and how often drinking yogurt is consumed, were included as well. Perceived healthiness and taste liking served as dependent variables. The questionnaire included several scales to measure these concepts. In addition to that, general health interest served as a moderating variable and product attitude as a controlling variable, both concepts were measured as well in the questionnaire. All items were measured using a 7-point Likert scale ranging from 'Strongly disagree' to 'Strongly agree'. A complete overview is shown in Appendix C.

Taste liking

Taste liking was measured using three items: good, tasty, and pleasant, based on Van Rompay, Van Hoof, Rorink and Folsche (2019). The items formed a reliable scale ($\alpha = .91$).

Perceived healthiness

Perceived healthiness was measured using a scale developed by Fenko et al. (2016). Four items of this scale were adapted to the purpose of this study: 'I expect this product to be healthy', 'This product looks healthy', 'This product seems low on calories', 'This drinking yogurt looks healthier than similar variants of drinking yogurt' and one item was added to this scale: 'This product looks natural' ($\alpha = .83$).

General health interest

The moderating variable general health interest was assessed by a subscale of the Taste and Health Attitude scale developed by Roininen et al. (1991). The subscale consisted of eight items, of which four positively formulated items: ‘I am very particular about the healthiness of food I eat’, ‘I always follow a healthy and balanced diet’, ‘It is important for me that my diet is low in fat’ and ‘It is important for me that my daily diet contains a lot of vitamins and minerals’ and four negatively formulated items: ‘I eat what I like and I do not worry about the healthiness of food’, ‘The healthiness of food has little impact on my food choices’, ‘The healthiness of snacks makes no difference for me’ and ‘I do not avoid any foods, even if they may raise my cholesterol’ ($\alpha = .84$).

Product Attitude

The controlling variable product attitude was measured by six items based on a scale of Fenko et al. (2016). Three items were adapted from this scale: ‘This product looks good’, I think this product is of high quality’ and ‘This product looks attractive’. Three items were added to this scale: ‘This product is appealing to me’, ‘This product is pleasant’ and ‘I like this product’ ($\alpha = .91$).

4. Results

The Process Macro (Hayes, 2017) was used to test the hypothesized effects. Model 60, as visualised in the research model (see *Figure 1*), was used to test the effects, with colour saturation and the type of label as independent variables, general health interest as moderator, perceived healthiness as mediator and taste liking as the dependent variable.

4.1 Correlation analysis

Before conducting analyses to test the hypothesized effects, a correlation analysis of the measurement variables was conducted. Table 7 shows the results of the Pearson's correlation between all measurement variables. Surprisingly, perceived healthiness was significantly and positively correlated with taste liking (r = .34, p = <.001). Age correlated negatively and significant with both gender (r = -.18, p = .021) and the dependent variable taste liking (r = -.16, p = .044). Age also correlated positively and significant with the moderating variable general health interest (r = .20, p = .012).

Table 7

Pearson's Correlation between variables

	Age	Gender	Perceived healthiness	General health interest	Taste liking
Age	1				
Gender	-.18**	1			
Perceived healthiness	-.08	.03	1		
General health interest	.20*	.14	.07	1	
Taste liking	-.16**	.07	.34**	.04	1

** Significant effect p<0.05

4.2 Taste liking

The explained variance of the full model was statistically significant for the dependent variable taste liking (R^2 = .12, F(4,157) = 5.527, p < .001). The mean scores and standard deviations of taste liking for all conditions are presented in Table 8. However, the direct effects of colour saturation on taste liking turned out to be negative and insignificant (β = -0.02, t(157) = -0,12, p = .908). Taste liking was higher in the condition were the colour saturation was low (M_{Low} = 5.37, SD_{Low} = 1.06), compared to the condition were the colour saturation was high (M_{High} = 5.21, SD_{High} = 1.24). This is the opposite of what was expected. Therefore, hypothesis 1 is not supported.

Table 8

Descriptive statistics of the dependent variable taste liking.

	Saturation		Type of label		
Variable	High	Low	Health	Hedonic	Control
Taste liking	*M* = 5.21	*M* = 5.37	*M* = 5.33	*M* = 5.20	*M* = 5.35
	SD = 1.24	*SD* = 1.06	*SD* = 1.26	*SD* = 1.26	*SD* = 0.93

In addition to that, results show that the effect of perceived healthiness on taste liking is insignificant as well (β = 0.04, $t(157) = 0.15$, p = .878). These results indicate no significant effect of the independent variable on the dependent variable and no significant effect of the mediating variable on the dependent variable. Therefore, it can be concluded that the effect of colour saturation is not mediated by perceived healthiness, so hypothesis 3 is not supported.

4.3 Perceived healthiness

The explained variance of the full model was statistically significant for the mediator variable perceived healthiness (R^2 = .10, $F(7,154) = 2.523$ p = .017). The mean scores and standard deviations of perceived healthiness for all conditions are presented in Table 9.

Table 9

Descriptive statistics of the moderating variable perceived healthiness.

	Saturation		Type of label		
Variable	High	Low	Health	Hedonic	Control
Perceived	*M* = 3.62	*M* = 4.12	*M* = 4.13	*M* = 3.70	*M* = 3.79
healthiness	*SD* = 1.18	*SD* = 1.12	*SD* = 1.21	*SD* = 1.20	*SD* = 1.10

Results show that the effect of colour saturation on perceived healthiness was negative and significant (β = -1.66, $t(154) = -2.33$, p = .021). The scores for perceived healthiness were significantly higher in the low saturated condition (M_{Low} = 4.12, SD_{Low} = 1.12), compared to the high saturated condition (M_{High} = 3.62, SD_{High} = 1.18). Therefore hypothesis 2 is supported.

4.3.1 Interaction effect colour saturation x type of label

The direct effect of the health label (β = 0.26, t(154) = 0.85, p = .398) and the hedonic label (β = 0.12, t(154) = 0.39, p = .698) on perceived healthiness were both insignificant compared to the control condition. These results indicate that there is no direct effect of the type of label on the mediating variable perceived healthiness. The interaction effect of colour saturation and the health label (β = 0.19, t(154) = 0.44, p = .657), as well as the interaction effect of colour saturation and the hedonic label (β = -0.38, t(154) = -0,85, p = .397) were statistically insignificant compared to the control condition. Figure 4 displays the interaction plot.

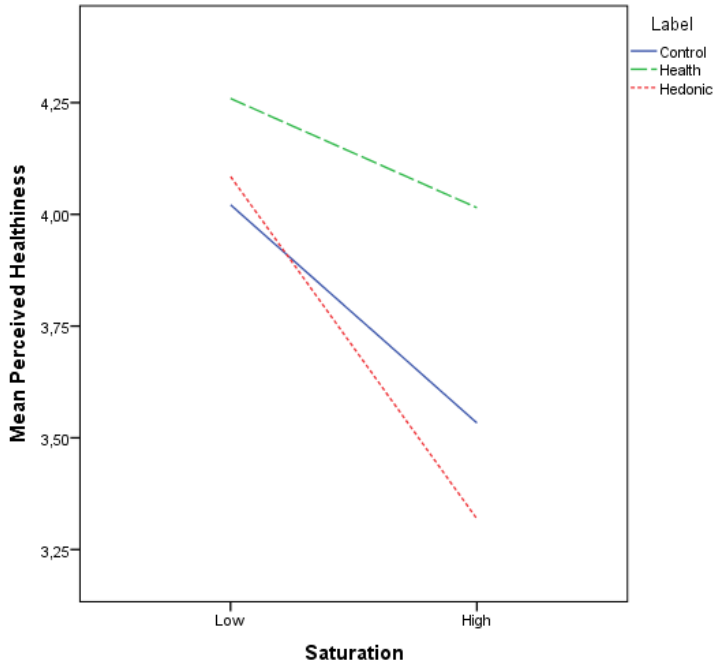


Figure 4. Interaction effect of colour saturation and type of label on perceived healthiness.

Respondents that were exposed to a low colour saturation in combination with a health label (e.g. the congruent condition) ($M_{\text{LowSat x Health}}$ = 4.26, SD = 1.27) scored higher on perceived healthiness, compared to the control condition ($M_{\text{LowSat x Control}}$ = 4.02, SD = 0.95). In addition to that, respondents that were exposed to a high colour saturation in combination with a hedonic label (e.g. the congruent condition) ($M_{\text{HighSat x Hedonic}}$ = 3.32, SD = 1.08) scored lower on perceived healthiness, compared to the control condition ($M_{\text{HighSat x Control}}$ = 3.53, SD = 1.19).

Furthermore, respondents in the high saturated condition in combination with a health label (e.g. the incongruent condition), scored higher on perceived healthiness compared to the control condition ($M_{\text{HighSat x Health}}$ = 4.01, SD = 1.20).

However, respondents in the low saturated condition with a hedonic label (e.g. the incongruent condition) scored also higher on perceived healthiness compared to the control condition ($M_{\text{LowSat x Hedonic}}$ = 4.08, *SD* = 1.21). This was contrary to the expectation. However, since there are no significant interaction effects, hypotheses 4 and 5 could not be supported.

4.4 General health interest

4.4.1 Colour saturation x general health interest

Results of Process Macro (Hayes, 2017) show that the direct effect of general health interest on perceived healthiness was negative and marginally significant (β = -0.22, $t(154)$ = -1.87, p = .064). The interaction effect of colour saturation and general health interest on perceived healthiness turned out to be marginally significant (β = 0.30, $t(154)$ = 1.81, p = .072), therefore hypothesis 6 is marginally supported. Figure 5 displays the interaction plots of the interaction effect per condition. The effect of colour saturation on perceived healthiness was smaller when respondents scored higher on general health interest ($M_{\text{HighSat x HighGHI}}$ = 3.64, *SD* = 0.36 vs. $M_{\text{LowSat x HighGHI}}$ = 3.75, *SD* = 0.13) compared to respondents who scored lower on general health interest ($M_{\text{LowSat x LowGHI}}$ = 4.23 *SD* = 0.13 vs. $M_{\text{HighSat x LowGHI}}$ = 3.46, *SD* = 0.36).

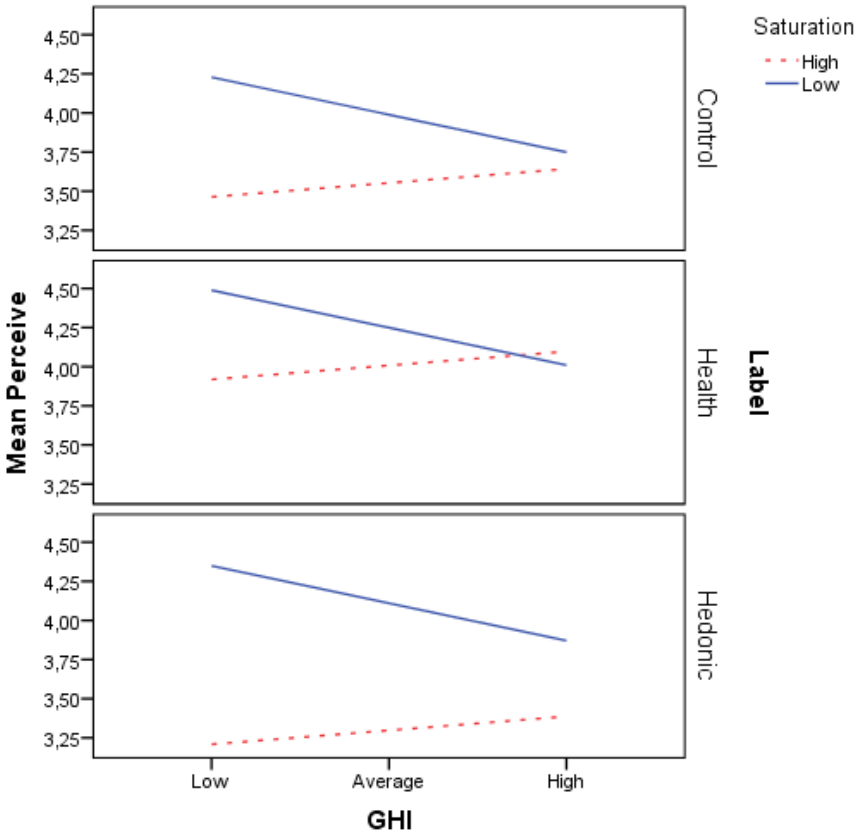


Figure 5. Interaction effect of colour saturation and general health interest on perceived healthiness.

4.4.2 Perceived healthiness x general health interest

Results show that the direct effect of general health interest on taste liking was negative and insignificant (β = -0.21, t(157) = -0.80, p = .423). In addition to that, the interaction effect of perceived healthiness and general health interest on taste liking was statistically insignificant (β = 0.07, t(157) = 1.09, p = .276) as well. It can be concluded that the effect of perceived healthiness on taste liking is not moderated by general health interest and therefore hypothesis 7 is not supported. The interaction plot is displayed in Figure 6. The scores for taste liking were higher with a higher perceived healthiness in combination with a higher score on general health interest ($M_{\text{HighPH x HighGHI}}$ = 5.84, SD = 0.47), compared with a higher perceived healthiness in combination with a lower score on general health interest ($M_{\text{HighPH x LowGHI}}$ = 5.53, SD = 0.29).

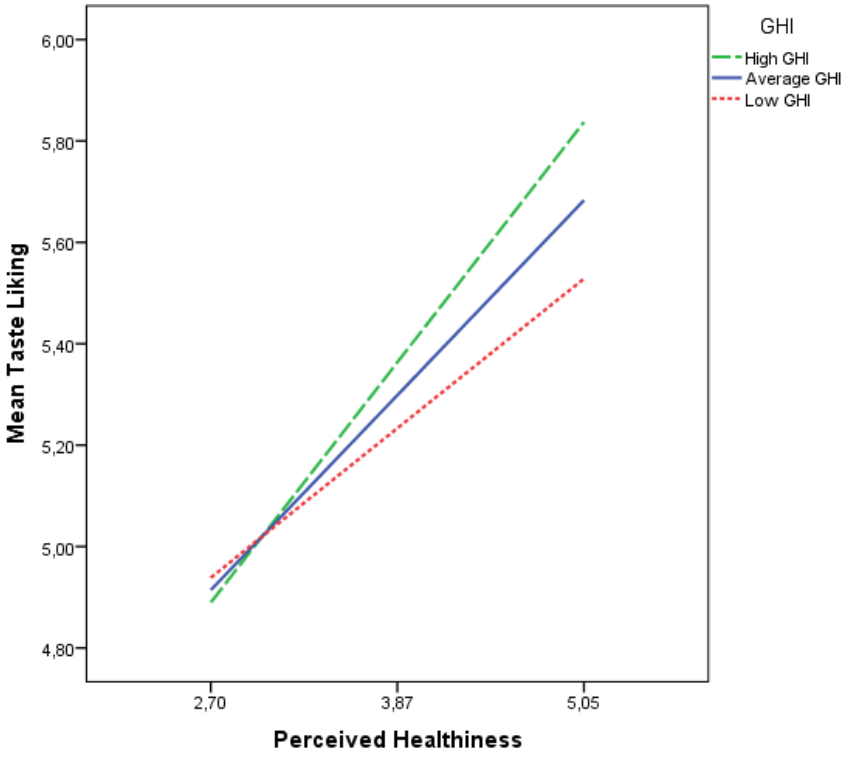


Figure 6. Interaction effect of perceived healthiness and general health interest on taste liking.

4.5. Hypotheses

Table 9 gives an overview of the supported and not supported hypotheses, based on this study's findings.

Table 9

Overview of the supported and not supported hypotheses

Hypothesis		Outcome
H1	Low (vs. high) colour saturation results in a low (vs. high) taste liking.	Not supported
H2	Low (vs. high) colour saturation results in high (vs. low) perceived healthiness.	Supported
H3	The effect of colour saturation on taste liking is mediated by perceived healthiness.	Not supported
H4	When low colour saturation is congruent with the explicit food cue an additive effect will occur and both cues will be used for (a) health-related inferences or (b) hedonic-related inferences.	Not supported
H5	When colour saturation is incongruent with the explicit food cue, an attenuation effect will occur and the implicit cue (colour saturation) will be ignored.	Not supported
H6	The effect of colour saturation on perceived healthiness is moderated by general health interest, such that a high general health interest leads to a smaller effect of colour saturation on perceived healthiness, compared with a low general health interest.	Marginally supported
H7	The effect of perceived healthiness on taste liking is moderated by general health interest, such that a high general health interest results in the opposite effect of the UTI and therefore a high perceived healthiness results in a high taste liking.	Not supported

5. Discussion

The aim of this study was to experimentally investigate the effects of colour saturation (high vs. low) and type of label (health, hedonic, control) on taste liking. Perceived healthiness was expected to mediate the effect of the independent variables on taste liking and general health interest was expected to moderate this effect as well. Furthermore, an interaction effect of the independent variables was also expected.

5.1 Discussion of the results

This research did not find any significant effects between colour saturation and taste liking. In addition to that, the average scores were higher for taste liking in the low saturated condition. This is an interesting finding, as it was expected that a low colour saturation results in a lower taste liking, compared to a high colour saturation. A possible explanation for the insignificant effect of colour saturation on taste liking could be that the high saturated package is experienced as unnatural and therefore less tasty. Mead and Richerson (2018) show that highly saturated colours are mostly related to unhealthy and unnatural food products, such as chips and sodas. Following this line of reasoning, the high saturated drinking yogurt package may be experienced as less tasty, because the package was associated with unnaturalness. Also, Tijssen et al. (2017) argue that colour saturation can have a different effect on taste perception, depending on the product category. This might result in a different effect of colour saturation on the taste perception, since drinking yogurt is a different product category than for example chips and sodas.

Secondly, in line with Mai et al. (2016) and Tijssen et al. (2017) it was expected that perceived healthiness would have a negative effect on taste liking. Surprisingly, this effect was positive but insignificant. These findings appear to be inconsistent with the unhealthy = tasty intuition (UTI) (Raghunathan et al. 2006). Huang and Lu (2016) argue that people nowadays are more inclined to eat healthy products. It might be possible that the UTI heuristic is not as relevant anymore because the trend is shifting, and people are adopting a healthier lifestyle.

In addition to that, this research measured the taste liking by means of an actual taste test. Results might be different if participants were not able to taste the product and were only exposed to visual stimuli. Mai et al. (2016) explain that if consumers are unable to access sensory properties through actual tasting, they are going to bridge this gap by relying on product cues and the UTI heuristic becomes activated. Consumers assume that a healthy product is not tasty, but these judgements become less effective or not even present when

there is the possibility to actually taste the product (Mai et al., 2016).

As third, it was expected that colour saturation would negatively affect the perceived healthiness. So, a high colour saturation would result in a lower perceived healthiness and a low colour saturation would result in a higher perceived healthiness. This was in line with the expectation and a significant effect was found. This is also in line with the results of Mai et al. (2016) and Tijssen et al. (2017). The results of both studies showed that low saturated colours are associated with product healthiness.

Furthermore, the results of this study have shown that there is no significant effect between colour saturation and the type of label. This is in contrast with Huang and Lu (2016) who found that if the package colour and the label were congruent both cues are used for the same product inferences, which is based on the CCT (Maheswaran & Chaiken, 1991). Also, the expected disfluency effect did not occur. The low saturated condition with the hedonic label had a higher average score on perceived healthiness than the control condition. The explicit cue did not overrule or undo the effect of the implicit cue. Perhaps, scepticism towards the hedonic label clarifies why the effect of the hedonic label was less effective in comparison with the health label in case of incongruency between colour saturation and the type of label (Fenko et al. 2016). When a product cue is ambiguous people tend to use other types of information to reduce this ambiguity (Trifts, Huang, & Gerald, 2013). It may be possible, that the hedonic label was experienced more ambiguous in comparison to the health label and had therefore not the expected effect, namely overruling the implicit cue.

In addition to that, it was expected that general health interest moderated the effect of colour saturation on perceived healthiness. This study found a marginally significant effect between colour saturation and general health interest. The difference in the effect of colour saturation on perceived healthiness was smaller in every condition when participants scored higher on the general health interest scale. This is also in line with a study by Mai et al. (2016). They describe that people with higher levels of nutritional knowledge are less susceptible for package cues such as colour saturation and do not categorise food as healthy or unhealthy based on only the level of saturation on the package. Therefore, this also results in a weakened effect of the unhealthy = tasty intuition (Mai et al., 2016).

Furthermore, the interaction effect of general health interest and colour saturation on perceived healthiness was smaller in the hedonic label condition compared to the health label condition and the control condition. Consumers who score higher on general health interest are more inclined to buy healthy food products (Roininen et al., 1999), instead of hedonic food products. Therefore, the effect of general health interest and colour saturation might be

less effective in the hedonic label condition. The hedonic label communicates information about the hedonic aspects of the food products, while people who score high on general health interest are more interested in buying healthy food products.

Lastly, it was expected that general health interest moderated the effect of perceived healthiness on taste liking. The study did not find any significant effects between perceived healthiness and general health interest on taste liking. These findings appear to be inconsistent with the unhealthy = tasty intuition (Raghunathan et al. 2006). As explained before, a possible explanation could be that the UTI heuristic is less relevant, because people are adopting a healthier lifestyle.

5.2. Implications

5.2.1. Theoretical implications

The aim of this research was to examine the effects of colour saturation and the type of label on the perceived healthiness and taste liking of the consumer. This study contributes to the existing theoretical knowledge, due to the limited research on the interaction effects on implicit and explicit product cues in combination with the possibility to taste the product and this study provides additional information about the applicability of the Cue Consistency Theory (CCT).

Results of this study show that explicit product cues, such as the type of label did not affect the perceived healthiness and taste liking. It can be concluded that there are multiple other factors influencing consumers' perception of a product.

Moreover, perceived healthiness and taste liking are not as intertwined as expected beforehand. When a person has the possibility to taste the product, an implicit product cue, such as colour saturation still influences the perceived healthiness, but not the taste liking.

In addition to that, the results of this study were not in line with the Cue Consistency Theory. There were no significant effects between the implicit cue and the explicit cue. Congruency between the product cues does not seem to have an additive effect on perceived healthiness, what is contrary to the CCT. Results of Van Ooijen et al. (2017) were also not in line with the CCT. They did not find an additive effect of colour and price on product quality inferences. A reason could be that price was considered as an abstract or ambiguous cue for product quality, which results in disregarding the explicit price cue (Van Ooijen et al., 2017).

Contrary, the results of Huang and Lu (2017) were in line with the Cue Consistency Theory. They found that congruency between the cues causes an additive effect. Colour was used as in implicit cue and label as an explicit cue.

It seems that there are contradictory results when looking at the CCT. A possible explanation for these contradictory results might be the chosen implicit and explicit cues. Different types of implicit cues and different types of explicit cues may result in different outcomes. It is possible that several cues are too indirect and ambiguous, which could result in disregarding the cue. This may explain why several results are in line with the CCT and other results are not in line with the CCT.

5.2.2. Practical implications

This research extended research on the effectiveness of product packaging cues and how it affects consumer's perception of a product. This research examined which packaging cues, explicit or implicit are more effective in influencing product perception and how these cues interact with each other. Colour saturation, the implicit cue, seems to affect the perceived healthiness. Packaging designers should keep that in mind. If they want to communicate the healthiness of the product, a low saturated colour would be a better choice. Also, this research showed that colour saturation did not affect the taste liking. Packaging designers should be aware that participants had the possibility to taste the product and when this is not possible results could be different.

Although the effect of general health interest and colour saturation on perceived healthiness was not robust, there was certainly a small effect. Health aware consumers may experience packaging cues differently compared to consumers who are less conscious of eating healthy. It depends on the goal and which target group is most important for the food manufactures, in the consideration of how to design a product package. If food manufacturers want to reach health-aware consumers, they should keep in mind that this target group is less susceptible to implicit cues, such as colour saturation. Therefore, focussing on other types of cues, such as a label or text would be a better choice.

5.3. Limitations and recommendations for future research

This study includes several limitations. First, a fictional brand was used for the experiment. An own brand was created for this study on purpose, to prevent bias of brand preference of the participants. However, by doing so, only a small number of elements were present on the package, which is not as realistic. Normally, product packages are overloaded with all sorts of different elemental cues. Future research could address, for instance, the interaction effect of multiple implicit cues in combination with different explicit attributes. To extend practical relevance, future research could also focus on already existing brands.

The second limitation is the design of the stimuli. It is possible that the effects are

different when another colour was used. People might have associations with the colour yellow that influenced the results. Also, the chosen implicit and explicit cues could have influenced the results. Colour saturation might be too abstract and ambiguous compared to colour hue, or other types of implicit cues. Other types of implicit manipulations may be less ambiguous and could result in a stronger effect. It is also possible that the explicit cue was too ambiguous, which may have resulted in disregarding the explicit cue. Future research could address other types of implicit cues (e.g. shape, graphics) or explicit cues (e.g. brand). Multiple implicit cues would be interesting to research as well, in order to measure which implicit cue is experienced more dominantly.

Furthermore, an experimental setting was used in this study. Although this setting was on purpose, to limit other factors and to focus on packaging design only, for future research it could be interesting to test the effects of packaging cues in a real-life setting. Numerous of situational factors are influencing food choices as well, among which time or the physical surroundings in the supermarket, such as shelf-arrangement or multisensory experience (e.g. music, scent) (Köster, 2009). Therefore, the results may be different in a real-life setting.

Another limitation is the type of product chosen in this research. In this experiment, the product category of drinking yogurt is chosen to test the effects of implicit and explicit product cues. Another type of drinking yogurt might result in different outcomes of the study, but also other types of products may give different results. Drinking yogurt is a low involvement product. Future research could address different product categories. Effects of implicit and explicit cues may be different with high involvement products (e.g. phone, car).

Another limitation lies in the sampling method used in this study. Convenience sampling was used to recruit respondents for the study. This may have had a negative effect on the representativeness of the sample. Respondents were gathered at the University of Twente, which creates an uneven distribution of age an intelligence level. It would be interesting for future research to use different target groups varying more in age and intelligence. Also, the effect of implicit and explicit cues could differ across cultures and therefore a cross-cultural target group could be interesting to research as well.

Lastly, the sense of taste before participating in this research may have influenced the results. It is possible that participants' taste perception is influenced by certain categories of food and beverages consumed before the experiment. It would be better to keep in mind when a taste test is included in the study to let participants eat something neutral like a biscuit beforehand or drink some water to neutralize the taste.

6. Conclusion

This study has shown that colour saturation influences the perceived healthiness of a product. A high colour saturation results in a lower perceived healthiness and a low colour saturation results in a higher perceived healthiness. Only the implicit cue influenced the perceived healthiness. No interaction effect between the implicit cue, colour saturation and the explicit cue, the type of label was found. Furthermore, colour saturation did not affect the taste liking. There was expected that a low colour saturation would negatively affect the taste perception, but the opposite was found. It might be possible that the UTI heuristic is not relevant, because the trend is shifting, and people are adopting a healthier lifestyle. Additionally, no mediating effects were found between perceived healthiness and taste liking. Lastly, the moderating variable general health interest showed a trend effect on perceived healthiness. It seems that implicit cues are experienced differently if a person is more inclined to buy healthy food products. To conclude, this study found several effects. Food choices are complex behaviours and are influenced by many interacting factors. Packaging designers should think carefully about the goal they have in mind and which target group they want to reach. Future research is needed to examine the effects of other types of packaging cues and how these cues interact in different contexts.

References

Alter, A. L., Oppenheimer, D. M., Epley, N., & Eyre, R. N. (2007). Overcoming intuition: metacognitive difficulty activates analytic reasoning. *Journal of Experimental Psychology: General*, *136*(4), 569. https://doi.org/10.1037/0096-3445.136.4.569

Becker, L., Rompay, T.J.L. van, 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. https://doi.org/10.1016/j.foodqual.2010.06.007

Chandon, P., Hutchinson, J. W., Bradlow, E. T., & Young, S. H. (2009). Does in-store marketing work? Effects of the number and position of shelf facings on brand attention and evaluation at the point of purchase. *Journal of marketing*, *73*(6), 1-17. https://doi.org/10.1509/jmkg.73.6.1

Cohen, D. A., & Babey, S. H. (2012). Contextual influences on eating behaviours: heuristic processing and dietary choices. *Obesity Reviews*, *13*(9), 766-779. https://doi.org/10.1111/j.1467789X.2012.01001.x

Dijksterhuis, A., Smith, P. K., Van Baaren, R. B., & Wigboldus, D. H. (2005). The unconscious consumer: Effects of environment on consumer behavior. *Journal of consumer psychology*, *15*(3), 193-202. https://doi.org/10.1207/s15327663jcp1503_3

Dubois, L., Farmer, A., Girard, M., & Peterson, K. (2007). Regular sugar-sweetened beverage consumption between meals increases risk of overweight among preschool-aged children. *Journal of the American Dietetic Association*, *107*(6), 924-934. https://doi.org/10.1016/j.jada.2007.03.004

Evans, J. S. B., & Stanovich, K. E. (2013). Dual-process theories of higher cognition: Advancing the debate. *Perspectives on psychological science*, *8*(3), 223-241. https://doi.org/10.1177/1745691612460685

Fenko, A., Kersten, L., & Bialkova, S. (2016). Overcoming consumer scepticism toward food labels: The role of multisensory experience. *Food quality and preference*, *48*, 81-92. https://doi.org/10.1016/j.foodqual.2015.08.013

Fenko, A., Lotterman, H., & Galetzka, M. (2016). What's in a name? The effects of sound symbolism and package shape on consumer responses to food products. *Food quality and preference*, *51*, 100-108. https://doi.org/10.1016/j.foodqual.2016.02.021

Goldman, I. L. (2003). Recognition of fruit and vegetables as healthful: vitamins and phytonutrients. *HortTechnology*, *13*(2), 252-258. https://doi.org/10.21273/HORTTECH.13.2.0252

Gidlöf, K., Anikin, A., Lingonblad, M., & Wallin, A. (2017). Looking is buying. How visual attention and choice are affected by consumer preferences and properties of the supermarket shelf. *Appetite*, *116*, 29-38. https://doi.org/10.1016/j.appet.2017.04.020

Hayes, A. F. (2017). Introduction to mediation, moderation, and conditional process analysis: A regression-based approach. Guilford Publications.

Huang, L., & Lu, J. (2016). The impact of package color and the nutrition content labels on the perception of food healthiness and purchase intention. *Journal of food products marketing*, *22*(2), 191-218. https://doi.org/10.1080/10454446.2014.1000434

Kahneman, D. (2003). A perspective on judgment and choice: mapping bounded rationality. *American psychologist*, *58*(9), 697. http://dx.doi.org/10.1037/0003-066X.58.9.697

Karjalainen, T. M. (2007). It looks like a Toyota: Educational approaches to designing for visual brand recognition. *International Journal of design*, *1*(1) 67-81.

Kiesel, K., & Villas-Boas, S. B. (2013). Can information costs affect consumer choice? Nutritional labels in a supermarket experiment. *International Journal of Industrial Organization*, *31*(2), 153-163. https://doi.org/10.1016/j.ijindorg.2010.11.002

Koenigstorfer, J., Groeppel-Klein, A., & Kamm, F. (2014). Healthful food decision making in response to traffic light color-coded nutrition labeling. *Journal of Public Policy & Marketing*, *33*(1), 65-77. https://doi.org/10.1509/jppm.12.091

Köster, E. P. (2009). Diversity in the determinants of food choice: A psychological perspective. *Food quality and preference*, *20*(2), 70-82. https://doi.org/10.1016/j.foodqual.2007.11.002

Labrecque, L. I., Patrick, V. M., & Milne, G. R. (2013). The marketers' prismatic palette: A review of color research and future directions. *Psychology & Marketing*, *30*(2), 187-202. https://doi.org/10.1002/mar.20597

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*(1), 33-39. https://doi.org/10.1016/j.foodqual.2013.01.010

Ludwig, D. S., Peterson, K. E., & Gortmaker, S. L. (2001). Relation between consumption of sugar-sweetened drinks and childhood obesity: a prospective, observational analysis. *The Lancet*, *357*(9255), 505-508. https://doi.org/10.1016/S01406736(00)04041-1

Maheswaran, D., & Chaiken, S. (1991). Promoting systematic processing in low-motivation settings: Effect of incongruent information on processing and judgment. *Journal of personality and social psychology*, *61*(1), 13. http://dx.doi.org/10.1037/00223514.61.1.13

Mai, R., Symmank, C., & Seeberg-Elverfeldt, B. (2016). Light and pale colors in food packaging: When does this package cue signal superior healthiness or inferior tastiness? *Journal of Retailing*, *92*(4), 426-444. https://doi.org/10.1016/j.jretai.2016.08.002

Malik, V. S., Popkin, B. M., Bray, G. A., Després, J. P., Willett, W. C., & Hu, F. B. (2010). Sugar-sweetened beverages and risk of metabolic syndrome and type 2 diabetes: a meta-analysis. *Diabetes care*, *33*(11), 2477-2483. https://doi.org/10.2337/dc10-1079

Mead, J. A., & Richerson, R. (2018). Package color saturation and food healthfulness perceptions. *Journal of Business Research*, *82*, 10-18. https://doi.org/10.1016/j.jbusres.2017.08.015

Pula, K., Parks, C. D., & Ross, C. F. (2014). Regulatory focus and food choice motives. Prevention orientation associated with mood, convenience, and familiarity. *Appetite*, *78*, 15-22. https://doi.org/10.1016/j.appet.2014.02.015

Raghunathan, R., Naylor, R. W., & Hoyer, W. D. (2006). The unhealthy= tasty intuition and its effects on taste inferences, enjoyment, and choice of food products. *Journal of Marketing*, *70*(4), 170 184. https://doi.org/10.1509/jmkg.70.4.170

Roininen, K., Lähteenmäki, L., & Tuorila, H. (1999). Quantification of consumer attitudes to health and hedonic characteristics of foods. *Appetite*, *33*(1), 71-88. https://doi.org/10.1006/appe.1999.0232

Scheibehenne, B., Miesler, L., & Todd, P. M. (2007). Fast and frugal food choices: Uncovering individual decision heuristics. *Appetite*, *49*(3), 578-589. https://doi.org/10.1016/j.appet.2007.03.224

Schifferstein, H. N., Fenko, A., Desmet, P. M., Labbe, D., & Martin, N. (2013). Influence of package design on the dynamics of multisensory and emotional food experience. *Food Quality and Preference*, *27*(1), 18-25. https://doi.org/10.1016/j.foodqual.2012.06.003

Selinger, E., & Whyte, K. (2011). Is there a right way to nudge? The practice and ethics of choice architecture. *Sociology Compass*, *5*(10), 923-935. https://doi.org/10.1111/j.17519020.2011.00413.x

Shah, A. K., & Oppenheimer, D. M. (2008). Heuristics made easy: An effort-reduction framework. *Psychological bulletin*, *134*(2), 207. https://doi.org/10.1037/0033-2909.134.2.207

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*(1), 23. doi:10.1186/s13411-015-0033-1

Trifts, V., Huang, L., & Gerald, H. (2013). Price versus nice. How unfavorable price comparisons help retain customers. Journal of Marketing Theory and Practice, 21, 163–178. doi:10.2753/MTP1069-6679210203

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. https://doi.org/10.1016/j.foodqual.2017.01.019

Van Ooijen, I., Fransen, M. L., Verlegh, P. W., & Smit, E. G. (2017). Packaging design as an implicit communicator: Effects on product quality inferences in the presence of explicit quality cues. *Food quality and preference*, *62*, 71-79. https://doi.org/10.1016/j.foodqual.2017.06.007

Van Ooijen, I., Fransen, M. L., Verlegh, P. W., & Smit, E. G. (2017). Signalling product healthiness through symbolic package cues: Effects of package shape and goal congruence on consumer behaviour. *Appetite*, *109*, 73-82. https://doi.org/10.1016/j.appet.2016.11.021

Van Rompay, T. J., 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. https://doi.org/10.1016/j.foodqual.2016.06.001

Van Rompay, T. J., 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. https://doi.org/10.1016/j.appet.2019.01.002

Velasco, C., Woods, A. T., Petit, O., Cheok, A. D., & Spence, C. (2016). Crossmodal correspondences between taste and shape, and their implications for product packaging: A review. Food Quality and Preference, *52*, 17-26. https://doi.org/10.1016/j.foodqual.2016.03.005

Yeomans, M. R., Lartamo, S., Procter, E. L., Lee, M. D., & Gray, R. W. (2001). The actual, but not labelled, fat content of a soup preload alters short-term appetite in healthy men. *Physiology & behavior*, *73*(4), 533-540. http://dx.doi.org/10.1016/S0031-9384(01)00502-9

Zandstra, E. H., De Graaf, C., & Van Staveren, W. A. (2001). Influence of health and taste attitudes on consumption of low-and high-fat foods. *Food Quality and Preference*, *12*(1), 75-82. https://doi.org/10.1016/S0950-3293(00)00032-X

Appendices

Appendix A: Items used in pre-test 1

Table A1

Scales and items used in pre-test 1.

Construct (Cronbach's α)	Item	Source
Perceived healthiness (α = .87)	I expect this product to be healthy	Fenko et al. (2016)
	This product seems healthy	
	This product looks low on calories	
	This drinking yogurt looks healthier than similar variants of drinking yogurt	
	This product looks natural	
Aesthetics (α = .86)	I think this package looks beautiful	
	I think this drinking yogurt is of high quality	
Brand name association healthiness	[Brand name] sounds healthy	
Brand name association tastiness	[Brand name] sounds delicious	
Brand name association flavor	[Brand name] sounds full of flavor	
Suitability brand name	[Brand name] is a suitable name for drinking yogurt	

Appendix B: Pre-test 1 results brand names

Table B1

Means and standard deviations brand name association with healthiness

Variables	N	*M*	*SD*
Brand 1 (Škola) [a]	50	4.68	1.48
Brand 2 (Yovavit) [a]	50	5.12	1.30
Brand 3 (Ayrane) [a]	50	3.94	1.54

[a] 7-point Likert scale (1=strongly disagree / 7=strongly agree)

Table B2

Means and standard deviations brand name association with taste liking

Variables	N	*M*	*SD*
Brand 1 (Škola) [a]	50	4.24	1.49
Brand 2 (Yovavit) [a]	50	4.40	1.39
Brand 3 (Ayrane) [a]	50	3.02	1.49

[a] 7-point Likert scale (1=strongly disagree / 7=strongly agree)

Table B3

Means and standard deviations brand name association with flavour

Variables	N	*M*	*SD*
Brand 1 (Škola) [a]	50	4.64	1.34
Brand 2 (Yovavit) [a]	50	4.28	1.43
Brand 3 (Ayrane) [a]	50	3.46	1.53

[a] 7-point Likert scale (1=strongly disagree / 7=strongly agree)

Table B4

Means and standard deviations suitability brand name

Variables	N	*M*	*SD*
Brand 1 (Škola) [a]	50	4.34	1.73
Brand 2 (Yovavit) [a]	50	5.40	1.18
Brand 3 (Ayrane) [a]	50	3.24	1.59

[a] 7-point Likert scale (1=strongly disagree / 7=strongly agree)

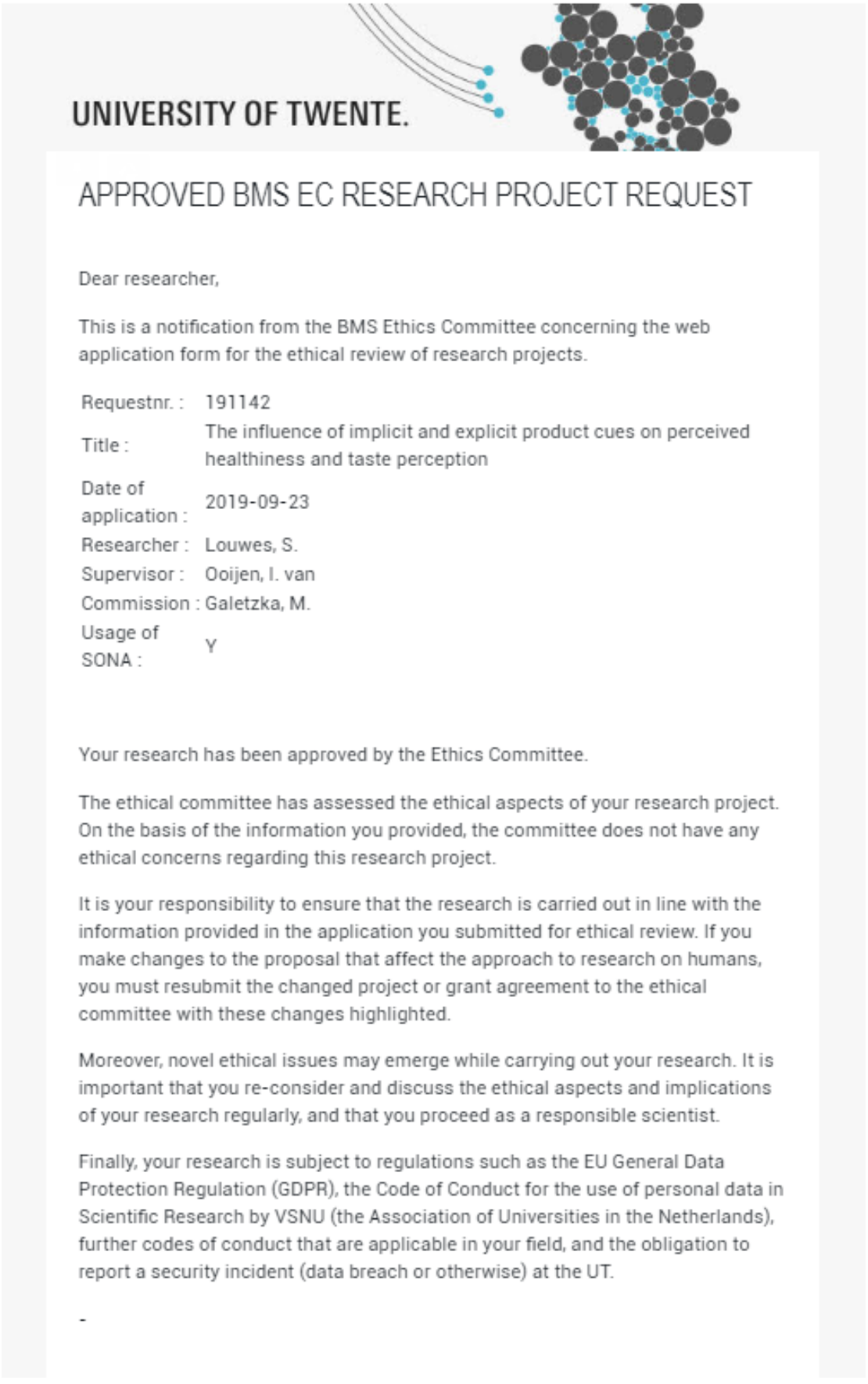
Appendix C: Items used in the main study

Table C1

Scales and items used in the main study.

Construct (Cronbach's α)	Item	Source
	The taste of this drinking yogurt is…	
Taste liking (α = .91)	…good …tasty …pleasant	Van Rompay et al. (2019)
Taste characteristics	…sweet …sour …bitter …salty	
Perceived taste intensity (α = .84)	…strong …full …powerful …intense	Becker et al. (2011) and Van Rompay et al. (2016)
Perceived healthiness (α = .83)	I expect this product to be healthy This product looks healthy This product seems low on calories This drinking yogurt looks healthier than similar variants of drinking yogurt This product looks natural	Fenko et al. (2016)
Product Attitude (α = .91)	This product looks good I think this product is of high quality This product looks attractive This product is appealing to me This product is pleasant I like this product	Fenko et al. (2016)
General Health Interest (α = .84)	I eat what I like and I do not worry about healthiness of food. (R) I am very particular about the healthiness of food I eat The healthiness of food has little impact on my food choices. (R) I always follow a healthy and balanced diet. It is important for me that my diet is low in fat The healthiness of snacks makes no difference to me. (R) I do not avoid any foods, even if they may raise my cholesterol. (R) It is important for me that my daily diet contains a lot of vitamins and minerals.	Roininen et al. (1991)

Appendix D: Approval form of ethics committee



UNIVERSITY OF TWENTE.

APPROVED BMS EC RESEARCH PROJECT REQUEST

Dear researcher,

This is a notification from the BMS Ethics Committee concerning the web application form for the ethical review of research projects.

Requestnr. :	191142
Title :	The influence of implicit and explicit product cues on perceived healthiness and taste perception
Date of application :	2019-09-23
Researcher :	Louwes, S.
Supervisor :	Ooijen, I. van
Commission :	Galetzka, M.
Usage of SONA :	Y

Your research has been approved by the Ethics Committee.

The ethical committee has assessed the ethical aspects of your research project. On the basis of the information you provided, the committee does not have any ethical concerns regarding this research project.

It is your responsibility to ensure that the research is carried out in line with the information provided in the application you submitted for ethical review. If you make changes to the proposal that affect the approach to research on humans, you must resubmit the changed project or grant agreement to the ethical committee with these changes highlighted.

Moreover, novel ethical issues may emerge while carrying out your research. It is important that you re-consider and discuss the ethical aspects and implications of your research regularly, and that you proceed as a responsible scientist.

Finally, your research is subject to regulations such as the EU General Data Protection Regulation (GDPR), the Code of Conduct for the use of personal data in Scientific Research by VSNU (the Association of Universities in the Netherlands), further codes of conduct that are applicable in your field, and the obligation to report a security incident (data breach or otherwise) at the UT.

-