Haptic cues as an additional value on the product's health perception: The effects of multi-sensory package design on the health perception, taste evaluation and product evaluations of green ice tea.

Master Thesis
December, 2017

Linda Zwiers

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Supervisors:
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ABSTRACT

Research shows that package design is a powerful tool in marketing. Product package may draw consumers' attention and hence, influence consumers' product evaluation and choice. However, so far, research mainly focused on the visual aspects of product packaging and its impact on product evaluation. Though, currently, researchers pay more and more attention to the influence of multi-sensory packages, such as visual-tactual package design. A multi-sensory product experience creates an additional and novel dimension to the product and may steer product experience. Since the high need to promote healthy foods, due to the major problem of obesity and the increasing popularity of healthy foods, this study focuses on manipulating the product package of green ice tea. The research presented here investigates the impact of a visual-tactual product package, as opposed to a visual-only product package, on the product's health perception, naturalness perception, taste evaluation/overall evaluation, and price expectation. Further, different types of green ice tea (pure and sweetened) are included to investigate if the degree of the product's healthiness interplays with the product design. For that purpose, three bottle labels were designed with either no natural associations (control bottle), a 2D-design of leaves (vision-only bottle), or a 3D-design of leaves, to which a surface texture was added (vision+touch bottle), and handed out to participants who tasted the product and subsequently assessed it. In addition, General Health Interest (GHI) was measured and inserted as a moderator to investigate whether GHI interacted with package design. The findings presented indicate that the addition of a natural surface texture to the product package of green ice tea positively influenced the product's taste evaluation/overall evaluation. On the contrary, the results presented indicate that associations portrayed by surface texture did not transfer to health perception, naturalness perception, and price expectation. Finally, the findings presented suggest that participants with a high score on GHI, as opposed to participants with a low score on GHI, are more susceptible to multi-sensory package manipulation, with respect to naturalness perception.

Keywords: *Package design, surface texture, haptic cues, visual+tactual, multi-sensory, health perception, naturalness perception, taste evaluation, overall evaluation, price expectation, beverage evaluation, product evaluation, sensation transference, green ice tea*

CONTENTS

1. INTRODUCTION

In the past few years, people seem to be increasingly more interested in healthy foods. This indicates that people desire to maintain a more healthy lifestyle, not only in the field of diet, but also in the field of physical activity. Meanwhile, a major problem in recent times is the increasing incidence of overweight and obesity, which jeopardizes human health. Back in 1948, when the global pattern of diseases was considered by the World Health Organization, obesity was already recognized as a disease (James, 2008). Even though, not everyone in the medical world agreed with this, because any clinical problems caused by obesity were easy to cure by reducing food intake (James, 2008). Yet, obesity impairs normal bodily function to a great extent (Apovian, Garvey & Ryan, 2015), and even leads to increased morbidity and mortality (Pi-Sunyer, 2002).

Hence, the need to promote a positive change in lifestyle is great. Since an improvement in human health is most likely achieved by changing eating habits (Beirreiro-Hurle, Gracia, and de-Magistris, 2010) it is interesting to investigate the possibilities to communicate the product's health. By the fast majority of humans, sweetness is experienced as a palatable taste, and this preference for sweetness is responsible for a significant sugar intake (Tappy & Lê, 2010). Food producers glorify their products by adding sugars or sweet substitutes, such as stevia, into their products, making it difficult to promote healthy products. In addition, as a result of the growing interest in healthy foods, the amount of healthy products has increased, making it harder to stand out among competitors.

When standing in front of the supermarket shelves, consumers are confronted with a wide range of products. Thereby, consumers are increasingly confronted with food labels filled with nutrition information. Barreiro-Hurle, Gracia, and de-Magistris (2010) argued that the presence of multiple nutrition and health information labels, as opposed to individual labels, has no positive impact on consumers' utility when making food choices. Therefore, research is needed to communicate health information in an innovative manner which is easy to process.

At point of purchase, package design is one of the most important means to draw consumers' attention (Van Rompay, Finger, Saakes & Fenko, 2016) and hence, influences consumer product evaluation and choice (Creusen & Schoormans, 2005). In recent years, researchers already looked into the visual influences (e.g. shape, colour and size) on product evaluation (e.g. Becker, Van Rompay, Schifferstein & Galetzka, 2011; Deliza, MacFie & Hedderley, 1996; Schifferstein, 2009; Spence & Wan, 2015; Westerman et al., 2012) However, besides the visual aspect, research currently pays more attention to the effects of multi-sensory product packages, such as adding tactile elements (e.g. Biggs, Juravle & Spence, 2016; Piqueras-Fiszman & Spence, 2012; Van Rompay, Finger, Saakes & Fenko, 2016).

Inspired by possibilities for multi-sensory packages to communicate product characteristics (e.g. healthiness and naturalness) and to distinguish products from competitors, this research is focused on adding, along with visual elements, tactual elements on the product package. However, not all types of products are equally suitable to highlight its health aspect. It is, for instance, due to its unhealthy nature, less reliable and moreover dishonest to manipulate the package of unhealthy foods and beverages (e.g. fast food and soft drinks) in order to make it look healthier. Ruumpol (2014) argued that packages can be used to communicate healthfulness, though, it may be only applicable for products that are already perceived as healthy.

Consumption of products that consist of natural substances, such as green tea can help treat obesity and, thus, improve human health (Kovacs, Lejeune, Nijs & Westerterp-Plantenga, 2004). Research from Dulloo et al. (1999) showed that green tea increases energy expenditure and fat oxidation twenty-four-hour. Also, nowadays, green (iced) tea seems to be a popular trend and is, if no sugar added, a healthier product compared to most other beverages, such as soft drinks and sweetened lemonades*. Inspired by its healthy nature, this research focuses on manipulating the package of green ice tea with both visual and tactile elements in order to investigate the possibilities for multi-sensory packages to increase among others the product's health perception and to find out if the multi-sensory product package positively affects the product's taste evaluation and overall evaluation.

This study focuses on the distinction between vision-only elements and vision+touch elements, which means that it will be examined if there is a significant difference in the perceived healthiness of green ice tea between a 2D-design (vision-only) and a 3D-design (vision+touch), where in addition to the visual aspect, a tangible aspect (a surface texture) is added. The design contains images of green leaves to ensure an association with nature. In addition, a control version is added to the design, containing a random printing without natural associations, to ensure that the addition of leaves (regardless of a 2D-design or a 3D-design) influences health perception.

In addition to the focus on perceived healthiness of green ice tea, this study also focuses on influencing perceived naturalness, taste evaluation/overall evaluation, and price expectation. Finally, to find out if the impact of the conditions (control versus vision-only versus vision+touch) varies among a more healthier type of green ice tea (pure) and a less healthier type of green ice tea (sweetened), the type of green ice tea (pure versus sweetened) is inserted as a second independent variable. This leads to the following research question:

> **RQ:** *To what extent do the type of elements added on the package (control versus vision-only versus vision+touch) and the type of green ice tea (pure versus sweetened) influence the product's perceived healthiness, perceived naturalness, taste evaluation/ overall evaluation, and price expectation?*

Finally, General Health Interest (GHI), a scale which is used to measure the extent to which participants are focused on health (Roininen, Lähteenmäki & Tuorila, 1999), is inserted as a moderator. Participants' GHI is measured in order to find out if health perception outcomes differ among participants who are high health orientated and participants who are low (or not) interested in healthiness.

Goal of the study

Product package design is a powerful tool in marketing, because it can influence product decision (Schoormans & Robben, 1997) and the way consumers experience a product (Becker, Van Rompay, Schifferstein & Galetzka, 2011). Many research is conducted in the field of package design, though research conducted in the field of multi-sensory package design is limited. The goal of this study is to find out to what extent the addition of multi-sensory modalities (vision+touch) affects, among others, the product's health perception. More specifically, this study aims to find out if the tangible element in package design has an additional value to attain certain product characteristics, such as healthiness and taste evaluation. On a theoretical level, food brands may benefit from the results emerged from this research in order to improve promotion of their healthy products and subsequently increase their sales.

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* More detailed background information about the unhealthy effects of soft drinks and the beneficial effects of green ice tea can be found in Appendix A.

2. THEORETICAL FRAMEWORK

2.1 The importance of package design

Next to the protection of the product and the facilitation of distribution, the package of a product also has many communication functions, such as product identification and price information (Schoormans & Robben, 1997). In addition, product design attracts consumers and may even increase the quality of the product due to usage experiences (Bloch, 1995). Attraction of attention is the precondition for information processing, which can be achieved by marketing stimuli (Schoormans & Robben, 1997). Therefore, package design is important for primarily attracting consumers' attention and subsequently communicate the beneficial aspects of the product in order to *sell* the product. Shortly, the package design may have an influence on the level of sales and the success of a business.

A product package may, thus, affect consumers' product choices between several similar products of different brands. One possible way to communicate a product's features is by food labelling. Peters-Taxeira and Badrie (2005) argued that food labelling is important since 92.7% of participants agreed that nutrition information should be visible on a food product. However, their research also showed that 36.6% of respondents indicated that they did not read this information due to its complexity. Therefore, it is interesting to, instead of presenting the product's features in letter and logos on the label, investigate whether manipulation of the package appearance (e.g. shape, pictures, colours) has an influence on how the product is experienced,

The focus of this study is aimed at the impact of the *aesthetic* features of the package design on the perceived quality of the product, in order to increase the product's evaluation. Aesthetic originally refers to sensory perception and understanding (Hekkert, 2006). Nowadays, however, the meaning of the term is transformed to '*gratification of the senses or sensuous delight'* (Goldman, 2001 as cited by Hekkert, 2006 *p. 158*), and is now generally used with reference to visual art (Hekkert, 2006). These aesthetic qualities, resulting in a package that is pleasing to the eye, may steer consumer decision making. Creusen and Schoormans (2005) argued that the aesthetic and symbolic roles of package appearance influence product perception and are rated as most decisive in consumer product choice. Consumers find looking at a beautiful product rewarding and in case of similar functioning and price, consumers prefer a product that appeals the most to them aesthetically (Creusen & Schoormans, 2015).

Based on its packaging, consumers make certain assumptions about the quality of its content. This is an implicit process in which consumers draw inferences from the aesthetic and symbolic product package and assign these characteristics to its content (Becker, Van Rompay, Schifferstein & Galetzka, 2011). Thus, consumers develop certain expectations about a product when viewing and touching the product's package, which is interesting because the packaging features are not directly related to the product's content. Briefly summarized, product packages can communicate product aspects and create a certain image of the product and above all may steer consumer decision making.

For example, research from Becker, Van Rompay, Schifferstein, and Galetzka (2011) showed that shape curvature of a yoghurt package has an influence on the taste perception of the yoghurt. Their research also showed that shape curvature and colour saturation influence product evaluations and price expectation. Another example is showed by research from Van Lith (2015), who found that products that mimic a healthy body and consist of a healthy colour, are perceived as more healthy.

2.2 Multi-sensory product design

Humans know five sensory modalities, which are; vision, audition, touch, olfaction (or smell), and taste (Fenko, Schifferstein & Hekkert, 2010). Although it may seem unlikely, in product experience, multiple sensory modalities (and sometimes even all sensory modalities) contribute to consumers' experience with the product. For example, when using your tablet, the product experience is not solely dependent on the visual appearance of the product. Also the touch of the screen, the size, the sound, and probably the weight of the tablet are decisive for a positive (or perhaps a negative) product experience. The same applies for sport sneakers. In addition to the visual appearance, its touch, smell, and sound is also important and will form the product's experience.

Creusen and Schoormans (2005) argued that the most important product value for consumers should be the starting point of the product's appearance design. The sensory modalities that are important during product usage seem to be dependent on the primary function of the product (Fenko, Schifferstein & Hekkert, 2010). Important is, thus, to consider which sensory modalities are important in the case of drinking ice tea from a drinking bottle. Although, it is believed that vision is the most dominant sensory modality in human experience (Schifferstein, 2006), vision is not always the only important, and not even always the most important sensory modality during product usage (Fenko, Schifferstein & Hekkert, 2010; Schifferstein, 2006). For instance, with the use of a deodorant, the smell of the product has probably greater value than the visual appearance of the product. As well as with music devices, visual appearance is probably less important than the sound that is produced by the musical instrument.

Though, this does not mean that product designers should focus their design solely on the dominant sensory modality of the product. The trick is to design a product that ensures satisfaction of all sensory modalities involved. As a result, the multi-sensory experience creates an additional and novel dimension to the product, and may enhance consumers' product experience (Lwin, Morrin & Krishna, 2010). Orth, Campana, and Malkewitz (2010) found an attractiveness-quality relation in their research and stated that quality perceptions could be improved by designing packages that are more elaborate than competitors in their segment.

Vision is often considered to dominate human experiences, which could strongly suggest that human experiences are for the biggest part dependent on the visual information they perceive (Schifferstein, 2006). In product evaluations, the product's aesthetic features are often found important for durable products, since they are used for a longer period of time and are visible to other people (Creusen & Schoormans, 2005). Though, the overall visual dominance effect may not hold for all product experiences.

A study from Schifferstein (2006) showed that dependent on the product category, different sensory modalities are rated as most important. For *hand tools*, such as a computer mouse and a pen, touch is rated as most important sensory modality, followed by its visual appearance (Schifferstein, 2006). In order to judge the roughness of a product surface, consumers' judgments are more dependent on tactile cues as opposed to visual cues (Lederman, Thorne & Jones, 1986). Arguably, for beverage consumption *the look and the feel* of the product are most important. Since a drinking bottle is touched by the hands during usage, it is important to not solely focus on the visual appearance, but also include the tactual aspect in the product design. In this study, touch does not specifically refer to a certain product shape, such as with the famous Coca Cola bottle, which shape is comfortable in the hand. This study, however, focuses on touch as tangible elements or more specifically a *surface texture* (e.g. Biggs, Juravle & Spence, 2016; Piqueras-Fiszman & Spence, 2012; Van Rompay, Finger, Saakes & Fenko, 2016).

2.3 Vision, touch and (in)congruence

Many studies have shown that vision dominates touch (e.g. Hekkert, 2006; Krishna, 2006; Rock & Victor, 1964; Schifferstein, 2006; Thesen et al., 2004;), which means that humans rely more on their visual sense than their haptic sense. However, Berkeley (1907), as cited by Krishna (2006) stated that '*it must be acknowledged that we never see and feel one and the same object. That which is seen is one thing, and that which is felt is another'* (p. 557). This means that we perceive objects with both our visual sense and our haptic sense.

The information derived from our visual and haptic senses can be congruent, meaning that what is seen and what is felt is providing the same information. In addition, tactile and visual modalities can also interact with each other. For instance, the so-called size-weight illusion (Charpentier, 1891) suggests that bigger objects of the same weight can feel lighter because of their visual appearance (Krishna, 2006). In addition, research from Gibson (1933) showed that when vertical lines were distorted by a prism and bended into curves, the straight lines did not only look curved, but also felt curved. However, when participants closed their eyes, the lines felt straight. In research from Ludden, Schifferstein, and Hekkert (2009) participants felt a lamp, which seemed to be made of glass and, thus, should feel rigid and fragile. However, the lamp was actually made out of rubber and felt flexible.

Ludden, Schifferstein & Hekkert (2009) argued that the visual perception creates expectations for what will be perceived through touch. Their research showed that incongruence of visual and tactile elements disconfirm formed expectations which evokes a surprise reaction. This reaction of surprise may in turn cause experiences of admiration (Ludden, Schifferstein & Hekkert, 2009) and in industrial design, the experience of novelty is often experienced as pleasurable and may even positively affect the product's aesthetic evaluation (Hekkert, Snelders & Van Wieringen, 2003).

However, Hekkert (2006) argued that an unifying principle of aesthetic pleasure is that we tend to prefer products that express the same message to our different senses. For instance, research from Zellner, Bartoli, and Eckard (1991) showed that in odour identification, participants identify odour more accurately when paired with an appropriate colour (e.g. red-cherry) and less accurately when paired with an inappropriate colour (e.g. red-lemon) or when colour cues were absent. Also, research from Schifferstein and Verlegh (1996) showed that adding a matching odour enhances the taste and that congruent odour-taste combinations are rated as more pleasant. Finally, research from Becker et al., 2011) showed that when meanings elicited by package colour and shape were congruent, rather than incongruent, this resulted in a more positive overall product evaluation.

More relevant, a study from Van Rompay et al. (2016) showed that when material surface patterns and drinking type were in congruence, associations triggered by the vision+touch product experience were transferred to the product's taste. This means that when the messages of the different sensory stimuli is multipart and consistent, the product can be identified more accurately and is judged as a more pleasurable combination of sensory stimuli (Zellner, Bartoli & Eckard, 1991). This is because it is pleasurable for the mind to experience that the themes are congruent (Hekkert, 2006).

2.4 The influence of surface texture

Barnett-Cowan (2010) argued that the feel of the food when holding it in the hand may influence the perception of that food while eating it. In his study, participants rated the freshness and crispness of a fresh or stale pretzel. In case of incongruence of information provided to the hand and presented to the mouth, the freshness and crispness were systematically altered. More specifically, when holding a fresh part of the pretzel, and biting in a stale part of the pretzel, participants rated the stale part of the pretzel as being significantly fresher and crispier in-mouth because the hand held what felt like a fresh pretzel, and visa versa.

More surprising is that the feel of a non-food item (indirect contact with the product), such as a product container, can influence food (or beverage) perception during consumption. For example, Piqueras-Fiszman et al. (2011) studied the influence of the weight of the dish in which food is served on the product's perception. Their results indicated that yoghurt served in a heavier bowl, as opposed to a lighter bowl, was perceived as denser (in the mouth), and was expected to be more expensive. Further, their research showed that, in lesser extent, the yoghurt served in a heavier bowl, compared to a lighter bowl, was rated higher on flavour intensity and liking.

A study from Krishna and Morrin (2008) was conducted to find out if the firmness of a cup has an effect on participants' judgements of the water that is served in the cup. Characteristics of the cups, such as firmness, weight, or surface texture, should not affect the quality or taste of the water itself, which are called *nondiagnostic haptic cues*. Though, their research showed that drinking water form a flimsy cup (low quality nondiagnostic haptic cue) negatively affects quality perceptions of the water that is served within the cup. Conversely, drinking the same water from a firm cup (high quality nondiagnostic haptic cue) significantly reduced negative thoughts about the quality of the water.

Another example of a research into the effects of a beverage container on the product's perception is that from Tu, Yang, and Ma (2015), which showed that a Chinese cold tea served in a glass container was rated higher on perceived iceness and coldness compared to a plastic or paper container. These results suggest that the haptic quality of the beverage container has an influence on the perceived quality of the product that is served within.

In addition, research from Piqueras-Fiszman and Spence (2012) showed that crunchiness and hardness ratings of biscuits can be affected by tactile information presented by the hands. Their research showed that biscuits served from a pot finished with rough sandpaper, compared to a pot with a smooth finish, are rated as significantly crunchier and harder. This means that the haptic information we perceive through our hands, can be transferred to the perception of the food texture.

Likewise, a recent study from Biggs, Jaravle, and Spence (2016) showed that haptically and visually perceived texture of plateware can influence both mouthfeel judgements of the food texture and its taste or flavour. The study extends findings from previous research demonstrating the effects of package feel (e.g. Krishna & Morrin, 2008; Piqueras-Fiszman & Spence, 2012), with a substantially larger sample size (N=654). The results show that biscuits feel rougher in the mouth when served from a rough plate, whereas they feel smoother (melting in the mouth) when served from the smooth plate. Moreover, the same effect emerged with respect to taste; biscuits tasted more salty and gingery when served on a rough plate, whereas they tasted sweeter when served on a smooth plate.

Based on aforementioned studies, it would appear that what people feel in their hand, can affect the product's sensory properties during consumption, which can be explained by the phenomenon of *sensation transference* (Cheskin, 1957; Biggs, Juravle & Spence, 2016). Sensation transference has been defined as *'the phenomenon whereby certain sensory attributes of a product perceived via one or more of the senses (such as vision and touch) can bias a consumer's perception of other product attributes derived from other sensory modalities, and by so doing, modulate a person's overall (multisensory) product experience*' (Piqueras-Fiszman & Spence, 2012, *p. 68*). More specifically, The haptic information we receive from our hands, and the visual information we receive through our eyes, can affect the product's perceptions (e.g. food texture, density, quality).

Likewise, Spence and Gallace (2011) argued that the product's surface texture can influence consumers' tactile experience of that product and in turn affects consumers' product evaluation. For example, Velvet packaged their toilet tissue in plastic that really felt like velvet, which corresponded to the brand image, namely toilet paper as soft as velvet. Also, Hovis softened its crust-less bread package so that this feel of softness was associated with the softness of the bread (Spence & Gallace, 2011). This means that *the feel* of the package can influence consumers' perceptions of the product that is within.

Although contrast effects may surface (Zampini, Mawhinney & Spence, 2006), aforementioned studies suggest that product perception, such as softness and product quality can be influenced by manipulating the product package semantically congruent with how the product should be experienced (soft package = soft product). Likewise, Piqueras-Fiszman and Spence (2012) argued that participants' ratings were only affected by haptic information in case of congruence between textural attributes of the package and the textural attributes of the food being rated.

In sum, this research aim is to address the influence of a visual+tactual product package on the product's health perception, natural perception, taste evaluation/overall evaluation and price expectation. Taken into account above mentioned research findings and theorizing on the relationship between congruence of sensory package design and product experience, the following hypothesis is drawn:

> **H1**: A multi-sensory package surface, as opposed to a visual-only package surface, results in a higher product's taste evaluation/overall evaluation.

To test whether the surface texture of a green ice tea drinking bottle affects the product's perceptions with respect to naturalness and healthiness, the *natural feeling* of the product package is taken into account. Naturalness and healthiness are highly correlated (Van Lith, 2015), meaning that when a product is perceived as healthy, it is most likely also perceived as natural (and visa versa). By manipulating the surface texture of the package, or more specifically manipulating the *natural feeling* of the product package, this research seeks to investigate if the addition of a more *natural touch* to the product package translates into the product's perception (natural feeling = natural product). Taken into account aforementioned studies, this leads to the following hypotheses:

> **H2**: A multi-sensory package surface, as opposed to a visual-only package surface, results in a higher product's health perception

> **H3**: A multi-sensory package surface, as opposed to a visual-only package surface, results in a higher product's naturalness perception

Furthermore, the research seeks to find out whether a possible effect of package texture manipulation applies to both product types (pure green ice tea vs. sweetened green ice tea). Based on the study from Van Rompay et al. (2016) and aforementioned studies on the relation between congruence of sensory stimuli and the positive effect on the product's evaluation and accuracy of product identification (Becker et al., 2001; Hekkert, 2006; Schifferstein & Verlegh, 1996; Zellner, Bartoli & Eckard, 1991), the following explorative hypothesis (EH) is drawn:

> **EH1**: A multi-sensory package surface combined with a congruent pure green ice tea beverage (rather than an incongruent sweetened green ice tea beverage) enhances health perception, naturalness perception and taste evaluation/overall evaluation.

2.5 Price expectation

The so called attractiveness-quality link, or beautiful=good relation suggests that '*attractiveness relates positively to quality judgments'* (Kamins 1990; Parekh & Kanekar, 1994, as sited by Orth, Campana & Malkewitz, 2010, *p. 28).* Research from Orth, Campana and Malkewitz (2010) suggests that package design can influence expectation of product price through quality and attractiveness judgements. Their study showed that respondents expected a higher price for products with a more elaborate design*, which was partly mediated via quality and attractive judgements.

Also, research from Krishna and Morrin (2008) found that price expectations can be influenced by non-diagnostic haptic cues, such as package quality. Their study showed that water from a firm bottle (high quality) is expected to be more expensive as opposed to water from a flimsy bottle (low quality). This means that the package's quality may influence the product's price expectation, and more specifically, that consumers are willing to pay a higher price for products consisting of a high quality container.

Further, van Rompay and Pruyn (2011) argued that congruence of different visual symbolic meanings is important with respect to price expectations. Their study showed that consumers expect a higher price for congruent products, because they are perceived as more attractive. Since product judgments are more positive under congruence, as opposed to incongruence, conditions (Littel & Orth, 2013), this effect might also be applicable to visual-tactual products in congruence and the expectation of price. Based on above mentioned findings, the following hypotheses are drawn for price expectation:

> **H4:** A multi-sensory package surface, as opposed to a visual-only package surface, results in a higher product's price expectation.
>
> **EH2**: A multi-sensory package surface combined with a congruent pure green ice tea beverage (rather than an incongruent sweetened green ice tea beverage) results in a higher product's price expectation.

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* '*The elaborate factor is a combination of design element complexity, activity, and depth. It captures the concept of richness and the ability of the design to convey a visual representation's essence.'* (See Henderson & Cote, 1998, as cited by Orth, Compana & Malkewitz, 2010, *p. 24*)

2.6 Taste versus healthiness

Food and beverages have different properties that determine consumers' product quality (Mai & Hoffman, 2012), such as taste, texture, healthiness, and aroma. Preference for which property is leading in quality assessment, is personally dependent. Research from Mai and Hoffmann (2012) showed that, concerning food contributes, the (health-unrelated) property *taste* was valued highest by consumers (21.4%), and that sugar content was valued lowest (7.9%). Mai and Hoffmann (2012) differentiated two segments; *taste lovers* and *nutrition fact seekers*. Further, their research showed that *taste lovers* have a lower health consciousness, and neglect factors that indicate unhealthiness. Conversely, *nutrition fact seekers* have a higher health conscious and pay more attention to unhealthy factors, such as sugar content (Mai & Hoffmann, 2012).

Taste and health seem to be diametrically opposed to each other. Raghunathan, Naylor, and Hoyer (2006) claim that unhealthy food is rated as better tasting and more enjoyable during consumption. Participants believed that healthiness and tastiness are negatively correlated. This so called unhealthy = tasty intuition is generated by the unwholesome = fun intuition and by constantly exposure to compatible messages in the media (Raghunathan, Naylor & Hoyer, 2006). Also, Lloyd, Paisley, and Mela (1995) argued that food low in fat reduces perceived taste quality. Contrary, in France, the opposite intuition reigns, namely the healthy = tasty intuition (Werle, Trendel & Ardito, 2013). Healthy foods are rated as more tasteful, more pleasurable and of better quality, while unhealthy foods are associated with bad taste in France (Werle, Trendel & Ardito, 2013).

2.7 General Health Interest

It is of great importance to find out how consumers differ in their food/beverage choices. By consumer segmentation, different types of products (taste-focused, health-focused) can be targeted on the corresponding segment of consumers (taste lovers, nutrition fact seekers). Roininen, Lähteenmäki, and Tuorila (1999) designed several scales in order to measure consumers' health and taste attitudes towards foods. Healthiness and hedonic characteristics are substantial predictors of food liking and food consumption (Roininen, Lähteenmäki & Tuorila, 1999). One health-related scale, referred to as General Health Interest (GHI) (Roininen, Lähteenmäki & Tuorila, 1999), can be used to measure the extent to which participants are health focused concerning their food choices. This scale consists of eight items, with a Cronbach's alpha of 0.89, indicating that it is a good scale to measure participants' health interest.

Research from Contento, Michela, and Goldberg (1988) showed that adolescents who are motivated to obtain healthful food, are less influenced by taste. Conversely, the group of adolescents for whom taste is the most influential factor for food choices, are relatively unhealthy orientated, which means that health characteristics of foods are not important factors for their food choices. Though, intention to consume healthy foods does not necessarily result in actual behaviour of consuming healthy foods. However, a study from Contento, Michela, and Goldberg (1988) did show that participants from the health oriented group had the most healthful eating patterns and, on the contrary, participants from the taste oriented group had the most unhealthful eating patterns. The taste oriented group consumed larger amounts of fat and sugar compared to the health oriented group. This means that, in general, consumers interested in healthy foods also actually consume more healthy foods and that consumers interested in tasty foods compromise on healthiness.

The study from Roininen, Lähteenmäki, and Tuorila (1999) showed that participants with a high score on GHI rated non-fat milk and reduced-fat cheese as healthier, and full-fat milk, full-fat chocolate, full-fat cheese and soft drinks as less healthy compared to participants with a low score on GHI. Further, participants who scored high on GHI made more healthful-not pleasant food choices compared to participants who scored moderate or low on GHI, which may indicate that consumers high on GHI are willing to accept some loss in taste in advance of healthiness (Roininen, Lähteenmäki & Tuorila, 1999). Finally, a study from Van Lith (2015) showed that participants who scored high on GHI, rated unhealthy food (chocolate) as less tasty in comparison to participants with a low score on GHI.

In this research, GHI is inserted as a moderator in order to find out if participants with a high (or low) score on GHI score differently on health perception and/or taste evaluation/overall evaluation of the tested green ice tea. Effects of package design on food/beverage perception varies among intrapersonal factors (e.g. design sensitivity (Krishna & Morrin, 2008)) (Van Rompay, Deterink & Fenko, 2016), suggesting that depending on personal characteristics, the persuasiveness of a package manipulation may vary. In this case, General Health Interest is such a personal characteristic, which may have an influence on a person's susceptibility to healthy package manipulation.

Because health oriented consumers actually consume more healthy foods (Contento, Michela & Goldberg, 1988) and rate healthy products as more healthy as opposed to consumers with a low score on GHI (Roinen, Lahteenmake & Tuorila, 1991), it is assumed that health oriented consumers have knowledge of and recognize healthy products more accurately compared to consumers with a low score on GHI.

Research from Aschemann-Witzel, Maroscheck, and Hamm (2013) showed that occasional organic consumers are more influenced by nutrition and health claims on products, because they are less sceptical about the health-related information. More intensive organic consumers are more sceptical about health-related information and therefore less susceptible to health claims. In addition, research from Van Rompay, Deterink, and Fenko (2016) showed that visitors of a discount supermarket (price sensitive buyers) are influenced by package manipulation, in which a more healthy package appearance positively affected the yoghurt's healthiness. Conversely, visitors of a 'green' supermarket (organic buyers) were not influenced by healthy package manipulations.

It is, therefore, predicted that health oriented consumers are not (or less) influenced by package manipulation in order to make the product appear healthier. Conversely, taste-oriented consumers are more focused on good taste and are probably less able to recognize healthy products. Therefore, it is hypothesized that taste-focused (low GHI) consumers are more influenced by package manipulation, with respect to health features. In sum, it is expected that GHI moderates the effects of the types of package (control, vision-only, vision+touch) on health perception and naturalness perception of green ice tea.

H5 : For participants with a low score on GHI, package design has a more pronounced influence on the product's perceptions as opposed to participants with a high score on GHI.

3. PRETEST

Prior to the main study, two pretests were conducted in order to find out which types of bottles and which types of green ice tea are most appropriate to use as stimulus materials during the main study. These pretests serve as manipulation checks, to ensure that the stimulus materials actually differ in terms of tangibility (concerning the bottles) and taste (concerning the green ice teas).

3.1 Pretest 1

In pretest 1, three variations of green ice tea are tasted and criticized to ensure a deviation in pureness/sweetness between the drinks. The green ice teas are prepared by making hot green tea and cooling it down by storing it in the fridge. For preparation of the ice teas, freshly dried green tea leaves are used, which means that there are no added ingredients. The three green ice tea variants differ solely in the area of sweetness. Green ice tea 1 is pure, while the other two green ice teas are added with an amount of sugar. Green ice tea 2 contains 5 grams of sugar on one bottle of 330 ml, and in green ice tea 3, a double amount of sugar is added (10 grams).

A total of 9 participants (4 male, 5 female; mean age 32.56 years) rated among others *sweetness, added sugars* and *pureness* on a 7-point Likert scale (ranging from "strongly disagree" to "strongly agree"). Comparisons of means showed that both sweetened green ice teas are perceived as sweeter compared to the pure green ice tea (M_{pure} = 1,89, SD = 1.05, M_{5gram} = 4.67, SD = 1.50, M_{10gram} = 5.56, SD = 1.67). An analysis of variance revealed that these scores differ significantly ($F(2, 24) = 16.09$, $p < 0.001$, $\eta^2 = 0.57$) and Pairwise Comparisons confirmed that both sweetened variants are significantly sweeter compared to the pure variant ($p_{5gram} = 0.001$, $p_{10gram} < 0.001$).

In addition, an analysis of means showed that the sweetened variants differentiated most clearly on *added sugars* compared to the pure variant (M_{pure} = 1,56, SD = 0.88, M_{5gram} = 5.22, SD = 1.64, M_{10gram} = 6.00, SD = 0.87), which indicates that this difference in added sugars is clearly noticeable. Moreover, comparisons of means showed that the pure variant is perceived as more pure compared to the two sweetened variants (M_{pure} = 4.56, SD = 1.67, M_{5gram} = 3.44, SD = 1.51, M_{10gram} = 2.89, SD = 1.69). However, an analysis of variance, with *pureness* as dependent variable, did not obtain a significant difference between the three variants ($F(2, 24) = 2.46$, $p = 0.107$, $\eta^2 = 0.17$).

Since both sweetened variants are perceived as significantly sweeter compared to the pure variant, and the amount of added sugars is clearly noticeable, both sweetened variants are considered as appropriate to use for the main study. Though, an analysis of means showed that the variant with 10 grams of sugar scored rather low on tastiness (M = 3.67, SD = 1.94), which is probably due to a negative relation with the level of sweetness. Because the variant with 5 grams of sugar is rated as rather good tasting (M = 4.33, SD = 1.23), this variant is, together with the pure variant, selected for the main study. The full questionnaire and results of pretest 1 can be found in Appendix B.

3.2 Pretest 2

For this pretest, five labels of green ice tea bottles are designed containing a deviation in the area of appearance (display of leaves or not) and tangibility (presence or absence of relief). All five ice tea bottles are equipped with a label from off-white cardboard paper. The first bottle that is tested in this pretest is the *control bottle,* which is not associated with nature. This label, which is quite basic, contains a random green printing and an abstract logo in order to minimalize association with leaves. The other four bottles are considered as natural and are displayed with green leaves. Bottles 2 and 3, and 4 and 5 are considered as couples, because these bottles have a similar appearance, though, differ in tangibility. Additional leaves displayed on bottle 2 (*vision-only*) and bottle 3 (*vision+touch*) are green coloured, while these leaves are colourless (or white) in bottles 4 (*vision-only*) and 5 (*vision+touch*). Images of the five labels can be found in Fig. 1.

Fig. 1 Five labels tested in pretest 2

Control

Vision-only (green)

Vision+touch (green)

Vision-only (white)

Vision+touch (white)

The purpose of this pretest was to investigate whether the tangibility of the packages is distinguishable enough concerning its relief and the extent to which the surface of the label feels natural. A total of 23 participants (9 male, 14 female; mean age: 27.09 years) rated *feeling natural* and *feeling relief* on a 7-point Likert scale (raging from "strongly disagree" to "strongly agree").

Comparisons of means showed that both vision+touch bottles score higher on *feeling natural* compared to both vision-only bottles (see Table 1). An analysis of variance confirmed that there is a significant difference between the bottles ($F(4, 110) = 7.51$, $p < 0.001$ $\eta^2 = 0.22$). Pairwise Comparisons obtained a significant difference between the vision-only variants and the vision+touch variants ($p_{green\ pair} = 0.022$; $p_{white\ pair} < 0.001$). On the other hand, while the white variant of the vision+touch bottle scores significantly higher on *feeling natural* compared to the control bottle, the green variant of the vision+touch bottle does not ($p_{green} = 0.115$, $p_{white} = 0.049$).

Table 1. Descriptive Statistics – Feeling Natural

	Mean	Std. Deviation	N
Bottle 1 - control	5.04	1.19	23
Bottle 2 - vision-only green	4.83	1.40	23
Bottle 3 - vision+touch green	5.83	0.78	23
Bottle 4 - vision-only white	4.57	1.24	23
Bottle 5 - vision+touch white	5.96	0.56	23

Further, a manipulation check, with regard to the clarity of feeling relief, confirmed that participants clearly feel more relief in both vision+touch bottles compared to both vision-only bottles and the control bottle (see Table 2) . An analysis of variance revealed a strong significant difference in *feeling relief* between the five bottles ($F(4, 110) = 196.31$, $p < 0.001$, $\eta^2 = 0.88$) and Pairwise Comparisons showed that the vision+touch bottles score indeed significantly higher on *feeling relief* compared to the vision-only bottles and the control bottle (all p's < 0.001).

Table 2. Descriptive Statistics – Feeling Relief

	Mean	Std. Deviation	N
Bottle 1 - control	1.96	1.40	23
Bottle 2 - vision-only green	1.70	1.46	23
Bottle 3 - vision+touch green	6.96	0.21	23
Bottle 4 - vision-only white	1.26	0.92	23
Bottle 5 - vision+touch white	6.96	0.21	23

Finally, in order to ensure credibility of existence of the product, the bottles are criticized for its realistic appearance (see Table 3). Although the control bottle scored lower on its realistic appearance compared to the other four bottles, this score is above moderate and therefore all bottles are considered as appropriate for the main study.

Table 3. Descriptive Statistics – Realism

	Mean	Std. Deviation	N
Bottle 1 - control	4.39	1.31	23
Bottle 2 - vision-only green	5.00	1.28	23
Bottle 3 - vision+touch green	5.35	1.15	23
Bottle 4 - vision-only white	5.09	0.90	23
Bottle 5 - vision+touch white	5.61	0.84	23

Since the feeling of relief and the extent to which the package feels natural deviates greater for the white pair compared to the green pair, the white vision-only and white vision+touch bottles are, next to the control bottle, selected as stimulus materials for the main study (see Fig. 2). The full questionnaire and results of pretest 2 can be found in Appendix C.

Fig. 2. Stimulus Materials Selection

Control bottle

Vision-only bottle

Vision+touch bottle

4. METHOD MAIN STUDY

4.1 Research design

The main purpose of this research is to find out if product texture has an influence on product perception regarding its healthiness, naturalness, taste evaluation/overall evaluation, and price expectation. Further, it is examined if product type, concerning its sweetness, interacts with product design. These effects were explored in a 3 (control vs. vision-only vs. vision+touch) x 2 (pure green ice tea vs. sweetened green ice tea) x 2 (low GHI vs. high GHI) between-subjects experimental design. The research model of this study is shown in Fig. 3.

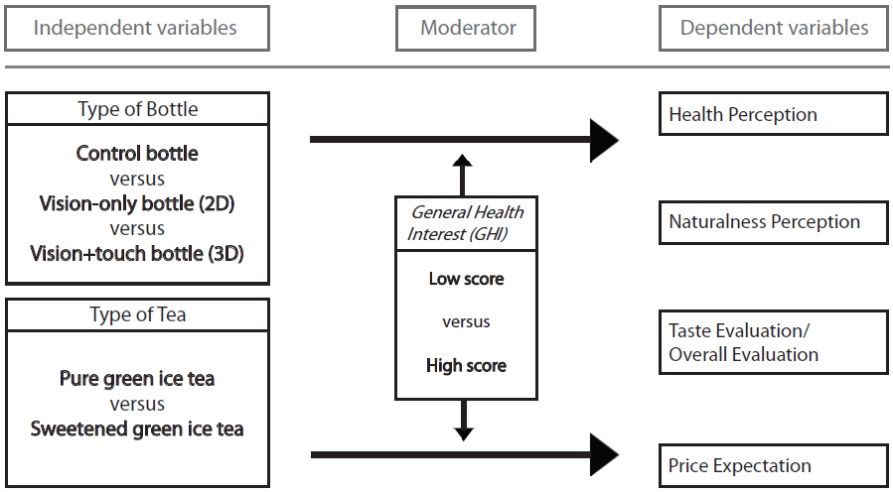

Fig. 3. Research model

4.2 Participants and procedure

A total of 130 respondents participated in the research (57 male, 73 female; M_{age} = 34.90, SD = 14.90). Table 4 presents age and gender distribution across the six conditions. An analysis of variance confirmed that age was equally distributed ($F(5, 124) = 2.11$, $p = 0.069$) Likewise, an analysis of variance did not obtain a significant difference in gender ($F < 1$, *ns*).

Table 4. Age and gender distribution across the six conditions

	N	Age		Gender	
Condition		M	SD	Female (%)	Male (%)
1 - Control - pure	22	37.23	18.14	59.1	40.9
2 - Vision-only - pure	22	34.73	14.78	45.5	54.5
3 - Vision+touch - pure	21	40.67	14.37	66.7	33.3
4 - Control - sweetened	21	37.86	16.69	61.9	38.1
5 - Vision-only - sweetened	21	30.52	11.64	61.9	38.1
6 - Vision+touch - sweetened	23	28.87	10.66	43.5	56.5

Respondents were approached at staff rooms from two secondary schools, at a canteen of a physiotherapy company, and at University of Twente. Participants were asked if they were willing to participate in a product sampling taste test for a new green ice tea. When agreed, respondents were asked if they had any medical restrictions on consuming green ice tea and/or sugars (no participants were excluded based on this screening question). Subsequently, participants were requested to hold (touch), and check the product. Since it was inconvenient to randomly assign each respondent to one condition, each variant was tested per day-part or by a certain group of participants. Subsequently, respondents were requested to pour an amount of green ice tea in a plastic cup for tasting. During the research, it was tried to keep the green ice tea at low temperature by storing it in the fridge of placing it in a cooler bag with cooling elements. Finally, after tasting, respondents filled in the survey, which was handled digitally on the iPad and in some cases on a mobile telephone. The complete survey can be found in Appendix D.

4.3 Measures

The dependent variables 'health perception', 'naturalness perception', 'taste evaluation/ overall evaluation', and 'price expectation', and the moderator 'GHI' are measured by scales consisting of multiple items. All items are measured by a 7-point Likert scale (ranging from 'strongly disagree' to 'strongly agree'), except for 1 item concerning the expected price of the product, which is measured with an open question.

Health perception

The dependent variable health perception is measured by a scale which consists of four items; *'I think this product is healthy', 'I think this product is high in calories (R)', 'I think this product in responsible',* and *'I think this product makes me fat (R)'.* These items together form a scale with a Cronbach's Alpha of .62. Even though this is a fairly low score, deleting one of the items from the scale did not result in an increased Cronbach's Alpha score.

Naturalness perception

The perception of naturalness is a dependent variable measured by six items; *'I think this product is pure', 'I think this product contains added colourings (R)', 'I think this product contains added flavourings (R)', 'I think this product is natural', 'I think this product contains extracts from real green tea leaves',* and *'I think this product is artificial (R)'.* The six items together form a reliable scale with a Cronbach's Alpha of .81.

Taste evaluation/overall evaluation

The taste evaluation and overall evaluation are measured together by a scale consisting of five items; *'I find this product tasteful (delicious)', 'I would like to consume this product more often', 'This product is unappealing to me (R)', 'I would buy this product',* and *'I asses this product as a good quality product'.* These five items together form a reliable scale with a Cronbach's Alpha of .88.

Price expectation

The expectation of price is a dependent variable measured by two items. The first item is measured by the 7-point Likert scale; *'I think that, compared to other green ice teas, this is a relatively expensive product'.* The second item is an open question in which respondents could answer a number; *'I think this product will cost €....?'* However, the two items together do not particularly form a reliable scale, since the Cronbach's Alpha score is .44. Therefore, the expectation of price and the measurement of relative expensiveness are measured separately.

General Health Interest

General Health Interest is measured by an existing scale from Roininen et al. (1999), which consists of eight items. In this study, the eight items together also form a reliable scale with a Cronbach's Alpha of .87. The eight items of the General Health Interest scale are; *'The healthiness of food has little impact on my food choices (R)', 'I am very particular about the healthiness of food I eat', 'I eat what I like and I do not worry much about the healthiness of food (R)', 'It is important for me that my diet is low in fat', 'I always follow a healthy and balanced diet', 'It is important for me that my daily diet contains a lot of vitamins and minerals', 'The healthiness of snacks makes no difference to me (R)',* and *'I do not avoid foods, even if they may raise my cholesterol (R)'.* Respondents are divided into two groups with the median's separation (Median=4.75).

5. RESULTS

5.1 Results of the 3x2x2 design

In this section, the main effects and interaction effects of the 3x2x2 design are shown in Table 5. Analysis of variance are conducted with *type of bottle* (control, vs. vision-only vs. vision+touch), *type of tea* (pure vs. sweetened), and *GHI* (low score vs. high score) as independent variables and *health perception, naturalness perception, taste evaluation/overall evaluation, price expectation* and *relative price expectation* as dependent variables.

Table 5. Results of the 3x2x2 design

Independent variable(s)	Dependent variable	F	p
Type of bottle	Health perception	.15	.865
Type of tea	Health perception	8.73	.004
GHI	Health perception	3.77	.055
Type of bottle x type of tea	Health perception	1.21	.303
Type of bottle x GHI	Health perception	1.09	.340
Type of tea x GHI	Health perception	3.50	.064
Type of bottle x type of tea x GHI	Health perception	1.20	.304
Type of bottle	Naturalness perception	.33	.720
Type of tea	Naturalness perception	1.70	.195
GHI	Naturalness perception	.28	.600
Type of bottle x type of tea	Naturalness perception	.08	.923
Type of bottle x GHI	Naturalness perception	2.25	.110
Type of tea x GHI	Naturalness perception	.79	.376
Type of bottle x type of tea x GHI	Naturalness perception	2.04	.135
Type of bottle	Taste/overall evaluation	2.97	.055
Type of tea	Taste/overall evaluation	.87	.354
GHI	Taste/overall evaluation	<0.001	.994
Type of bottle x type of tea	Taste/overall evaluation	.38	.687
Type of bottle x GHI	Taste/overall evaluation	.22	.802
Type of tea x GHI	Taste/overall evaluation	3.72	.056
Type of bottle x type of tea x GHI	Taste/overall evaluation	1.01	.369
Type of bottle	Price expectation	.84	.437
Type of tea	Price expectation	3.98	.048
GHI	Price expectation	.58	.450
Type of bottle x type of tea	Price expectation	.80	.453
Type of bottle x GHI	Price expectation	.13	.880
Type of tea x GHI	Price expectation	.63	.429
Type of bottle x type of tea x GHI	Price expectation	.67	.512
Type of bottle	Relative price expectation	1.49	.230
Type of tea	Relative price expectation	.05	.822
GHI	Relative price expectation	1.74	.190
Type of bottle x type of tea	Relative price expectation	1.00	.370
Type of bottle x GHI	Relative price expectation	.78	.463
Type of tea x GHI	Relative price expectation	.03	.854
Type of bottle x type of tea x GHI	Relative price expectation	.65	.525

5.2 Results of the 2x2x2 design

Since it appeared that the control bottle deviates extremely from predictions, it is decided to left out the control bottle from the results section. The control bottle was, namely, expected to score lowest on *feeling natural* and *feeling relief,* though, the output of pretest 2 showed that the scores of the control bottle are located between the vision-only and vision+touch variants. Likewise, the results from the main study showed that the control bottle still deviated from predictions and scored highest on *health perception,* and higher on *naturalness perception* and *overall evaluation* compared to the vision-only bottle. Since the control bottle may have disturbed potential significant effects between the 2D-design (vision-only) and the 3D-design (vision+touch), which is the main question of the research, the results section below discusses the outcomes of the 2x2x2 design. The main effects and interaction effects are shown in Table 6.

Table 6. Results of the 2x2x2 design

Independent variable(s)	**Dependent variable**	**F**	**p**
Type of bottle	Health perception	.02	.904
Type of tea	Health perception	2.72	.103
GHI	Health perception	.55	.462
Type of bottle x type of tea	Health perception	1.17	.284
Type of bottle x GHI	Health perception	.25	.617
Type of tea x GHI	Health perception	.47	.497
Type of bottle x type of tea x GHI	Health perception	.52	.475
Type of bottle	Naturalness perception	.54	.464
Type of tea	Naturalness perception	.81	.371
GHI	Naturalness perception	.20	.654
Type of bottle x type of tea	Naturalness perception	.12	.734
Type of bottle x GHI	Naturalness perception	4.06	.047
Type of tea x GHI	Naturalness perception	<0.01	.956
Type of bottle x type of tea x GHI	Naturalness perception	2.34	.130
Type of bottle	Taste/overall evaluation	6.77	.011
Type of tea	Taste/overall evaluation	1.76	.188
GHI	Taste/overall evaluation	.15	.695
Type of bottle x type of tea	Taste/overall evaluation	.01	.942
Type of bottle x GHI	Taste/overall evaluation	.05	.832
Type of tea x GHI	Taste/overall evaluation	6.35	.014
Type of bottle x type of tea x GHI	Taste/overall evaluation	.02	.886
Type of bottle	Price expectation	<0.01	.961
Type of tea	Price expectation	4.65	.034
GHI	Price expectation	.59	.447
Type of bottle x type of tea	Price expectation	.42	.518
Type of bottle x GHI	Price expectation	.15	.699
Type of tea x GHI	Price expectation	1.42	.237
Type of bottle x type of tea x GHI	Price expectation	.26	.615
Type of bottle	Relative price expectation	1.20	.276
Type of tea	Relative price expectation	.30	.586
GHI	Relative price expectation	.74	.394
Type of bottle x type of tea	Relative price expectation	1.50	.225
Type of bottle x GHI	Relative price expectation	1.38	.243
Type of tea x GHI	Relative price expectation	.10	.750
Type of bottle x type of tea x GHI	Relative price expectation	1.10	.297

In this section, relevant main effects and interaction effects will be described. Analyses of variance are conducted with *type of bottle* (vision-only vs. vision+touch), *type of tea* (pure vs. sweetened), and *GHI* (low score vs. high score) as independent variables and *health perception, naturalness perception, taste evaluation/overall evaluation, price expectation* and *relative price expectation* as dependent variables. Pairwise Comparisons, with a Bonferroni correction, is used to find out between what groups significant differences exist.

5.2.1. Health perception

An ANOVA, with *health perception* as dependent variable, did not reveal a significant main effect for type of bottle ($F < 1$, *ns*), type of tea ($F(1, 78) = 2.72$, $p = 0.103$, $\eta^2 = 0.03$), and GHI ($F < 1$, *ns*). Further, the ANOVA did not obtain a significant interaction between type of bottle and type of tea ($F(1, 78) = 1.17$, $p = 0.284$, $\eta^2 = 0.02$). Likewise, all other interactions were found not significant (all F's < 1, *ns*).

5.2.2. Naturalness perception

The ANOVA, with *naturalness perception* as dependent variable, did not obtain any main effects for type of bottle, type of tea, and GHI (all F's < 1, *ns*). However, the ANOVA revealed a significant interaction effect between type of bottle and GHI (**(**$F(1, 78) = 4.06$, $p = 0.047$, $\eta^2 = 0.05$) (Fig. 4). Participants with a high score on GHI perceived the vision+touch bottle significantly higher in naturalness compared to the vision-only bottle ($p = 0.047$). On the other hand, participants with a low score on GHI perceived the vision-only bottle higher in naturalness compared to the vision+touch bottle. This difference, however, was not significant ($p = 0.384$). Further, for the vision-only condition, there was a marginal difference in naturalness perception between participants with a low score on GHI and participants with a high score on GHI ($p = 0.092$). For the vision+touch condition, this difference was not significant ($p = 0.260$).

Further, the interactions of type of bottle x type of tea, and type of tea x GHI were not significant (both $F's < 1$, *ns*). Likewise, there was no significant three-way interaction found for type of bottle x type of tea x GHI on naturalness perception ($F(1, 78) = 2.34$, $p = 0.130$, $\eta^2 = 0.03$).

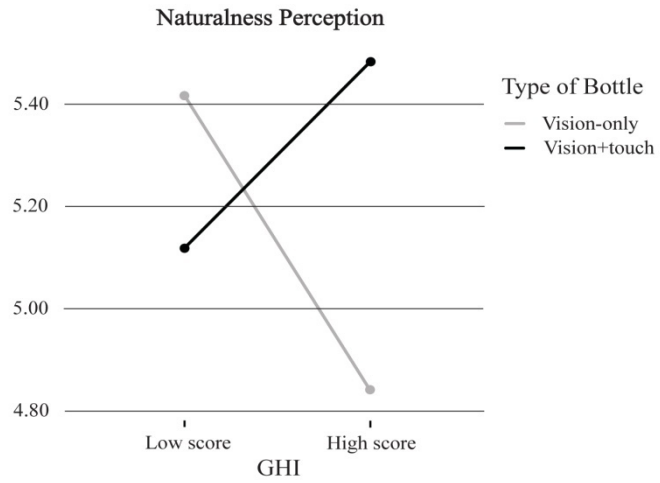

Fig. 4. Interaction effect type of bottle and GHI on naturalness perception

5.2.3. Taste evaluation/overall evaluation

Most interestingly, the expected main effect for type of bottle on *taste evaluation and overall evaluation* surfaced ($F(1, 78) = 6.77$, $p = 0.011$, $\eta^2 = 0.08$), showing that (regardless of the type of tea) the vision+touch bottle, as opposed to the vision-only bottle, is higher evaluated ($M_{v+t} = 4.16$, $SD_{v+t} = 1.15$, $M_{v-o} = 3.49$, $SD_{v-o} = 1.37$). On the other hand, the ANOVA, with taste evaluation/ overall evaluation as dependent variable, did not obtain significant main effects for type of tea ($F(1, 78) = 1.76$, $p = 0.188$, $\eta^2 = 0.02$) and GHI ($F < 1$, *ns*).

Further, the ANOVA revealed a significant interaction effect between type of tea and GHI ($F(1, 78) = 6.35$, $p = 0.014$, $\eta^2 = 0.08$). As shown in Fig. 5, for participants who scored high on GHI, comparison of means revealed a significantly higher score on taste evaluation/overall evaluation for the sweetened green ice tea as opposed to the pure green ice tea ($p = 0.006$). However, for participants with a low score on GHI, this difference was not significant ($p = 0.418$). In addition, in the sweetened condition, participants with a high score on GHI yielded in a significantly higher score on taste evaluation/overall evaluation compared to participants with a low score on GHI ($p = 0.041$). Conversely, in the pure condition, this difference in taste evaluation/overall evaluation between the low and high GHI-groups was not significant ($p = 0.404$).

Finally, the AVOVA did not reveal a significant interaction effect for type of bottle x type of tea, and type of bottle x GHI (both *F*'s < 1, *ns*). Likewise, the ANOVA did not obtain a significant three-way interaction between type of bottle, type of tea, and GHI ($F < 1$, *ns*).

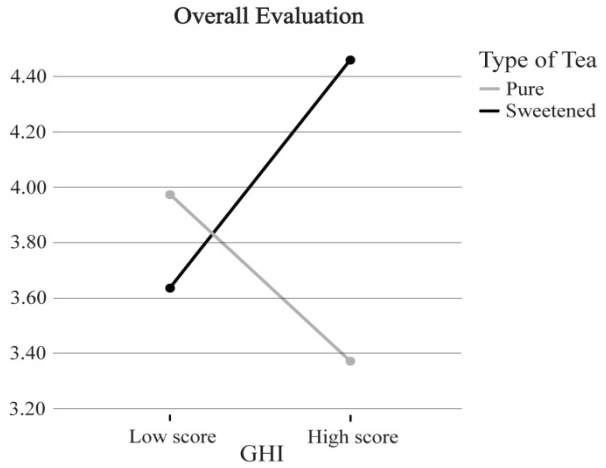

Fig. 5. Interaction effect type of tea and GHI on taste/overall evaluation

5.2.4. Price expectation

An AVOVA, conducted with *price expectation* as dependent variable, revealed a significant main effect for type of tea ($F(1, 78) = 4.65$, $p = 0.034$, $\eta^2 = 0.06$), showing that (as expected) the pure green ice tea is perceived as significantly more expensive ($M = 1.71$, $SD = 0.76$) compared to the sweetened green ice tea ($M = 1.37$, $SD = 0.60$). On the other hand, the ANOVA did not reveal a significant main effect for type of bottle and GHI (both *F*'s < 1, *ns*). Likewise, the ANOVA did not obtain an interaction effect between type of bottle and type of tea ($F < 1$, *ns*), type of bottle and GHI ($F < 1$, *ns*), type of tea and GHI ($F(1, 78) = 1.42$, $p = 0.237$, $\eta^2 = 0.02$), and neither for the three-way interaction ($F < 1$, *ns*).

5.2.5. Relative price expectation

Finally, for *relative price expectation*, the ANOVA did not reveal a significant main effect for type of bottle ($F(1, 78) = 1.20$, $p = 0.276$, $\eta^2 = 0.02$), and neither for type of tea and GHI (both *F*'s < 1, *ns*). Likewise, the ANOVA did not obtain a significant interaction effect between type of bottle and type of tea ($F(1, 78) = 1.50$, $p = 0.225$, $\eta^2 = 0.02$), type of bottle and GHI ($F(1, 78) = 1.38$, $p = 0.243$, $\eta^2 = 0.02$), and type of tea and GHI ($F < 1$, *ns*). At last, the ANOVA did not reveal a significant three-way interaction effect on relative price expectation ($F(1, 78) = 1.10$, $p = 0.297$, $\eta^2 = 0.01$).

6. DISCUSSION

6.1 General discussion of results

Inspired by trends towards multi-sensory packaging and promotion of healthy foods, this research aimed to investigate the effects of tactile package manipulation on the perceived healthiness, perceived naturalness, taste evaluation/overall evaluation, and price expectation of green ice tea (pure and sweetened variants). The results presented show that adding a natural tangible relief to the package of green ice tea positively influences taste evaluation and overall evaluation. This finding corresponds to the research of Spence and Gallace (2011) who argued that the product's surface texture can influence consumers' product evaluation. Presumably, the multi-sensory experience created an additional and novel dimension to the product, which enhanced product experience (Lwin, Morrin & Krishna, 2010). This is probably due to the fact that product experience is not solely dependent on the visual appearance. More specifically, touch is rated as most important sensory modality for 'hand tools' (Schifferstein, 2006). In addition, this finding underlines the research of Krishna and Morrin (2008), who found that a high quality haptic cue results in a more positive experience of the product's quality. On a theoretical level, this finding suggests that (with regard to green ice tea) vision+touch packages, rather than vision-only packages, might indeed result in a higher taste evaluation and overall product evaluation.

Although similar positive effects of adding tactile elements to the package were expected for perceived healthiness and perceived naturalness, these effects did not occur. The expectations derived from research from Spence and Gallace (2011), who argued that product perception can be influenced by manipulating the product package semantically congruent with how the product should be experienced. Since results from the the pretest clearly showed that the vision+touch package felt more natural compared to the vision-only package, it was expected that the vision+touch package positively influenced the perceived naturalness of the product.

A possible explanation for the absence of this result is that, despite the vision+touch package felt significantly more natural as opposed to the vision-only package, both packages scored considerably high on *feeling natural*, which is probably due to choice of material. A research from Van Lith (2015) found that a package from cardboard paper is perceived as most healthy and natural compared to (low and high shine) plastic and organic paper. On top of that, participants had the opportunity to compare the *feel* of the packages during the pretest which could have lead to a greater difference in naturalness scores. During the main study, the natural feeling of the packages might not have deviated enough to obtain a significant effect on naturalness perception and healthiness perception.

Further, from the pretest it appeared that the appearance of both bottles are perceived as rather high on naturalness and healthiness. Moreover, analysis of variance did not obtain a significant difference in natural appearance and healthy appearance between the vision-only bottle and vision+touch bottle, which might indicate that the visual aspect of the packages are quite similar. A logical consequence is that (based on appearance) the contents of the bottles did not differ in terms of naturalness and healthiness. This may indicate that the addition of surface texture was too subtle to obtain a difference in health perception and naturalness perception. On top of that, the optical illusion of relief in the vision-only bottle, which actually did not felt three dimensional, could have led to a surprise reaction, which in turn could have led to experiences of admiration (Ludden, Schifferstein & Hekkert, 2008; Ludden, Schifferstein & Hekkert, 2009).

In addition, both packages are imaged with green leaves and contain the colour green, which is a colour often seen in nature and is associated with increased healthfulness (schuldt, 2012, as cited by Ruumpol, 2014, *p.* 16). It is plausible that, as a result, both packages are associated with healthiness and, therefore, assessed both as healthy.

Likewise, the expected positive effect of adding tactile elements to the package on the expected price did not surface. Even though the pretest confirmed that the vision+touch bottle was significantly more beautiful in appearance as opposed to the vision-only bottle, the means of the expected prices were close to each other ($_{v\text{-}o:}$ €1,53, $_{v+t}$ €1,54). Although these amounts are both relatively high for a 330 ml bottle, which may indicate that both packages are perceived as rather luxurious, mean scores of *relative price expectation* indicate that, compared to other green ice teas, both packages are perceived as equally expensive. However, the results revealed a significant difference in price expectation between the two tea variants, showing that the pure green ice tea (regardless of the type of package) was expected to be significantly more expensive as opposed to the sweetened variant. Since people mostly relate healthy products with high prices, it was expected that the pure, more healthy variant of green ice tea, is rated as more expensive compared to the sweetened variant.

Further, the experiment yielded a few results which were opposite to the expectations. Since health oriented consumers actually consume more healthy foods (Contento, Michela & Goldberg, 1988) and, therefore, recognize these healthy products, it was hypothesized that participants who scored high on GHI were less influenced by package manipulations. On the contrary, participants who scored low on GHI were expected to be more affected by package manipulations and, therefore, were expected to assess the product as healthier and more natural. The results, however, showed that participants with a high score on GHI, rather than participants with a low score on GHI, were susceptible to tactile package manipulation. Against expectation, participants with a high score on GHI assessed the vision+touch package (regardless of type of tea) as more natural compared to the vision-only bottle. Further, compared to participants with a low score on GHI, participants who scored high on GHI assessed the product packaged in the vision-only bottle as less natural.

One explanation for this unexpected result might be that health oriented consumers are able to evaluate healthy products (including their package) more accurately because they are more familiar with healthy foods. In addition, it appeared from the pretest that both variants of green ice tea were assessed as healthy and natural (no significant difference), which may had the consequence that participants with a low GHI score recognized the product's healthiness less accurately because they are less familiar with healthy foods. On a theoretical level, this might indicate that health oriented consumers can be influenced by tactile package manipulation concerning natural perception. This might mean that when targeting a healthy product on health oriented consumers, tactile product packages may increase naturalness perception for the target group, though, may not be influential for consumers who are less health focused.

Finally, another result in contradiction with the expectations is the interaction effect of the type of tea and GHI on taste evaluation/overall evaluation. Since health oriented consumers actually consume more healthy foods and consume less sweetened products, which is accompanied by a decreased preference for high-caloric foods and sweetness (Martin, O'Neil & Pawlow, 2006), it was expected that participants with a high GHI score preferred the pure green ice tea variant. On the opposite, it was expected that participants with a low GHI score (whom are more taste oriented) preferred the sweetened green ice tea. Results, however, did not underline these expectations. Instead, outcomes showed that participants with a high GHI score preferred the sweetened green ice tea variant significantly more compared to the pure green ice tea variant. One possible explanation for this conflicting result is that both tea variants were assessed as healthy. From this, it can be concluded that health oriented consumers prefer a healthy green ice tea that is slightly sweetened above unsweetened green ice tea.

6.2 Limitations and recommendations for future research

The main aim of this research was to investigate the effects of a multi-sensory (visual+tactual) product packaging, as opposed to a singular-sensory (visial-only) product packaging on the product's perceptions, with regard to its healthiness, naturalness, taste and overall evaluations, and price expectations. More specifically, the goal of this research was to find out if adding a haptic cue to the product package positively influences the product's characteristics. Initial, the research was conducted with three types of bottles; the control bottle, the vision-only bottle, and the vision+touch bottle. Though, since the results of the pretest and main study revealed deviant outcomes for the control bottle, which could have disturbed the outcomes of the main question, the control bottle was omitted from the results section.

The control bottle, which was considered as the variant without natural associations, was designed as a neutral package in order to test the effects of adding natural elements to the package (regardless of 2D or 3D variant). Because of its natural origin, it was expected that depiction of (green) leaves would lead to a higher health perception and naturalness perception. Though, against expectations, the control bottle appeared to be perceived as more natural compared to the vision-only bottle and even as more healthy as opposed to the vision-only and vision+touch bottles. This might be due to a greater presence of the natural colour green that is used in the control version, as opposed to the white/grey coloured leaves on the vision-only and vision+touch bottles.

Further, during the main study, the control bottle obtained a higher overall evaluation score compared to the vision-only bottle. This might indicate that participants have a preference for a basic, more abstract design compared to a more massive and imposing design. Also during the pretest, participants assessed both the control bottle and the vision-only bottle as rather beautiful in appearance. This higher overall evaluation for the control bottle as opposed to the vision-only bottle might be due to a probably more fluently processable design, which leads to a more positive aesthetic pleasure and a more positive evaluation (Reber, Schwarz & Winkielman, 2004). A mild experience, such as an abstract design, is what humans generally find beautiful (Reber, Schwarz & Winkielman, 2004). Future research could respond to this gap in the effects of combining different types of package design styles and multi-sensory elements on among others health perception and overall evaluation. In this follow-up research, package designs could be distinguished in abstractness/impressiveness, in order to find out if package design interacts with multi-sensory elements.

Further, since the results of the main study revealed only few effects of multi-sensory package manipulation on the perceptions of different product types (regarding its healthiness), future research could further zoom in on the impact of visual+tactual package design on the perceptions of healthy and unhealthy product types. One recommendation here is to make a more clearer distinction between the product's' health perceptions. Finally, since this research revealed conflicting results concerning the influence of package manipulation on the product's evaluations for low and high health-oriented participants, future research could further explore the different effects of multi-sensory packaging between consumers with low and high GHI scores.

6.3 Practical implications

This research demonstrates interesting outcomes regarding the effects of multi-sensory product packaging on the evaluations of the content. On a theoretical level, managers of all kind of food stores can benefit from the results of this research. Due to the so called unhealthy = tasty intuition (Raghunathan, Naylor & Hoyer, 2006), healthy foods are generally associated with '*distasteful'.* This research revealed interesting results on the possibility to positively influence the taste and overall evaluation of healthy products by means of package manipulation. More specifically, to enhance attractiveness of healthy products, the product package can be manipulated with (appropriate) haptic cues in order to improve taste evaluations and stimulate repeat buys, which in turn leads to higher sales.

Based on the results of this research managers are recommended to equip the packages of healthy products with a *natural feeling*. The results of this research suggest that the additional value of the haptic cues enhances the product's attractiveness with respect to its taste and quality both for consumers who are low health focused as for consumers who are high health focused. Therefore, these outcomes are conductive for both '*green'* supermarkets, which are mainly visited by health sensitive shoppers, as for other ordinary supermarkets, which are visited by a mixed audience.

Further, it was expected that health-focused consumers were less susceptible to healthy (multi-sensory) package manipulation compared to low health-focused consumers (Aschemann-Witzel, Maroscheck & Hamm, 2013; Van Rompay, Deterink & Fenko, 2016). This research, however, suggests that health-focused buyers (as opposed to low health-focused buyers) are in fact more susceptible to tactile package manipulation with respect to the evaluation of the product's naturalness. That is to say, respondents with a high GHI score assessed the product (regardless of type of product) packaged in a vision+touch bottle as significantly more natural, compared to that same product packaged in a vision-only bottle.

This outcome is especially interesting for the so called *green* shops, which are focused on high health-oriented consumers by selling healthy products. Managers of these *green* shops are recommended to add natural haptic cues to the packaging of their healthy products; in the view of this research, green ice tea beverages in particular. By doing so, health-focused shoppers are more attracted to the product and are more likely to buy products they perceive as *natural,* which in turn benefits sales outcomes. On top of that, participants with a high GHI score indicated that, regarding its taste and overall evaluation, they preferred the sweetened green ice tea rather than the pure green ice tea. This might mean that it is also possible for a less healthy product to positively influence the product's naturalness through tactile package manipulation.

Next to the healthy = not tasty association, people seem to associate healthy products with a higher price, which probably means that healthy products are more valued compared to unhealthy products. This healthy = expensive intuition is confirmed by this research's outcome, in which the pure green ice tea (rather than the sweetened green ice tea) is expected to be significantly more expensive. This might mean that shop owners can ask for a higher price regarding products that are perceived as healthy/natural (regardless of its package design), which as well will be reflected in higher sales.

6.4 Conclusion

The results of the study presented testify to the potential of multi-sensory packaging for positively influencing taste perception and overall evaluations of the green ice tea. Though, the study did not confirm the expected additional value of the haptic cues on the product's health perception, naturalness perception, and price expectation. On the contrary, when targeting health-focused consumers, the green ice tea packaged in a vision+touch package (rather than a vision-only package) enhances the product's naturalness perception. Supermarkets, among others *green* shops, could benefit from these results.

Due to some ambiguity regarding the results of the control bottle, it is recommended that further experimentations with package design combined with haptic cues are conducted. In addition, future research is necessary taken into account a clearer difference in the product's health perception to investigate whether the multi-sensory package manipulation interacts with the healthfulness of the product.

7. RESOURCES

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APPENDIX A

Background information about the unhealthy effects of soft drinks and the beneficial effects of green ice tea

1. Preference of sweetness

By the vast majority of humans, sweetness is experienced as a palatable taste. Moreover, of all factors comprising the pleasantness of a food, sweetness is highly favoured, and this preference for sweetness is responsible for a significant sugar intake (Tappy & Lê, 2010). Most probably, this preference for sweetness is descended from our ancestors, who lived in a time when sugars were scarce (Tappy & Lê, 2010). Though, nowadays, there is an abundance of sugars, and sugar consumption is even featured with addictive effects (Benton, 2010; Avena, Rada & Hoebel, 2008). The International Sugar Organization (2008) showed that, in Europe, the per capita consumption of sugar is increased by almost 16% over twenty years (from 107 g/day in 1986 to 127 g/day in 2006) (Tappy & Lê, 2010). This is a cause for concern because (high) consumption of sugars is brought in relation to several diseases (see section 2.).

The three most common sweeteners; sucrose, fructose, and glucose are naturally occurring sugars which are present in our foods. Fructose and glucose are, in small quantities, present in fruits and honey. Sucrose, excising of one molecule of glucose and one molecule of fructose, is found in larger quantities in sugar cane and beets (Tappy & Lê, 2010). Glucose is absorbed in the blood and is converted as energy (or in a surplus as fat), while fructose is quickly absorbed in the intestines and is converted almost entirely into fat and, thus, fructose is the evil-doer (Cortvriendt, 2015).

Park & Yetley (1993) showed that the majority of fructose intake is due to the consumption of soft drinks, and that adolescents and young adults are the top consumers of these sweetened beverages (see Tappy & Lê, 2010, p. 25). An alternative of added sugars in soft drinks is the addition of noncaloric sweeteners such as the natural substance Stevia, which is popular in beverages, such as ice tea. A large part of consumers choose to consume products added with noncaloric sweeteners in order to prevent weight gain or even by means of losing weight. This seems like a healthy alternative to add sweet taste and, together, control body weight. However, research from Davidson, Martin, Clark, and Swithers (2011) showed that the intake of noncaloric sweeteners may foster excessive intake (overconsumption) and cause body weight gain. In addition, research from Fowler et al. (2008) showed that consumption of artificially sweetened beverages increases the risk of overweight and even obesity.

Since sugars and noncaloric sweeteners in soft drinks both cause increase of body weight and, thus, are unhealthy, avoidance of these beverages would be wisest in order to promote a healthy lifestyle. Although it seems unpalatable to interchange your habit and preference for sweetness with a less sweet taste, research showed that, the first unpleasant taste, rapidly becomes acceptable (Benton, 2010). This means that the preference for sweetness can alter over time, which ensures that the sweet taste becomes less pleasant. Research from Martin, O'Neil & Pawlow (2006) showed that when a very low-caloric diet is consumed for weeks, craving for food and sweetness decreased, even after the very low-caloric diet was finished. It may be assumed that restriction of sugar intake may result in a '*desugarized*' food pattern. The habituation of drinking water or tea, containing no sugar and, thus, no calories, might result in diminishing calorie intake over time, in order to maintain the healthy food pattern. This is a motivation in this study to promote healthy, pure, green ice tea, extracted from real green tea leaves.

2. Unhealthy effects of drinking sweetened beverages

Sweetened beverages, carbonated or non-carbonated, have become very popular as everyday beverage. Although the sweetness of these beverages is experienced as palatable, the detriment of these beverages is that the high amount of added sugars is unhealthy, causing several diseases. Research from Denova-Gutiérrez et al. (2010), which was conducted in Mexico, showed that daily consumption of sweetened drinks (more than two servings per day) gave a double risk of metabolic syndrome in comparison to not consuming any sweetened beverages. In addition, it was found that the occurrence of metabolic syndrome was linked to increased BMI and the percentage of body weight. Further, the study showed that increased sweetened beverage intake is related to an increase in systolic and diastolic blood pressure (Denova-Gutié et al., 2010). Finally, Dhingra et al. (2007) found that in middle-aged adults, consuming soft drinks is associated with metabolic risk factors.

Another study, conducted in Australia, from Sanigorski, Bell, and Swinburn (2007) showed an association between the consumption of fruit juice/soft drinks and overweight and obesity. School children who consumed fruit juice (more than two servings per day) or soft drinks (more than three servings per day) were significantly more likely to be overweighted or even suffer from obesity. Subsequently, high consumption of sweetened beverages in childhood may predict weight gain during adulthood (Nissinen et al., 2009). Also research from Viner and Cole (2006) suggest that unhealthy food patterns, such as consumption of sweetened beverages, result in obesity from childhood into adulthood. In their study, the majority of subjects, namely 60.7%, who were obese at the age of 16, were also found to be obese at the age of 30. Increase in BMI between the age of 16 and the age of 30 was among others predicted by consuming two or more soft drinks daily (Viner & Cole, 2006).

Unhealthy nutrition patterns also affect long-term quality of life. Getting old while suffering from obesity is quite exceptional. Bad eating lifestyle and physical inactivity induce an estimated 400.000 deaths annually in the U.S. and may shortly pass smoking as the leading cause of death (Mokdad, Marks, Stroup & Gerberding, 2004). Also Engeland, Bjørge, Søgaard, and Tverdal (2003) found an association between increased BMI and an increased risk of death in Norwegian boys and girls. Further, The Prospective Studies Collaboration (2009) analysed data from 57 studies and argued that overall mortality was lowest at about 22.5 to 25.0 kg/m2 (BMI). By an increase of 5 kg/m2, overall mortality increased by approximately 30% (cause: vascular, diabetic, renal, hepatic, neoplastic and respiratory diseases). Mortality above a BMI of 22.5 to 25.0 is mainly due to vascular disease and is presumably causal (The Prospective Studies Collaboration, 2009).

Finally, overweight and obesity are associated with higher rates of deaths caused by cancer (Calle, Rodriguez, Walker-Thurmond & Thun, 2003). It is estimated that, in the U.S., the percentage of cancer deaths attributable to overweight and obesity is 4.2 to 14.2 among men and 14.3 to 19.8 among women. In the U.S., approximately 90.000 deaths attributable to cancer could be prevented annually, provided that normal body weight is maintained (Calle, Rodriguez, Walker-Thurmone & Thun, 2003). Another risk of obesity is contracting diabetes type 2.0. A study from Nguyen, Nguyen, Lane, and Wang (2011) showed that the amount of adults suffering from diabetes increased throughout the increase of body weight.

3. The beneficial effects of drinking green tea

In contrast to the many adverse effects of drinking sweetened beverages and soft drinks, drinking (green) tea has many beneficial effects. Worldwide, tea is one of the most consumed beverage (Chen, Zhu, Tsang & Huang, 2001), situated second to water (Weisburger, 1997). Both green and black tea are produced with leaves from the plant *Camellia Sinensis* (Weisburger, 1997). To produce green tea, the leaves of this plant are only dried and roasted. Extending the process with fermentation of the leaves, produces black tea (Alcázar et al., 2007). Green tea is mainly consumed in Asia and North Africa (Alcázar et al., 2007), though, is becoming increasingly popular in European countries including the Netherlands.

Tea is a safe beverage to consume due to preparation of it with boiling water (Weisburger, 1997). In addition, green tea has many potential health benefits, which is supported by many studies. At first, in comparison of sweetened soft drinks, green tea solely consist of water and extracts from green tea leaves and, thus, contains no calories and is considered to be a healthy beverage. Drinking tea is, thus, conductive to prevent or treat obesity and an effective way to promote a healthy lifestyle. Moreover, drinking green tea is associated with energy expenditure and fat oxidation (Dulloo et al., 1999), which gives an added advantage to drinking green tea.

In addition, Research from Fujiki et al. (1998) showed that green tea may delay onset of cancer by daily consumption of over ten cups of green tea. Also Imai, Suga, and Nakachi (1997) found an association between increased consumption of green tea and slowdown of cancer incidence and stated that green tea has a potentially preventive effect on human cancers. Finally, Suganuma et al. (1999) found that green tea is, additional to cancer preventive, also effective as after cancer treatment. Because daily consumption of 10 cups green tea is quite many, there are even green tea capsules developed in order to make it easier to achieve daily intake (Fujiki, Suganuma, Imai & Nakachi, 2002).

Further, research from Arab, Liu, and Elashoff (2009) showed that daily consumption of green (or black) tea is negatively associated with risk of stroke. Consuming three or more cups of tea per day resulted in a 21% lower risk of stroke in comparison to those consuming less than one cup of tea per day. In addition, a study among Japanese men, showed that consuming green tea was linked to reduced risk of prostate cancer (Kurahashi, et al., 2008). For a more extensive review on the beneficial effects of green tea, reference is made to the article of Cabrera, Artacho, and Gimenez (2006).

In this study, however, research is conducted concerning green ice tea and therefore it is important to consider effectiveness of green tea when temperature is decreased. Iced teas were introduced in 1904 during a curse of hot weather (Weisburger, 1997) and are increasingly popular. Unfortunately, recent ice teas contain very little to no tea extracts and contain a huge amount of sugar. These ice teas are more comparable with lemonades and soft drinks and, therefore, do not have the beneficial effects of drinking pure green tea. Therefore, in this study, the ice tea is produced by cooling down the pure hot green tea.

Research from Chen, Zhu, Tsang, and Huang (2001) showed that when longjing tea, in aqueous solution, maintained at room temperature (37 C) for seven hours, there was no loss in green tea catachins* (GTC), suggesting that GTC are stable at room temperature. Though, other ingredients, such as citric acid, may speed up degradation of GTC and other ingredients may also interact with GTC (Chen, Zhu, Tsang & Huang, 2001). This means that pure ice tea, extracted from real tea leaves and containing no added sugars or other ingredients are healthier than those green tea lemonades and soft drinks that are currently very popular to drink. However, further research needs to be conducted to the long-term stability of GTC in canned and bottled drinks.

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*Green tea catachins are the substances that are believed to be protective against cardiovascular disease and cancer and have other pharmaceutical effects (Chen, Zhu, Tsang, and Huang (2001).

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APPENDIX B
Questionnaire and mean scores of pretest 1

Questionnaire Pretest 1:

In this short questionnaire, you will judge the taste of green ice tea. There are three different types of green ice tea. If necessary, you can always taste the green ice tea again while answering the questions.

You may now taste green ice tea 1 (and same for 2 and 3)

I asses the taste of this green ice tea as:

Unnatural	0	0	0	0	0	0	0	*Natural*
Unhealthy	0	0	0	0	0	0	0	*Healthy*
Not pure	0	0	0	0	0	0	0	*Pure*
Not sweet	0	0	0	0	0	0	0	*Sweet*
Not delicious	0	0	0	0	0	0	0	*Delicious*

I can taste that this green ice tea is added with sugars

Disagree	0	0	0	0	0	0	0	*Agree*

This green ice tea seems:

High-caloric	0	0	0	0	0	0	0	*Low-caloric*
Unhealthy	0	0	0	0	0	0	0	*Healthy*

Results pretest 1: Mean scores of the three green ice teas

		M Pure	**M** Sweet (5gr)	**M** Sweet (10gr)
Tasting:				
Unnatural (1)	- Natural (7)	4.67	3.67	2.89
Unhealthy (1)	- Healthy (7)	4.56	3.33	2.44
Not pure (1)	- Pure (7)	4.56	3.44	2.89
Not sweet (1)	- Sweet (7)	1.89	4.67	5.56
Not delicious (1)	- Delicious (7)	3.56	4.33	3.67
Added sugars:				
Disagree (1)	- Agree (7)	1.56	5.22	6.00
High-caloric (1)	- Low-caloric (7)	5.44	3.22	2.33
Unhealthy (1)	- Healthy (7)	4.89	3.22	2.22

APPENDIX C
Questionnaire and results of prestest 2

Questionnaire pretest 2:

In this short questionnaire, you will assess the appearance of five green ice tea bottles. Try to answer on your intuition, without thinking about it for too long. You may view the bottle, but not touch it yet.

Bottle 1 (and same for Bottle 2, Bottle 3, Bottle 4, and Bottle 5)

I assess the appearance of this green ice tea bottle as:

Unnatural	0	0	0	0	0	0	0	*Natural*
Unrealistic	0	0	0	0	0	0	0	*Realistic*
Unhealthy	0	0	0	0	0	0	0	*Healthy*
Ugly	0	0	0	0	0	0	0	*Beautiful*

When seeing this package, I make an association with leaves

Disagree	0	0	0	0	0	0	0	*Agree*

I see a relief in the package

Disagree	0	0	0	0	0	0	0	*Agree*

U may now touch and hold the bottle

I feel a relief in the package

Disagree	0	0	0	0	0	0	0	*Agree*

The package feels:

Unnatural	0	0	0	0	0	0	0	*Natural*

Results pretest 2:

Descriptive Statistics - Naturalness

	Mean	Std. Deviation	N
Bottle 1 - control	5.00	1.48	23
Bottle 2 - vision-only green	5.52	0.95	23
Bottle 3 - vision+touch green	5.65	0.83	23
Bottle 4 - vision-only white	5.22	1.00	23
Bottle 5 - vision+touch white	5.39	0.72	23

Descriptive Statistics - Realism

	Mean	Std. Deviation	N
Bottle 1 - control	4.39	1.31	23
Bottle 2 - vision-only green	5.00	1.28	23
Bottle 3 - vision+touch green	5.35	1.15	23
Bottle 4 - vision-only white	5.09	0.90	23
Bottle 5 - vision+touch white	5.61	0.84	23

Descriptive Statistics - Healthiness

	Mean	Std. Deviation	N
Bottle 1 - control	4.96	1.33	23
Bottle 2 - vision-only green	5.26	1.14	23
Bottle 3 - vision+touch green	5.48	0.85	23
Bottle 4 - vision-only white	5.04	0.88	23
Bottle 5 - vision+touch white	5.52	0.85	23

Descriptive Statistics - Beautifulness

	Mean	Std. Deviation	N
Bottle 1 - control	4.04	1.30	23
Bottle 2 - vision-only green	5.04	1.46	23
Bottle 3 - vision+touch green	5.83	0.78	23
Bottle 4 - vision-only white	4.96	1.02	23
Bottle 5 - vision+touch white	6.17	0.78	23

Descriptive Statistics - Association with leaves

	Mean	Std. Deviation	N
Bottle 1 - control	4.39	1.47	23
Bottle 2 - vision-only green	6.30	0.64	23
Bottle 3 - vision+touch green	6.35	0.57	23
Bottle 4 - vision-only white	6.04	0.83	23
Bottle 5 - vision+touch white	6.04	0.71	23

Descriptive Statistics - Seeing relief

	Mean	Std. Deviation	N
Bottle 1 - control	2.17	1.19	23
Bottle 2 - vision-only green	2.22	1.51	23
Bottle 3 - vision+touch green	6.43	0.66	23
Bottle 4 - vision-only white	5.25	1.89	23
Bottle 5 - vision+touch white	6.78	0.52	23

Descriptive Statistics - Feeling relief

	Mean	Std. Deviation	N
Bottle 1 - control	1.96	1.40	23
Bottle 2 - vision-only green	1.70	1.46	23
Bottle 3 - vision+touch green	6.96	0.21	23
Bottle 4 - vision-only white	1.26	0.92	23
Bottle 5 - vision+touch white	6.96	0.21	23

Descriptive Statistics - Feeling natural

	Mean	Std. Deviation	N
Bottle 1 - control	5.04	1.19	23
Bottle 2 - vision-only green	4.83	1.40	23
Bottle 3 - vision+touch green	5.83	0.78	23
Bottle 4 - vision-only white	4.57	1.24	23
Bottle 5 - vision+touch white	5.96	0.56	23

APPENDIX D
Questionnaire main study

As a part of my Master graduation at University Twente, I am conducting a research concerning green ice tea. Filling out this questionnaire will take about five minutes of your time. The questionnaire is completely anonymous and the data will only be used for this research.
There are no right or wrong answers. You can fill out the questions like how you think about it.

0 I agree to take part in this study.
You reserve the right to withdraw this consent without given reason and you can stop the experiment at any time without consequences.

Thanks in advance for your time and cooperation!

Do you have any medical restrictions on consuming green ice tea and/or sugars?

0 Yes → stop participating in the study
0 No → continue the questionnaire

You can now view and hold the bottle and taste the green ice tea

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I think this product:	Strongly disagree	Disagree	Tend to disagree	Don't disagree/ don't agree	Tend to agree	Agree	Strongly agree
Is healthy	0	0	0	0	0	0	0
Is high in calories	0	0	0	0	0	0	0
Is responsible	0	0	0	0	0	0	0
Makes me fat	0	0	0	0	0	0	0

I think this product:	Strongly disagree	Disagree	Tend to disagree	Don't disagree/ don't agree	Tend to agree	Agree	Strongly agr
Is pure	0	0	0	0	0	0	0
Contains added colourings	0	0	0	0	0	0	0
Contains added flavourings	0	0	0	0	0	0	0
Is natural	0	0	0	0	0	0	0
Contains extracts from green tea leaves	0	0	0	0	0	0	0
Is artificial	0	0	0	0	0	0	0

	Strongly disagree	Disagree	Tend to disagree	Don't disagree/ don't agree	Tend to agree	Agree	Strongly agree
I find this product tasteful (delicious)	0	0	0	0	0	0	0
I would like to consume this product more often	0	0	0	0	0	0	0
This product is unappealing to me	0	0	0	0	0	0	0
I would buy this product	0	0	0	0	0	0	0
I asses this product as a good quality product	0	0	0	0	0	0	0

	Strongly disagree	Disagree	Tend to disagree	Don't disagree/ don't agree	Tend to agree	Agree	Strongly agree
I think that, compared to other green ice teas, this is a relatively expensive product	0	0	0	0	0	0	0

I think this product will cost:

€..... , …....

	Strongly disagree	Disagree	Tend to disagree	Don't disagree/ don't agree	Tend to agree	Agree	Strongly agree
The healthiness of food has little impact on my food choices	0	0	0	0	0	0	0
I am very particular about the healthiness of food I eat	0	0	0	0	0	0	0
I eat what I like and I do not worry much about the healthiness of food	0	0	0	0	0	0	0
It is important for me that my diet is low in fat	0	0	0	0	0	0	0
I always follow a healthy and balanced diet	0	0	0	0	0	0	0
It is important for me that my daily diet contains a lot of vitamins and minerals	0	0	0	0	0	0	0
The healthiness of snacks makes no difference to me	0	0	0	0	0	0	0
I do not avoid foods, even if they may raise my cholesterol	0	0	0	0	0	0	0

Age:_____

0 Male 0 Female

Highest level of education:
0 Primary school (Dutch: Basisschool)
0 High school (Dutch: Middelbare school)
0 Intermediate vocational education (Dutch: MBO)
0 Bachelor (Dutch: HBO)
0 Master (Dutch: WO)
0 Other, namely _____