

# “GO SUGAR-FREE?”

The influence of online nudging on healthier food choices



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## **Abstract**

**Aim** - This study investigates to what extent a traffic light label nudge (TLL) and a descriptive norm nudge can be used to positively influence the healthiness of one's food choices and attitude towards low-sugar products in an online shopping. The relevance of this study can be derived from the significant rise in people diagnosed with obesity or other overweight related diseases. This study seeks to contribute to this problem by reducing people's sugar-intake and changing their eating habits.

**Method** - An experiment with a 2 (traffic light label vs no traffic light label) X 2 (descriptive norm vs no descriptive norm) between-subjects design with a moderator variable (health consciousness). An online supermarket was recreated based on existing online supermarkets. Participants (N = 228) were randomly assigned to one of the four conditions on the website of the online supermarket. Then, they were presented with a grocery list containing 10 products that they had to purchase. After completing the experiment, the participants were redirected to an online questionnaire to measure the constructs of this study.

**Results** - Statistical analyses showed no main effects of a traffic light label or a descriptive norm nudge on the healthiness of food choice or attitude towards low-sugar products. However, the results did show a statistically significant interaction effect with  $\Lambda = .911$ ,  $F(6, 202) = 3.272$ ,  $p = .004$ . A traffic light label positively influences one's food choice and attitude, depending on the degree of absence of a descriptive norm nudge. Also, a descriptive norm negatively influences one's food choice in absence of the TLL nudge. Furthermore, the descriptive norm negatively influences the attitude towards low-sugar products in the presence of a TLL nudge. Contrary to expectations, no moderating effects of health consciousness were found.

**Conclusion** - This research provides evidence that implementing complementary nudges (i.e. traffic light label and descriptive norm) can be an cost effective way to positively affect the healthiness of one's food choice and attitude towards low-sugar products. However, the participants did not purchase more low-sugar products when the nudges were presented separately. This lack of effectiveness may be attributed to the channel differences between an online context versus an offline context that could affect consumer's choices.

*Keywords:* nudging, healthy food behaviour, food choice, low-sugar products, health consciousness, salience, traffic light label, descriptive norm, online supermarket

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## 1. Introduction

In the Netherlands there has been a significant rise in rate of people diagnosed with obesity or other overweight related diseases in the last 30 years. The aim of this study is to use online nudges to positively influence one's food choice. Since 2015, the number of consumers who shopped their groceries online at least once has almost doubled from 13% to 25% with the Food/Nearfood sector as one of the biggest drivers, food choices are often made in an online environment (Thuiswinkel Markt Monitor, 2019). Strategic retail consultancy Crossmarks states that the buying behaviour has changed permanently (Habraken, 2020). Previous studies successfully proved that nudging can be used as an effective tool that provides consumers with information which enables them to make better food choices (Thaler & Sunstein, 2008). In the long run, this can contribute to healthier eating habits.

In 2012, for the first time in history, non-communicable diseases such as diabetes, heart diseases, and cancer caused a greater burden for humanity than infectious diseases. This led to over 35 million annual deaths in 2012 (Lustig, et al. 2012). The United Nations targets the Western pattern diet (WPD) as a prominent risk factors for these non-communicable diseases. This Western pattern diet is characterized by “a high consumption of red meat, refined grains, processed meat, high-fat dairy products, desserts, high-sugar drinks and eggs” (Fontes-Villalba et al., 2014). A lot of these products contain high-fructose corn-syrup (HFCS) and sucrose. Research shows that these added sugars, activate processes that lead to non-communicable diseases (Lustig, et al. 2012). In order to improve the public health, it is necessary to reduce the sugar consumption.

In the Netherlands, the first step was set in 2014, when the Dutch government drafted an agreement to improve the product composition. The purpose of this agreement is reducing the amount of salt, saturated fat and sugar in processed food before 2020 (Rijksoverheid, 2014). Policy makers and food producers may also contribute in this challenge by reducing the unhealthy = tasty intuition (UTI), as fats and sugars are highly preferred whether consumed as mixtures in food or separately. Not every choice that we face with long-term benefits for our health have obvious immediate appeal or a high level of desirability. Increasing health consciousness is a promising intervention that is often used by policy makers to help people make healthier food choices (Mai and Hoffmann., 2015). People who are more health consciousness are more likely to undertake healthier behaviours (e.g. eating sugar-free gingerbread) than less health-conscious individuals (Jayanti & Burns, 1998). Because health consciousness refers to this degree to which health concerns affect someone's



daily lifestyle, it is predicted that a positive relationship between health consciousness and health care behaviours exists.

Nudging is a tool that is often used to alter people's choices and may be used to steer people towards the desired low-sugar food choices. Previous studies proved the effectiveness of a variety of nudges, such as social norms, product placement, product labelling, providing nutrition information. With regard to pro-environmental behaviour, especially descriptive norms proved to be effective. A descriptive norm is an affectively oriented nudge that describes what most other people do or what behaviour is perceived as normal in a given situation (Cialdini 1988; Cadario & Chandon, 2020). Significant results were found in the fields of recycling, energy conservation, health behaviour, and transportation behaviour (Kormos, Gifford, & Brown, 2015). An earlier performed study investigated digital nudging towards healthier food choices and stated that it is worth further investigation to see if descriptive norms can effectively influence customers decision-making in an online environment (Steggerda, 2017).

Another nudge that is often used to change health behaviours and decisions is the 'salience' nudge. This nudge increases attention to a particular choice by showing novel, vivid, or personally relevant examples and explanations. In response to the nudge, a reaction will be evoked via emotional associations (Wilson et al., 2016; Blumenthal-Barby & Burroughs., 2012). For example, to increase smoking cessation, smokers watched a video where either themselves or a loved one is suffering from a heart attack. Over 50% of the participants reported having quit smoking completely after a period of 3 months (May et al, 2010). Salience nudges were successfully employed in a number of prosocial contexts, such as anti-smoking campaigns, reducing alcohol consumption, and healthy food behaviour.

With regard to salience nudges, Cadario and Chandon (2020) found that evaluative labelling was the type of healthy eating nudge that worked best. Evaluative labelling nudges provide consumers of nutritional information by using color-coding or adding symbols or marks to a product. Additionally, Wilson et al (2016) argued that among the evaluative labelling interventions, "traffic light labels" were especially effective in changing healthy food behaviour. These assumptions are supported by various experimental researches which introduced traffic light labels onto food and beverage products in hospital cafeterias (Levy et al., 2012; Thorndike et al., 2012). Wilson et al (2016) also argued that two complementary nudges can have a positive effect on the healthiness of food choice over a longer period of time. As Bonini and Hadjichristidis (2018) also suggested to investigate the effectiveness of a

combination of nudges on health behaviour, this study seeks to examine the effect between a salience and a descriptive norm nudge.

To date, research on nudging has been primarily conducted in offline contexts, and has proven to be effective in a variety of situations. However, nowadays people frequently have to make important decisions within digital choice environments due to an increased use of digital technologies. User interfaces such as websites include digital choice environments that influence choices by how it is organized and presents its workflows (Weinmann et al., 2016). Huyghe et al (2016) state that product presentations differ fundamentally offline versus online, and this has differential impacts on purchase behaviour. It is questioned whether channel differences affect consumer's choices. In addition, online grocery shopping became increasingly common and consumer's purchase behaviour has changed permanently (Thuiswinkel Markt Monitor, 2019), which suggests an even greater urgency of better understanding the effectiveness of nudges in an online environment.

Highlighting this difference between nudging in an offline and online shopping environment regarding healthier food behaviour, represents a significant academic contribution. Hence, the practical relevance of this study can be derived from the significant rise in obesity or other non-communicable diseases. The current study may have a direct impact on the intake of sugar-rich products by stimulating the purchase of low-sugar products. Furthermore, the food industry can use this newly discovered information to see how to use the nudges as a tool to alter people's eating habits, which may have significant long-term effects. The fact that these nudges may help limit the intake of sugar-rich products, and change people's eating habits, indicates the societal and practical significance of this study

This study focuses on reducing sugar consumption by using a salience and descriptive norm nudge to persuade participant's decision-making. In order to recreate a realistic online shopping environment and ensure ecological validity, an online supermarket was built based on an existing online supermarket. Health consciousness was added as a moderator variable to ascertain its role when making food choices.

Hence, this leads to the following research questions:

*RQ1: "To what extent can a salience nudge and a norm nudge be effective to increase the number of healthy food choices and positively affect one's attitude towards low-sugar products?"*

*RQ2: "What role does health consciousness play in the relationship between a salience nudge or a norm nudge on healthy food choices and attitude towards low-sugar products?"*

## 2. Theoretical framework

### 2.1 Food choice

Previous research explored several aspects of food choice from a wide variety of perspectives, including cultural, cognitive, social, situational, and physiological disciplines (Furst et al., 1996; Martins & Pliner, 2005; Mela, 1999). Traditional theories about consumer decision-making often rely on the belief that decision-making is a rational process. However, Köster (2009) stated that theories based on the concept of conscious and rational decision making have come under serious criticism because of their weak methodology, strong theoretical bias, and low predictive validity. Köster (2009) argued that past behaviour, habit, and hedonic appreciation are the best predictors for food choices.

There is a growing body of research supporting this perspective and suggesting that decision making can be better described by simple heuristics. Subsequently, the rules of thumb are that people make choices based on just a few important pieces of information (Scheibehenne et al., (2007). This distinction between decision making based on intuition and reasoning has been a topic of interest in the last decades. Despite the fact that these two perspectives on decision making differ greatly, there is broad consensus on the characteristics that distinguish the two different types of cognitive processes. Stanovich and West (2000) labelled these two cognitive processes *system 1* and *system 2*.

System 1 is based on intuition and the operations are “fast, automatic, effortless, associative, implicit (not available to introspection) and often emotionally charged; they are also governed by habit and are therefore difficult to control or modify.” System 2 is built on the principle of reasoning and these operations are defined as “slower, serial, effortful, more likely to be consciously monitored and deliberately controlled; they are also relatively flexible and potentially rule governed.” (Kahneman, 2003). In a study towards food choice behaviour, Furst and fellow researchers (1996) argued that the food choice process incorporates not only decisions with conscious control, but especially choices that are subconscious, automatic, and habitual.

The distinction between these two systems of decision making explains why people not always make the best possible choice. Results from a research by Scheibehenne (2007) towards food decision making support the assumption that food choices may be based on simple heuristics. In addition to this, Häubl and Trifts (2000) conducted a research towards consumer decision making in online shopping environments. This study discusses that consumers are often unable to evaluate all available alternatives thoroughly while making a purchase decision in an online environment, and therefore rely on system 1 processes.

Broers et al (2017) argued that the construct of nudging has its fundamentals in Kahnemann's (2003) theory on heuristics and biases. In order to change people's food behaviour, it is not only necessary to increase people's intentions to adopt a healthier eating pattern through health education but these intentions also have to be converted into actual behaviour. This "intention-behaviour gap" is one of the main reasons why motivation-based approaches targeting system 2 processes to change food behaviour often shows meagre results (Sheeran, 2002; Marteau et al. 2011). Although raising awareness is effective, there is limited success when it comes to actual lifestyle changes, such as weight reduction. Individual behaviour change is effective when it becomes habit forming, which requires support and reinforcement to make structural changes and sustain the desired behaviour. Therefore, innovative strategies that can effectively improve eating behaviour are necessary.

In that regard, nudging may provide added value because it targets automatic and affective processes by altering environmental cues. When making decisions, people often use simple heuristics and biases via a system 1 process because it would be too time-consuming to consciously reflect on all available alternatives through a system 2 process. Heuristics frequently lead to unhealthy food choices because people strive to reduce the amount of cognitive effort that is associated with decision-making. Therefore, people are willing to settle for the less desirable choice in return for a reduction in effort (Häubl & Trifts, 2000). Nonetheless, nudging uses heuristics that rely on automatic and affective processes for the well-being of people, by steering them towards healthier food options (Broers et al. 2017).

## **2.2 Attitude towards low-sugar products**

As more and more people are purchasing organic foods, the trend towards healthier food behaviour is growing. The awareness about the harmful effects of chemicals present in processed foods is increasing among consumers which may influence one's attitude (Basha et al., 2015). Attitudes express likes and dislikes, passions and hates, and attractions and repulsions. People have attitudes when they love or hate things or people and express this in many ways, including cognitive, emotional, and overt behaviour. Eagly and Chaiken (1993) defined an attitude as "*a psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor.*". A foundational assumption that is often made in academic literature is the notion that attitudes influence, shape, and predict actual behaviour (Kraus, 1995).

A study that is often used with reference to health-related behaviour is the Theory of Planned Behavior (TPB) by Ajzen (1991). The TPB is an extension of the Theory of Reasoned Action (TRA), developed by Martin Fishbein and Icek Ajzen in the 1960s (Fishbein & Ajzen, 1975). This theory is used to understand and predict behaviors. It assumes that behaviors are directly determined by behavioral intentions, which in turn are determined by three factors: attitude toward the behaviour, subjective norms, and perceived behavioral control (PBC). As the large majority of psychological literature considers attitude as the main predictor for behavioral change and assumes that attitudes serve to guide people's behaviour (Armitage & Christian, 2003), this study focusses on the attitude towards low-sugar products as one of the predictors of food behaviour. Thus, in order to change public food behaviour and reduce sugar consumption, it is important to change people's attitude towards low-sugar products.

A review by Gupta et al (2018) showed that health interventions through a variety of media tools is an effective way to increase knowledge and generate positive attitudes towards a reduced sugar consumption, thereby increasing the likelihood of changing their food behaviour. For instance, presenting information and evaluative labels improve people's knowledge and stimulate positive attitudes towards reducing their sugar intake (Hammond et al, 2004; Wakefield et al, 2010). Cadario and Chandon (2020) support this assumption and note that cognitively oriented interventions, such as evaluative labels, can be used to influence consumer's knowledge and changing attitudes. This research also found that healthy eating calls (e.g. descriptive norm) are an effective intervention type to affect how people feel. The aim of this study is to examine to what extent a salience nudge and descriptive norm nudge can influence one's attitude towards low-sugar products.

## 2.3 Online nudging

Nudging is a concept which is established in behavioural economics to steer people towards desired behaviour. Thaler and Sunstein (2008) define nudging as “any aspect of the choice architecture that alters people’s behaviour in a predictable way without forbidding any options or significantly changing their economic incentives”. Weinmann et al (2016) elaborated this definition by defining ‘digital nudging’ as “the use of user-interface design elements to guide people’s behaviour in digital choice environments.”. The central thought of nudging is that “small and apparently insignificant details can have major impacts on people’s behavior” (Thaler et al., 2013). Marteau et al (2011) discussed that the definition by Thaler and Sunstein excludes legislation, regulation, and interventions that alter economic incentives.

With regard to nudging, previous studies have shown that nudging has been successful in providing consumers with information which enables them to make better food-choices (Bucher et al., 2016). Therefore, it is suggested that the effectiveness of altering the product presentation may be a successful approach to influence habitual dietary choices (Thaler and Sunstein, 2008). Nudging is built on psychological and sociological theories that provide insight into how environments shape and constrain human behaviour. The novelty of nudging exists out of two characteristics. At first, based on behavioural economics and social psychology, it explains why people behave in ways that deviate from rationality as known in classical economics. Secondly, it is established in libertarian paternalism, a political philosophy which actively guides people’s choices in their best interests, but they keep their liberty to behave differently. Nudging can be a relatively simple, low solution for problems regarding people’s behaviour, without requiring legislation.

There have been a variety of classifications regarding nudging (Hollands et al., 2013; Ly et al., 2013) which all identified different categories based on different typologies. Furthermore, a study by Blumenthal-Barby and Burroughs (2012) allows a simple identification and naming of these interventions based on how these interventions influence one’s behaviour on a conscious or subconscious level. This study has had greater acknowledgement in the academic literature, and therefore, the classification in this study is based on Blumenthal-Barby and Burroughs (2012) and Wilson et al (2016). A plain overview of the classification is visualized in table 1.

<b>Category</b>	<b>Explanation</b>
<b><i>Incentive nudges</i></b>	<i>Incentives are used to either reinforce a positive choice, or to punish a negative choice. They may involve giving something to the consumer, or taking something away</i>
<b><i>Default nudges</i></b>	<i>A particular choice is pre-set (default), which makes it the easiest option. Consumers tend to choose default options as it simplifies decision-making</i>
<b><i>Salience and affect nudges</i></b>	<i>Novel, personally relevant or vivid examples and explanations are used to increase attention to particular choice. Reactions will be elicited primarily through emotional associations in response to the nudge</i>
<b><i>Norms and messenger nudges</i></b>	<i>Other people are used to establish a norm, as consumers are influenced by comparing themselves to others. Alternatively, people of status are used to communicate with consumers, as consumers are influenced by whom they receive information from</i>
<b><i>Priming nudges</i></b>	<i>Subconscious cues which may be physical, verbal or sensational, and are changed to nudge a particular choice</i>
<b><i>Commitments and ego nudges</i></b>	<i>Consumers make a commitment or promise public, and their desire to feel good about themselves will nudge them to make choices consistent with their commitment or promise</i>

*Table 1. Nudging and choice architecture categories (Blumenthal-Barby and Burroughs., 2012 & Wilson et al., 2016).*

In a recent study, Cadario and Chandon (2020) identified seven types of healthy eating nudges which are categorized in three categories: cognitively oriented, affectively oriented, and behaviourally oriented. The cognitively oriented interventions aim to influence consumer's knowledge and can be divided into three different types. The first type is "descriptive nutritional labelling" and this provides calorie count or nutritional information (e.g. labels on food packaging or restaurant menus). Secondly, the type "evaluative nutritional labelling" provides nutrition information and helps consumers interpret it by adding symbols or through color-coding (e.g. red, orange, and green as nutritive value increases). The third type, "visibility enhancement", informs consumers about the availability of healthy options by increasing their visibility on cafeteria shelves or grocery stores (e.g. healthy product at eye level).

The affectively oriented interventions are used to affect how consumers feel and are split in two different types. The first type is called “hedonic enhancements”, it uses vivid hedonic descriptions (e.g. “twisted citrus-glazed carrots”) or attractive displays, photos, or containers (e.g. bowl of fruit) to increase the hedonic appeal of healthy options. The second type, “healthy eating calls”, encourages people to be better by placing stickers or signs (e.g. take a fresh salad for lunch), or by asking staff to verbally encourage people to make a healthy food choice or to change their unhealthy choices.

Lastly, the behaviourally oriented interventions, which aim to affect people’s behaviour without influencing how they feel or what they know. The first type, “convenience enhancements”, make it physically easier for people to select or consume healthy options (e.g. pre-selection healthy option as default), or make it more difficult to select or consume unhealthy options (e.g. placing unhealthy options later in cafeteria line when tray is already full). The second type is “size enhancements”, which reshapes the size of the plate, bowl, or glass or the size of prepared portions. This type either decreases the amount of unhealthy food or increases the amount of healthy food the dish contains.

## **2.4 Salience nudge**

Regarding cognitively-oriented nudges, results show that evaluative labelling is the most effective intervention type (Cadario & Chandon, 2020). As described in Table 1, evaluative labelling would be categorized as a salience nudge as it influences people by using novel, personally relevant or vivid examples and explanations. This elicits emotional associations which remain available in memory and is strongly forming behaviour and decisions. Narratives and images are examples that are often used to make things salient.

Cawley et al (2015) measured the impact of a supermarket nutrition rating system on purchases of nutritious and less nutritious foods nutrition information systems provided nutrient and health-related food information to consumers, often in the form of labels on products or on the shelves. This type of information influences acquisition of both nutritious and less nutritious foods, influences the purchase of nutritious foods, and motivates avoidance of less healthy foods. Results of this study showed that nutrition ratings led consumers to buy a more nutritious mix of products. Remarkably, it mainly reduces purchases of less nutritious foods instead of increasing the purchase of nutritious foods.



Further, Thorndike et al (2012) performed a study in a hospital cafeteria to see whether the number of sales of healthy food and beverages would increase when a 2-phase labelling and choice architecture intervention were used.

The results demonstrated that a color-coded labelling (red = unhealthy, yellow = less healthy, green = healthy) nudge increased sales of healthy products and decreased sales of unhealthy products. Contrary to calorie labels, traffic light labelling (TLL) transforms complicated numerical nutritious information into simple color-coded labels. It is expected that a TLL may be more effective in motivating healthier food choices than calorie labelling due to its simplicity (Olstad et al., 2015).

The Associative Network Theory (Anderson and Bower, 1973 & Collins and Quillian, 1969) explain why salience nudges influence food and beverage choices. Memories consist out of multiple pieces that are connected to each other (e.g. colours, experiences etc.). This information may have emotional or practical meanings, and can become linked when these pieces of information are experienced together. These links can be strengthened by emotions or by repeated exposure. This explains why traffic light labels were effective (Thorndike et al., 2012), *“as the colours red, yellow, and green already have strong associations from prior experiences (i.e. green means ‘go’ or ‘healthy’, yellow means ‘caution’ and red means ‘stop’ or ‘dangerous’).”* (Wilson, 2016). Hence, consumers automatically associated these practical meanings to the color-coded food labels, which is supported by a general understanding of traffic light colours (Hieke & Wilczynski, 2012).

A prime reason for the effectiveness of salience is that the things that are made salient drive people emotionally (e.g. fear of death or insecurity about weight) or are things that someone cares about (e.g. avoiding loss of money). “Exploiting salience effects and exploiting affect effects are inextricably intertwined.”, according to Blumenthal-Barby and Burroughs (2012). Exploiting these features of human psychology to influence health behaviour and steer decisions in a particular way evokes ethically relevant questions.

Firstly, it should be considered whether the nudge would count as manipulation, as manipulation sometimes may be an infringement on a person’s autonomy. Second, if the nudge can be accounted for manipulation, then it must be evaluated if it is ethically justifiable, which is possible under certain circumstances. Third, it must be considered if this technique will be perceived as negative by the recipient. Lastly, one should consider whether it is true and accurate what is being presented, in contrast to misrepresented or exaggerated. By nature of the definition of manipulation, most occasions where salience and affect nudges are used will count as manipulation.

Manipulation occurs when one person influences another by “bypassing their capacity for reason, either by exploiting nonrational elements of psychological makeup or by influencing choices in a way that is not obvious to the subject.” (Greenspan, 2003).

However, manipulation is not always ethically unjustified. One can bypass an individual’s reasoning capabilities when it is for good reasons (e.g. one’s reasoning powers are diminished) or for good ends (e.g. preventing someone of harming themselves). It is important to weigh the risks and benefits of manipulating a person to change their health behaviour and one has to be able to explain the reasons for using these techniques instead of using rational arguments. For instance, the risks of manipulating someone to adopt a healthier diet by using traffic light labels are minimal to non-existent, while the health benefits are significant.

**H1:** A salience nudge in a digital choice environment will positively influence the **(a)** healthiness of one’s food choice and **(b)** attitude towards low-sugar products as opposed to a digital choice environment where no salience nudge is presented.

## 2.5 Descriptive norm

When looking at affectively oriented interventions, norm nudges may be classified as ‘healthy eating calls’ (Cadario & Chandon, 2020). Norm nudges are based on the principle that we are strongly influenced by what others do and by who communicates information. Humans are considered as social creatures who rely on other people for our behavioural and decisional cues. According to the Social Norm Approach (Perkins & Berkowitz, 1986), norms can be classified into two types: descriptive norms and injunctive norms, both referring to a different kind of motivation (Cialdini & Reno, 1990). Descriptive norm describes what most people do or what is perceived as normal (e.g. most people choose sugar-free gingerbread). Cialdini (1988) states “If everyone is doing it, it must be a sensible thing to do.”. He argued that observing and imitating actions of others, provides an advantage for efficient decision-making.

To elaborate on this, Sherif (1936, p. 3) found that descriptive norms can be conceptualized as a common rule of desired behaviour. The more individuals feel connected to a descriptive norm, the more likely it is that this individual will perform this desired behaviour. The injunctive norms refer to behaviour that is commonly approved or disapproved in a moral sense. In contrast to the descriptive norms, which defines what is done, injunctive norms specify what ought to be done (e.g. you should not consume more than

50 grams sugar per day). Further, a meta-analysis shows that descriptive norms have a greater effect on behaviour than injunctive norms (Melnik et al., 2010).

Cialdini and Reno (1990) analysed the effects of social norms on behaviour with regard to the focus theory of normative conduct. This theory suggests that norms do not influence behaviour similarly in all situations at all times. Also, the focus theory predicts that if only one of the two types of norms (descriptive or injunctive) is prominent in a person's mind, it will have a greater effect on behaviour. As mentioned before, descriptive norms proved to be effective in stimulating pro-environmental behaviours such as littering (Cialdini & Reno, 1990), energy conservation (Kantola, Syme, & Campbell, 1984), transportation behaviour (Kormos, Gifford, & Brown, 2015), and recycling (Schultz, 1999). The public health nutrition area is one of the areas where individuals tend to rely on social norms for making food choices (Higgs, 2014).

Several researchers concluded that descriptive and injunctive norms can effectively influence food choice by providing information about others eating habits (Robinson et al. 2014). However, it is not always influenced in the same way or to the same extent (Schultz et al, 2007). Injunctive norms may sometimes have unwelcome effects, as it may give people a feeling that they are being pushed in certain direction that is not in consonance with their personal goals (Jacobson, Mortensen, & Cialdini, 2011; Melnyk, Van Herpen, Fischer, & Van Trijp, 2011). This may be perceived as a limitation on one's freedom of choice and therefore evoke resistance to this desired behaviour (Silvia, 2006).

This is supported by a study from Stok et al (2014) towards the influence of norms on fruit consumption in adolescents, which showed a decrease in adolescent's intention to consume sufficient fruits when an injunctive norm was presented. Besides this, a message containing an injunctive norm did not positively influence fruit consumption. On the contrary, a descriptive norm did positively influence adolescent's actual fruit consumption. With regard to health behaviour, a meta-analysis showed that associations to health behavioural intentions were stronger for descriptive norms than for injunctive norms (Rivis & Sheeran, 2003).

There are various ways to counter potentially negative effects of norms describing undesired behaviour on the desired behavioural outcome. First, draw one's attention on injunctive norms that counter possible unwelcome effects of the descriptive norm (Schultz et al., 2007). A second is to design descriptive norms that are framed positively to create an effective message. Goldstein et al (2008) conducted two field experiments using social norms to motivate environmental conservation in hotels. Appeals employing descriptive norms were found to be superior to traditional norms that only focused on environmental protection.

The descriptive norm stated that “*Almost 75% of guests who are asked to participate in our new resource savings program do help by using their towels more than once.*”.

A third way to counteract unwelcome effects is to only present relevant descriptive norm information to the ones that should be influenced. There are three reasons why the use of descriptive norms may backfire. The first is that providing people with true information about environmental behaviour may highlight the fact that a lot of people do not respect the norm, thus giving them a valid reason to disregard it (Cialdini et al., 2006). Furthermore, misleadingly give people the impression that the majority of people follow the behaviour of a pro-environmental norm by using factually incorrect norms could damage public confidence in the source. Finally, drawing one’s attention to injunctive norms may be a solution, but it runs the risk that it will be counterproductive when it is perceived as too patronizing or moralizing towards their clients or consumers.

Given the fact that descriptive norms are effective because they provide a standard that people do not want to deviate from, there is a strong motive to use descriptive norms that suggest a high rate of compliance to a group norm. Nevertheless, through systematically using verbal and numerical quantifiers it may be possible to present true descriptive norms about a non-prevalent behaviour in such a way that it encourages this particular behaviour. For instance, it is recommended to use verbal quantifiers with a positive polarity (e.g. a few, some, many) over those with a negative polarity (e.g. few, not many, not all) because positive quantifiers draw attention towards performing the particular behaviour, whereas negative quantifiers draw attention against the behaviour in question (Schultz et al., 2008).

Although “a few” and “few” describe the same quantity, the essence of the message is completely different because of the way it is phrased. For example, the phrase “A few people went to the party because...” provides one with reasons why people went to the party (e.g. a famous artist came to perform). On the other hand, the phrase “Few people went to the party because...” provides one with reasons why people did not go to the party (e.g. already had another birthday). The successful message by Goldstein et al (2008) in the study about motivating environmental conservation hotel proved the importance of framing when it concerns the use of norm nudges to encourage pro-environmental behaviour.

According to Cialdini (1988), a descriptive norm offers an information-processing advantage and constitutes decisional shortcuts when one is choosing how to behave in a given situation, while injunctive norms present the prospect of social rewards and sanctions.

Descriptive norms describe a psychological and social phenomenon which states that people tend to copy actions of others by registering how these people act in these particular situations, resulting in efficiently decision-making. The main reason for this convergent behaviour is that people have similar information, similar action alternatives, and face similar consequences when making a decision (Bikhchandani et al., 1998). Also, people are inclined to believe that other people have more knowledge about a particular situation when one does not know how to behave appropriately in a given situation (Cialdini, 1984).

As a result, people often make similar choices. For example, if 'Lays' makes tastier potato chips than house brand chips, and people are aware of this, they will all end up buying Lays chips. However, even with similar information, differences in taste can lead to opposing choices. This convergent behaviour may even occur when the consequences are similar, but the primary information is not. In this case, people will communicate, observe others actions or observe consequences of these actions. The main aspect is how people determine which alternative is the better option. Considering these alternatives can be time-consuming and costly. Therefore, it is sometimes easier to rely on information of others and make similar choices.

Blumenthal-Barby and Burroughs (2012) identified three ethically relevant dimensions that need to be considered when using norm nudges. First is the danger of nudging people towards the undesired behaviour when using normative information. Thus, the norm nudge should be designed in such a way that it does not harm people. Second is constructing a narrative with non-factual norms about how the majority of the people behaves in a given situation (e.g. stating that the risk of breast cancer is 34% while it actually is 2%), especially in situations where most of the people behave unwisely. The last ethical consideration is the power differentials that may exist between the messenger and the recipient of the message. If the messenger is an authority figure such as a doctor, then the person who is being nudged may accept this message regardless of the consequences. Accepting this message unquestioningly limits someone's autonomy. Hence, one has to be aware of this threat and should manage these effects when constructing a norm message.

**H2:** A descriptive norm in a digital choice environment will positively influence the (a) healthiness of one's food choice and (b) attitude towards low-sugar products as opposed to a digital choice environment where no descriptive norm nudge is presented.

## 2.6 Combination of nudges

Nowadays, most research has focused on only one particular nudging intervention. Bonini and Hadjichristidis (2018) suggest to study whether combining nudging interventions could further promote pro-environmental behaviour. Even if the combined intervention does not show significant results, it still could shed a light into the underlying processes. Also, previous research suggest that two complementary nudges can influence healthier food choices over a long period of time, varying from three to 21 months (Wilson, 2016). Recall that a salience nudge is a cognitively oriented intervention and a norm nudge is an affectively oriented intervention. When concerning a traffic light label, it provides nutrition information and it helps consumers interpret it through colour-coding (Cadario & Chandon, 2020). This simple form of education makes the healthier product easier to choose.

In addition, a norm nudge encourages people to make better choices by placing stickers or by verbally encouraging them. Such injunctions may elicit a strong affective response in the shape of a feeling of guilt or social pressure on a person with regard to one's healthfulness (Cadario and Chandon, 2020; Wilson, 2016). These nudges combined make it easier to choose a healthy option above an unhealthy option. According to Kahneman and colleagues (1982) consumers tend to rely on simple heuristics and choose the easiest option, which supports this combination of nudges.

**H3:** When both nudges work simultaneously this will have a greater effect on **(a)** the healthiness of one's food choice and **(b)** attitude towards low-sugar products as opposed to no or one of the conditions.

## 2.7 Health consciousness

Despite a growing number of studies towards healthy eating behaviour's, many people still tend to overconsume energy-dense foods because of two reasons. First is that "unhealthy" foods are associated with being tasty (e.g. fats and sugars are highly preferred). Second is that taste is considered as the key driver of making food decisions (Levine, Kotz & Gosnell, 2003). Policy makers and food producers could help consumers make food changes and market healthier products by finding ways to reduce the unhealthy = tasty intuition (UTI). Highly health-conscious consumers are already less likely to believe that the unhealthier the food is, the tastier it is.

Hence, Mai and Hoffmann (2015) suggested that motivational factors may counter the UTI. Increasing health consciousness is an intervention that is often used by policy makers to

challenge the obesity epidemic. Health consciousness is defined as “an individual difference variable that assesses the degree to which a person plays an active role in maintaining his or her health.” (Naylor et al, 2009). Such individuals tend to be aware of their nutrition and physical fitness (Kraft and Goodell, 1993). Health-conscious consumers are aware about their state of well-being and are driven to maintain or improve their health. Besides this, one also attempts to prevent illness by engaging in healthy behaviours (Gould, 1988).

Previous work recognized this interest in health as a main driver for the purchase of organic foods (Lockie et al., 2002). Results showed that consumers who are health conscious and adopt a “wellness-oriented” lifestyle have a higher tendency to undertake preventive health behaviours (e.g. eating nutritious foods) than people who are less health conscious (Jayanti & Burns, 1998). Additionally, Magnusson et al (2003) found that health consciousness is a predictor of attitude, intention, and purchase of organic foods. Moreover, as organic food consumers are aware of the effects of food intake on health, they appreciate healthy and natural foods and are more inclined to buy healthier foods to improve their health (Schifferstein and Oude Ophuis, 1998). Health consciousness is also associated with low fruit and vegetable intake and a lack of exercise. Highly health-conscious people showed these types of behaviour on a lower rate when compared to less health-conscious people (Wardle and Steptoe, 2003). Other studies elaborate on this by stating that health consciousness has an effect on one’s attitude toward healthcare activities.

Gould (1988) mentioned that individuals with a high level of health-consciousness tend to have a favorable attitude towards preserving a healthy diet to prevent heart diseases and cancer. When translated into food consumption, past studies noted that highly health-conscious consumers think that organic foods are healthier, tastier, have better quality, and have a more favorable attitude towards organic products (Michaelidou and Hassan, 2008). People with a high level of health concern and who have more nutrition knowledge have a higher tendency to buy foods with health benefits and are willing to pay more for these products (Bower et al., 2003). With regard to nudging, a study by Drichoutis et al (2006) illustrated that highly health-conscious consumers were more likely to use nutrition labels (e.g. traffic light label).

**H4:** When one with a high level of consciousness is presented with a salience nudge it is expected to have a greater effect on **(a)** the healthiness of one’s food choice and **(b)** attitude towards low-sugar as opposed to one’s with a low level of health consciousness.

**H5:** When one with a high level of consciousness is presented with a descriptive norm it is expected to have a greater effect on **(a)** the healthiness of one's food choice and **(b)** attitude towards low-sugar products as opposed to one's with a low level of health consciousness.

## 2.8 Conceptual framework

This research studies the effect of a salience nudge, and a descriptive and injunctive norm nudge on participants food choices. Within this research, the default option and descriptive norm are considered as independent variables, whereas food choice is the dependent variable. A conceptual model is visualized in figure 1.

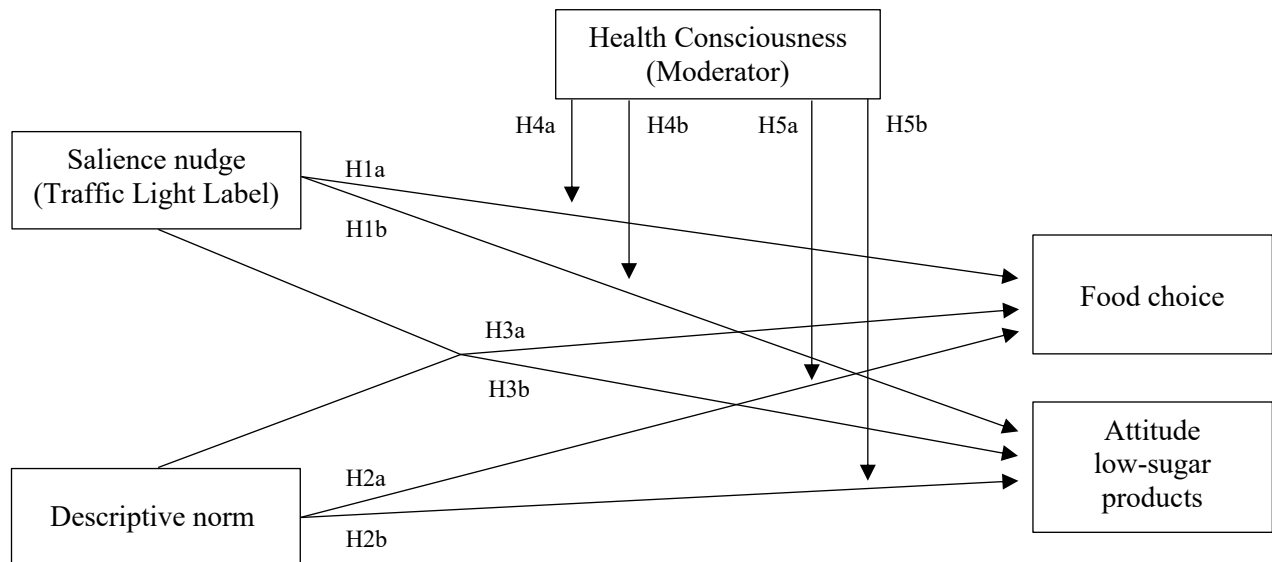


Figure 1: Conceptual model



### 3. Method

This study researched to what extent online nudges could be used to influence one's food choices and affect their attitude towards low-sugar products. An experiment was conducted where a realistic online shopping environment was created to test the hypotheses that were derived from the literature review. Within this online environment, a salience and a norm nudge were used to persuade the participants decision-making and steer them towards low-sugar products.

#### 3.1 Study design

This study had a 2x2 between-subjects design with a moderator variable. The first condition tested the presence of a salience nudge, which was constructed as a TLL nudge. The second condition tests a descriptive norm nudge in the form of a speech bubble. In the third condition, participants were confronted with a visualization of both nudges. Lastly, a controlling condition was added without any nudge. The four different conditions were visualized in table 3.1.

<b>Conditions</b>			
Condition 1	Salience nudge √	Descriptive norm	X
Condition 2	Salience nudge X	Descriptive norm	√
Condition 3	Salience nudge √	Descriptive norm	√
Condition 4	Salience nudge X	Descriptive norm	X

*Table 2: Conditions experimental design*

#### 3.2 Procedure

In the present study, participants had to complete an experiment that consisted out of three different components. First, participants filled in demographic questions prior to the experiment. In the second part, the respondents completed an assignment on the website of the online supermarket. The last part was filling in a questionnaire to measure the constructs health consciousness and attitude towards low-sugar products. At first, the participants were approached at a paramedical centre, named “De Bleekerij”. In consultation with various companies within the paramedical centre, an enclosed space was made available and patients were recruited to participate in this experiment. However, due to the Covid-19 pandemic and a stricter lockdown, it was no longer possible to continue recruiting participants at this paramedical centre. As a result of this lockdown, the experiment had to be distributed online through social connections.

The experiment was conducted digitally on either a desktop or a laptop, as this was more favourable for the visibility of the implemented nudges. Before participating in this study, respondents had to agree with all terms and conditions. The aim of the study was not disclosed to the participants, as this would neutralize the effect of the nudges. After agreement, the participants were presented with the demographic questions. Secondly, the participants were provided with a grocery list that contained 10 products, which they had to buy in a fictive online supermarket. The online supermarket had four different webpages, one for each condition. Subsequently, participants were randomly assigned to one of the four conditions. When all products were added to the shopping cart and the order was finished, the respondents received an order number and were redirected to the online questionnaire. The respondents had to fill in several statements measuring the moderator variable health consciousness and the dependent variable attitude towards low-sugar. Finally, participants responded to the manipulation check questions.

## **3.2 Stimuli**

### **3.2.1 Online supermarket**

For this experiment, an online supermarket was created with a WordPress content management system (CMS). The website's design was based on the online supermarket website from the Dutch supermarket Jumbo to ensure that a realistic shopping environment was created. The online supermarket was built for scientific purposes only. This website contained a category, subcategory, and product page. The home page had eighteen different product categories (e.g. breakfast cereals, sandwich spreads, and snacks), and these categories were consequently divided into subcategories (e.g. muesli and cereals or crackers and rice crackers). Finally, the participants were forwarded to the product page where they had to decide which product to buy.

All participants received a grocery list which only contained the product type, and no specific products or brands, as visualized in table 3. Providing the participants with only product types gave them freedom of choice for their final purchases, which stimulated realistic online shopping behavior. The grocery list contained 10 different product types, existing out of food and non-food related products. Five products were presented with a nudge and taken into account with the data-analysis. The other five products were added to the grocery list to recreate an everyday grocery list. Therefore, these five products were not incorporated in the data.

	<b>Example 1</b>	<b>Example 2</b>	<b>Example 3</b>
<b>Product category</b>	Breakfast cereals, sandwich spread, snacks	Soups, sauces, herbs, oil	Dishwashing detergents
<b>Product type</b>	Gingerbread	Sauces → Ketchup	Detergent
<b>Regular product</b>	Peijnenburg Ontbijtkoek naturel gesneden	Heinz Tomato ketchup	Dreft Handafwas original
<b>Level of sugar (per 100 grams)</b>	38.9 g	22.8 g	X
<b>Low-sugar product</b>	Peijnenburg Ontbijtkoek zero gesneden	Heinz Tomato ketchup 0% sugar/salt	X
<b>Level of sugar (per 100 grams)</b>	3.1 g	4.4 g	X

Table 3: Overview product categories

### 3.2.2 Salience nudge

For this experiment, the online supermarket was manipulated with a salience nudge and a norm nudge. The salience nudge used was a traffic light label which transformed nutritional information into color-coded labels. Three different types of one product were presented on the product page. Each food option was linked to either a green, yellow, or red colour, which respectively indicated a healthy, neutral, and unhealthy. The colours were based on the study by Thorndike et al (2012). As mentioned earlier, people associate these colors with the practical meanings of a traffic light (Hieke & Wilczynski, 2012). And therefore, it is expected that these colors are most suitable for this experiment.

### 3.2.3 Descriptive norm

The second nudge used in this study was a descriptive norm nudge. The successfulness of a descriptive message strongly depended on how the message was framed and designed (Goldstein et al., 2008 & Schultz et al., 2007). The design of the descriptive norm used was based on previous studies and suggestions that proved to be effective (Goldstein et al., 2008; Cialdini et al., 2006, & Schultz et al., 2008). Verbal quantifiers with a positive polarity were used to present true descriptive norms about people's low-sugar food choices to motivate this particular behaviour. The message was framed in a positive way and used positive quantifiers because this drew one's attention towards the desired behaviour. Hence, the following descriptive norm was used: "Did you know that *more* than 67% of the

Dutch opt for less sugar? Try it yourself!’. This norm was translated to Dutch since only Dutch participants took part in this study.

Further, the norm had to be notable and therefore the norm was put into a speech bubble. The speech bubble was coloured orange, as orange was the colour that has proven to be most effective in drawing impulsive buyer’s attention and promote enthusiasm (Digital Synopsis, 2021). The design of this norm nudge was made with the tool Adobe Photoshop.

### 3.3 Participants

A total of 298 persons participated in this online field experiment. 57 of the 298 respondents did not fully complete the questionnaire, and therefore, were excluded from data analysis. Another five participants did not fill in an order number and could not be connected to the corresponding order in the online supermarket. Then, three participants had missing information regarding the food choices. Lastly, five participants did not finish the experiment at once, but completed it over a longer period of time. This may have influenced the effect of the nudges, and were removed from the dataset to prevent potential biases. As the online supermarket’s website was Dutch, only participants who mastered the Dutch language took part in this study.

Hence, a total of 228 participants completed this experiment, of which 103 male (45.2%) and 125 female (54.8%). All participants were randomly assigned to one of the four conditions to create homogeneous groups, without involving judgements or potential biases. Among these four conditions, no gender differences were found ( $\chi^2(3, N = 228) = 3.04, p = .39$ ). The participants ages ranged between 16 and 75 years old ( $M = 39.25, SD = 16.71$ ). No significant differences were found in the age distributions between the four conditions ( $F(3, 224) = 2.10, p = .10$ ). Further, the four condition groups did not differ in education level ( $\chi^2(3, N = 228) = 2.60, p = .46$ ). The demographics of the participant are visualized per condition in table 3.2. This means that the randomization checks did not show any significant demographic differences between the four conditions.

Then, an Anova test was performed to compare the means of health consciousness ( $M = 5.01, SD = 0.79$ ). The Anova test showed no significant differences ( $F(3, 224) = 1.64, p = .46$ ). Another Anova test compared the means of the attitude towards low-sugar products ( $M = 4.34, SD = 0.77$ ). The results showed no significant difference in attitude towards the low-sugar products among the four conditions ( $F(3, 224) = 2.43, p = .26$ ). Please refer to table 4 for an overview of the demographic information of the participants.

Table 4: Demographics of participants per condition

		Overall				Condition 1				Condition 2				Condition 3				Condition 4			
		N	%	M	SD	N	%	M	SD	N	%	M	SD	N	%	M	SD	N	%	M	SD
Gender	Male	103	45.2			27	45.8			20	36.4			24	45.3			32	52.5		
	Female	125	54.8			32	54.2			35	63.6			29	54.7			29	47.5		
Education	Low	84	36.8			22	37.3			19	34.5			24	45.3			19	31.1		
	High	144	63.2			37	62.7			36	65.5			29	54.7			42	68.9		
Age				39.3	16.7			41.2	16.8			42.4	18.4			38.4	15.8			35.3	15.4
Health C.				5	0.8			4.9	0.8			5.0	0.7			4.9	0.7			5.1	0.9
	Low	107	46.9			30	50.8			26	47.3			27	50.9			24	39.3		
	High	121	53.1			29	49.2			29	52.7			26	49.1			37	60.7		
Attitude				4.3	0.7			4.4	0.7			4.4	0.8			4.1	0.7			4.4	0.9
	Low	113	49.6			26	44.1			20	36.4			33	62.3			34	55.7		
	High	115	50.4			33	55.9			35	63.6			20	37.7			27	44.3		
Total		228	100			59	100			55	100			53	100			61	100		

Note: The proportions of gender ( $\chi^2(3, N = 228) = 3.04, p = .39$ ), educational level ( $\chi^2(3, N = 228) = 2.60, p = .46$ ), and age ( $F(3, 224) = 2.10, p = .10$ ) did not significantly differ among the four conditions.

M – Mean, SD – Standard Deviation

Health C= Health consciousness, and Attitude = Attitude towards low-sugar

The various educational levels were divided into a low- and high educational level. The low educated group included participants that graduated up to and including a lower general secondary education. The high educated group included every participant with a higher general secondary education up until a PhD.

### 3.4 Manipulation checks

Two manipulation checks were conducted in this study. These manipulation checks measured if the traffic light nudge and speech bubble were noticed by the participants. The participants had to rate for both items how sure they were that they had seen the nudge on a 5-point semantic differential scale (1 = Very unsure, 5 = Very sure). An independent sample t-test showed a significant difference between the presence of a TLL nudge ( $M = 4.07, SD = 1.30$ ) and the absence of a TLL nudge ( $M = 1.92, SD = 1.06$ ), with  $t(226) = -13.63, p < 0.001$ . Thus, the participants noticed the presence and absence of the TLL nudge.

Second, an independent sample t-test showed a significant difference between the presence of a descriptive norm ( $M = 3.79, SD = 1.41$ ) and the absence of a descriptive norm ( $M = 2.22, SD = 1.30$ ), with  $t(226) = -8.76, p < 0.001$ . This indicates that the participants marked the presence and absence of the descriptive norm. Therefore, these results suggested that the manipulation checks were successful.

### **3.5 Construct validity and reliability**

Prior to conducting a factor analysis to determine the validity of the measurement scales, a Kaiser-Meyer-Olkin Measure of Sampling Adequacy and a Bartlett's test of sphericity were conducted. The KMO is a statistic that points out the proportion of variance in the variables that might be caused by underlying factors. The results of the overall sampling adequacy were sufficient (KMO = .842). With regard to the sampling adequacy of the individual variables, the anti-image correlation matrix yielded meritorious KMO scores ranging from .675 up until .927. The Bartlett's Test of Sphericity provided significant results ( $X^2(105) = 1493.65$ ,  $p < 0.001$ ), which indicates that the variables are related and therefore suitable for structure detection (Dziuban & Shirkey, 1974; Kaiser & Rice, 1974).

To test whether items loaded the right constructs, a factor analysis with a varimax rotation was performed on 15 items. As different measurement scales were merged into two new scales for the variable's health consciousness and attitude towards low-sugar products, the fixed factors in the factor analysis were set on a maximum of two. These two components explained a total of 56.27% of the variance. The Rotated Component Matrix indicated that two items were cross loaded, as they both loaded into each construct. Because both items did not differ more than 0.2 between each construct, the items were removed from the dataset. Then, two items of the component 'Attitude towards low-sugar products' loaded into the component 'Health consciousness'. For this reason, these two items were removed from the dataset as well. To measure the construct's reliability, the Cronbach's Alpha was used to examine the internal consistency within the aforementioned constructs. Refer to table 5 for the factor analysis.

Table 5 Factor analysis (varimax rotation) and Cronbach's Alpha

Construct	$\alpha$	Item	Components	
			1	2
Health Consciousness	.85	I am interested in information about my health	.79	
		I think about my health everyday	.78	
		I am alert to changes in my health	.76	
		I pay attention to the inner feelings I have about my health	.75	
		I am generally aware of my health	.72	
		I take responsibility for my health	.66	
		I think that low-sugar products are unpleasant*	.57	
		It is important to me that my products contain a low amount of sugar**	**	**
		I have negative feelings towards low-sugar products*	.49	
		I am more concerned about my health than the average person	.49	
Attitude low-sugar	.71	I think that low-sugar products are healthier than regular products	.78	
		I think that low-sugar products are good for my health	.76	
		I think that low-sugar products are favourable for my health	.76	
		I am very particular about the amount of sugar in my food**	**	**
		By eating light products, one can eat more without consuming too many calories	.49	

Note: items marked with asterisk symbol(s) deleted from scale.

\*Loaded into wrong component

\*\*Cross loaded items

### 3.6 Measures

In this study, the constructs food choice, attitude towards low-sugar products, and health consciousness were measured. The first dependent measure in this study was the consumer's food choice. As only five out of the 10 products were presented with a salience or norm nudge, the food choice was measured for five items. The following five products were presented with a nudge: gingerbread, apple sauce, tomato ketchup, ice tea, and peanut butter. All items were picked from a different category to improve the reliability of this study. Participants could choose between a low-sugar, regular, or a sugar-rich product. All items were measured separately and the mean of all five items combined represented one's overall food choice. As this study had four conditions with 'health consciousness' as an additional moderator (2x2 design + low/high), food choice was measured for eight constructs. A manipulation check was built in to see whether the nudge was noticed by the participants. The second dependent measure was "attitude towards low-sugar products". All items used to measure this construct were derived from validated scales used in previous studies and were measured on a seven-point Likert scale ranging from "strongly disagree" to "strongly agree"

(Krystallis et al., 2003; Roininen et al., 2001; Michaelidou & Hassan, 2008, and Rifon et al, 2004).

7 Items from the existing scales have been combined and merged into a new measurement scale. Cronbach's alphas from the aforementioned studies were ranging from 0.70 to a high of 0.97. Health consciousness was measured by a scale consisting out of 8 items. The items were based on previous studies with validated scales regarding health-consciousness (Jayanti and Burns, 1998; Gould, 1988, and Michaelidou and Hassan, 2008). Items from the studies above were combined, and a new measurement scale emerged. All items were measured on a 7-point Likert scale, ranging from "*strongly disagree*" to "*strongly agree*". Cronbach's alpha was ranging from a low of 0.71 to a high of 0.92, which reflected an acceptable internal consistency.

### **3.7 Usability testing**

A usability test was conducted to test the website's user-friendliness, and to measure the visibility of the descriptive norm and TLL nudge. A concurrent think-aloud protocol (CTA) method was used in addition to evaluate the usability of the website, which required the participants to verbalize their actions and train of thought while performing predefined tasks. A CTA method significantly detects more problems by means of observation only when compared to a retrospective think-aloud protocol (RTA). Results of a previous study indicate that a CTA is more representative of a strictly task-oriented usability test (van den Haak, M. et al 2010). In addition to this, an eye tracking experiment was conducted to measure the participant's visual attention and cognitive engagement. Tobii Pro Glasses 2 was the tool used for this eye-tracking experiment. These Tobii Pro Glasses 2 allowed the researchers to collect unmoderated attention data in order to observe the participant's viewing behaviour from a first-person perspective.

Combining a CTA protocol with eye-tracking observations were proven to be effective in an earlier study (Elling et al. 2012). During the CTA protocols, the participants formulated doubts and judgements on the website, and expressed their emotions (e.g. frustration). This provided a substantial contribution regarding the observable user problems. Additionally, an eye-tracking experiment was conducted to make observations about user's processes and obstacles during silences. This also provided insight in the visibility of the descriptive norm and TLL nudge. All participants in the usability test had to complete four separate tasks (appendix I). The tasks were constructed in such a way that all different conditions were tested.



The usability tests were performed in a Flexperiment room in the BMS lab at the University of Twente. This Flexperiment room provided a consistent laboratory environment for the usability tests. The participants took place in the Flexperiment room while the researcher could observe them on camera from the control room.

Participants usability tests	Age	Gender	Education
Respondent 1	24	Male	WO Master
Respondent 2	22	Male	HBO Bachelor
Respondent 3	21	Male	HBO Bachelor
Respondent 4	24	Female	WO Master
Respondent 5	25	Male	HBO Bachelor
Respondent 6	24	Male	HBO Bachelor

Table 6: Participants usability test

After finishing the usability tests, the eye-tracking data was converted into heatmaps and analysed with the Tobii Pro Lab software. The heatmaps used in this study visualize the relative count or relative duration. The relative count heatmap is calculated by the number of fixations relative to the total number of fixations made by the participants in the time of interest. The relative duration heatmap is calculated by the duration of the fixations relative to the sum of all fixation durations mapped in the time of interest on the snapshot. A task in the second condition was to buy a bottle of Heinz tomato ketchup, the participants were free to choose which type of ketchup they wanted to purchase (e.g. normal vs sugar-free).

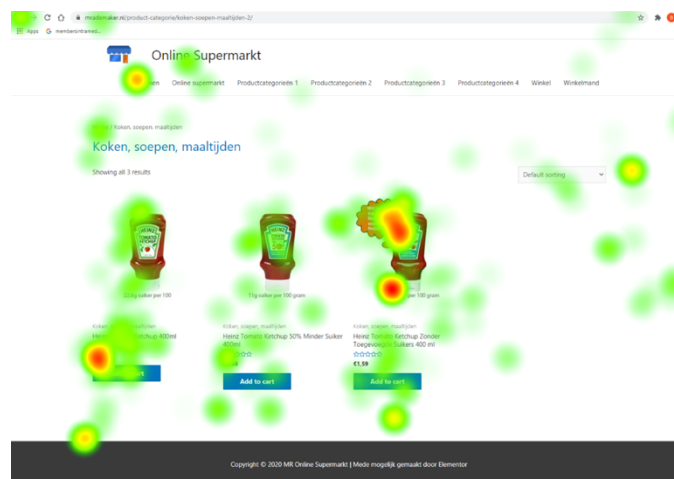


Figure 2: Heatmap ketchup relative duration

The heatmap of figure 2 showed a red area around the speech bubble, which meant that the participants looked relatively long at this specific point when compared to other areas. This result indicated that the nudge was noticed and read by the participants. Additionally, when respondent 1 was presented with a TLL nudge, the respondent said: “I have noticed something on the product page of the applesauce. Highest in level of sugar. I do not want that”, which confirmed the indicated results from this particular heatmap. Then, the participants had to continue to the third condition at the website to fulfil another task. In the third condition, both a descriptive norm as a TLL nudge were presented. Participants were asked to purchase a bottle of Lipton ice tea, and again, were free in their choice about the product type.

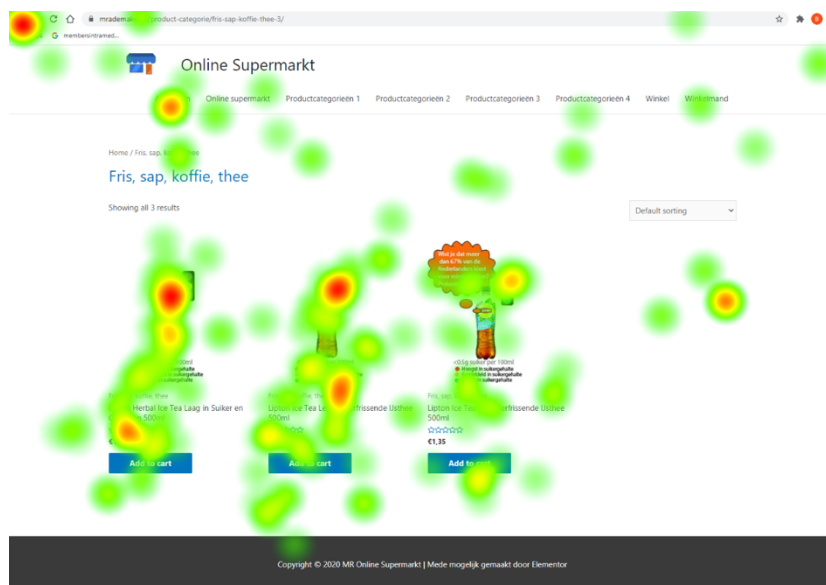


Figure 3: Heatmap ice tea relative count

For this task, a relative count heatmap is used instead of a relative duration heatmap to visualize the red areas around the TLL nudge. Since the TLL nudge only has to be shortly noticed to influence one’s decision-making, it is more relevant to measure if the participants noticed the nudge than to measure the relative time a participant looked at the TLL nudge. As opposed to the descriptive norm, which had to be fully read by the participants. Hence, they spent relatively more timing looking at this nudge. This explained the fact that the visual attention for the descriptive norm was lower for a heatmap that measured the relative count, but higher for a heatmap that measured the relative duration. All heatmaps are included in appendix II.

## 4. Results

In this section, all findings from the performed statistical analyses will be described. At first, a Multivariate Analysis of Variance (MANOVA) was employed to measure the effects of the independent variables on the dependent variables. Refer to table 7 to see the results of the MANOVA analysis. When diving into the MANOVA analysis, the results presented no significant main effect of the TLL nudge on food choice. In addition to this, the second main effect – a descriptive norm nudge on food choice, did not reveal any significant differences either. However, the Wilks' Lambda test did reveal a significant interaction effect between the two independent variables on food choice (TLL \* Descriptive norm). Furthermore, a moderating effect between health consciousness and food choice was measured, and no significant effects occurred for this test. Then, the main effects of the independent variables on the attitude towards low-sugar products was measured. With regard to the TLL nudge and descriptive norm nudge, no significant main effects were found considering attitude towards low-sugar products. Yet, a significant moderating effect occurred for health consciousness \* attitude towards low-sugar products.

As no main effects occurred, and only an interaction and moderating effect came to light, various Univariate Analyses of Variance (ANOVA) were employed to examine significant difference between the individual cases. Just as for the MANOVA results, refer to table 7 to see the ANOVA results.

*Table 7. Results of Multivariate Analysis of Variance and Univariate Analysis of Variance*

	MANOVA				ANOVA											
	Wilk's Lambda	df	F	p	GB		AS		TK		IT		PB		ATT	
					F	p	F	p	F	p	F	p	F	p	F	p
<b>Traffic Light Label (TLL)</b>	.985	6	.52	.791	1.47	.227	.77	.381	1.11	.294	1.52	.219	1.64	.202	.05	.824
<b>Descriptive Norm (DN)</b>	.959	6	1.44	.203	1.61	.207	.46	.497	0.06	.808	.05	.829	.10	.752	3.57	.060
<b>TLL * DN</b>	.911	6	3.27	.004*	.91	.341	.89	.347	3.19	.076	13.79	<.001*	2.01	.158	4.15	.043*

*Note:*

MANOVA = Multivariate analysis of variance - ANOVA = Univariate analysis of variance.

GB - Gingerbread, AS - Apple sauce, TK - Tomato ketchup, IT - Ice tea, PB - Peanut butter

ATT - Attitude towards low-sugar products.

\* Significance

## 4.1 Results main effects

### 4.1.1. Traffic Light Label

The main effects of a traffic light label nudge on the dependent variables (food choice and attitude towards low-sugar products) were first measured through a Multivariate Analysis of Variance. The MANOVA test revealed no significant effect of the TLL nudge on food choice, with  $\Lambda = .985$ ,  $F(6, 202) = .52$ ,  $p = .791$ . To follow up on the MANOVA, a Univariate Analysis of Variance was performed to measure the effects on the individual cases. As well as the MANOVA, the ANOVA did not present any significant main effects for the different types of products or attitude towards low-sugar products. Based on these results, the hypotheses H1a and H1b are rejected. An overview of the observed means and standard deviations for the dependent variables are visualized in table 8.

*Table 8. Means and Standard Deviations for main effects of TLL nudge*

	Traffic Light Label (N=56)	
	Mean	SD
Gingerbread	1.82	.72
Apple sauce	2.13	.88
Tomato ketchup	2.29	.85
Ice tea	1.82	.90
Peanut butter	2.21	.80
Attitude	4.42	.75

*Note:*

Attitude - Attitude towards low-sugar products

### 4.1.2. Descriptive norm

As well as for the traffic light label nudge, a MANOVA was employed to test the main effects of the descriptive norm nudge on the dependent variables. Also, this MANOVA showed no significant main effects, with  $\Lambda = .959$ ,  $F(6, 202) = 1.44$ ,  $p = .203$ . An ANOVA test was then carried out to measure main effects on an individual basis. Again, no significant effects were discovered. Therefore, hypotheses H2a and H2b were both rejected. The observed values of the means and standard deviations were illustrated in table 9.

*Table 9. Means and Standard Deviations for main effects of Descriptive Norm nudge*

	Descriptive Norm (N=50)	
	Mean	SD
Gingerbread	1.82	.66
Apple sauce	2.14	.97
Tomato ketchup	2.38	.83
Ice tea	2.0	.90
Peanut butter	2.32	.87
Attitude	4.19	.99

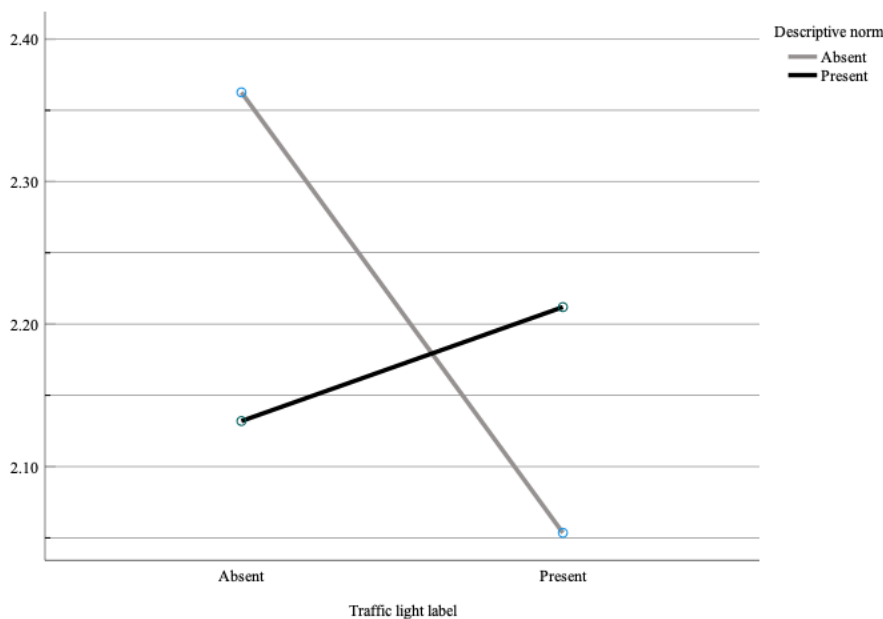
*Note:*

Attitude - Attitude towards low-sugar products

## 4.2 Interaction effect: Traffic Light Label \* Descriptive Norm

As opposed to the separate main effects, a significant interaction effect between the traffic light label and descriptive norm nudge was found. At first, a MANOVA was performed which showed a significant difference with a value of  $\Lambda = .911$ ,  $F(6, 202) = 3.27$ ,  $p = .004$ . Figure 4 shows the interaction effect between the presence of a traffic light label nudge and a descriptive norm nudge on one's food choice.

Figure 4. Interaction effect TLL \* Descriptive norm on food choice



Note:

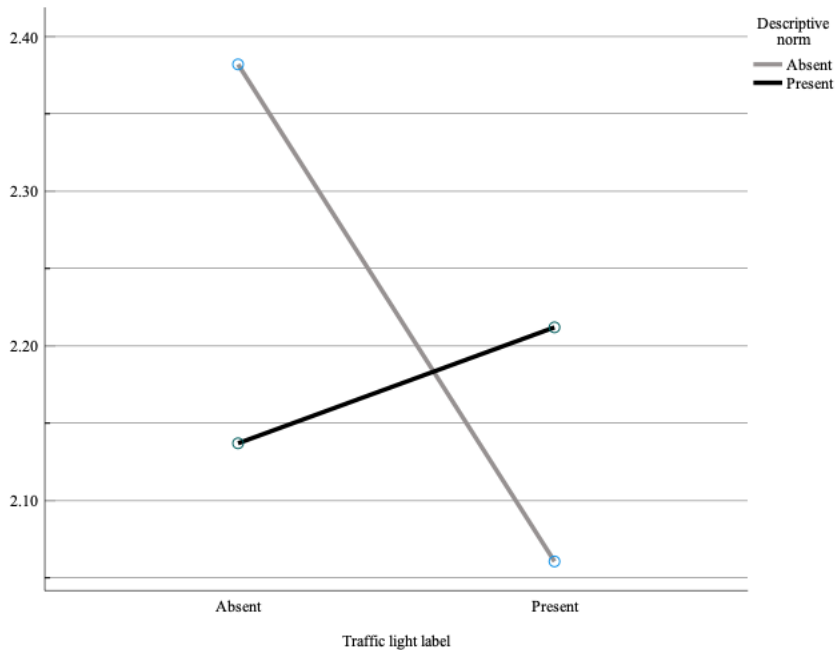
Scale means food choice (1-3): 1 – low-sugar products,

2 – average in sugar, 3 – sugar-rich products.

Figure 4 illustrates a cross-over interaction effect between both nudges on the mean food choice. When the TLL nudge and descriptive norm nudge are both absent, the participants more often chose products that contained a higher level of sugar ( $M = 2.36$ ,  $SD = .46$ ). On the other hand, participants chose more products containing a low level of sugar when presented with both nudges ( $M = 2.21$ ,  $SD = .55$ ). Thereby, it shows that the TLL nudge positively influences one's food choice, depending on the degree of absence of the descriptive norm nudge. Also, the descriptive norm nudge negatively influences one's food choice in the absence of the TLL nudge.

In elaboration to this, an ANOVA was conducted to measure the interaction effects on the different product types and attitude towards low-sugar products. The ANOVA pointed out a significant effect for the following product type; ice tea, with  $\Lambda = 10.40$ ,  $F(1, 207) = 13.79$ ,  $p = <.001$ . Refer to figure 5 for the interaction effect of ice tea on food choice.

Figure 5. Interaction effect TLL \* Descriptive norm on type of ice tea



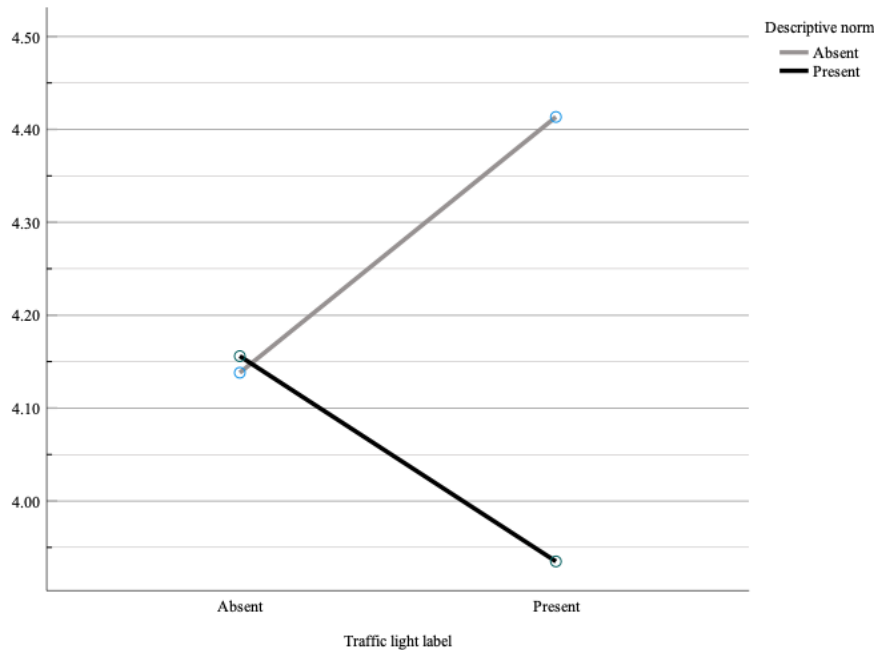
Note:

Scale means food choice (1-3): 1 – low-sugar products,  
2 – average in sugar, 3 – sugar-rich products.

As visualized in figure 5, the plot shows that there is a cross-over interaction effect. The participants most often chose the type of ice tea that was highest in sugar when the TLL nudge, as well as the descriptive norm nudge, were absent. The results of the plot show that a TLL nudge positively affects one's food choice, depending on the absence of the descriptive norm nudge. At the same time, the descriptive norm nudge positively influences one's food choice, depending on the absence of the TLL nudge.

Additionally, another ANOVA was performed and found a significant interaction effect on the attitude towards low-sugar products, with  $\Lambda = 3.249$ ,  $F(1, 207) = 4.15$ ,  $p = .043$ . Figure 6 visualizes the plot of this interaction effect.

Figure 6. Interaction effect TLL \* Descriptive norm on attitude towards low-sugar products



Note:

Scale means food choice (1-3): 1 – low-sugar products,  
2 – average in sugar, 3 – sugar-rich products.

The results show that the TLL nudge positively influences one's attitude towards low sugar, depending on the absence of a descriptive norm nudge. Secondly, a descriptive norm nudge negatively influences the food choice in the presence of a TLL nudge. Based on the above results, the hypotheses h3a and h3b are both supported. The descriptive values of the observed means and standard deviations can be found in table 10.

Table 10. Means and Standard Deviations for interaction effects TLL \* Descriptive norm

	Descriptive Norm (N=50)	
	Mean	SD
Gingerbread	1.8	.70
Apple sauce	2.16	.84
Tomato ketchup	2.46	.79
Ice tea	2.3	.86
Peanut butter	2.34	.75
Attitude	3.94	.80

Note:

Attitude - Attitude towards low-sugar products

### 4.3 Moderating effect of health consciousness

To measure the moderating effects of health consciousness on the dependent variables, a MANOVA and regression analysis were conducted. To begin with, the MANOVA did not reveal a significant moderating effect of health consciousness on the relationship between the Traffic Light Label \* food choice, with  $\Lambda = .911$ ,  $F(6, 202) = 1.36$ ,  $p = .231$ . Also, no significant moderating effects were found between the descriptive norm \* food choice with the value  $\Lambda = .983$ ,  $F(6, 202) = .5$ ,  $p = .738$ . In elaboration to this, an ANOVA was employed to investigate potential moderating effects for the separate product types and attitude towards low-sugar. However, no significant moderating effects were found. However, the MANOVA did reveal a significant main effect of health consciousness on the dependent variables, with  $\Lambda = .908$ ,  $F(6, 202) = 3.40$ ,  $p = .003$ . An ANOVA was employed in continuance of the MANOVA results, and showed a significant effect of health consciousness on the following food choice; tomato ketchup, with  $\Lambda = 5.372$ ,  $F(1, 207) = 8.75$ ,  $p = .003$ . Furthermore, the ANOVA results showed a significant effect of health consciousness on attitude towards low-sugar products, with  $\Lambda = 9.041$ ,  $F(1, 207) = 11.54$ ,  $p = <.001$ .

In addition to the aforementioned tests, a moderation analysis was conducted using the PROCESS macro extension (version 3.5.3) written by Andrew F. Hayes (nd). As stated in the research model, it was hypothesized that health consciousness had a moderating effect on the relationships between the TLL nudge and descriptive norm nudge on food choice, TLL nudge and descriptive norm nudge on the attitude towards low-sugar products. Before employing the moderator analysis, the mean values of the continuous variables were centered. The moderation analysis did not point out a statistically significant moderating effect between health consciousness and the TLL nudge on food choice ( $b = -.082$ , 95% CI  $[-.266, .102]$ ,  $t = -.88$ ,  $p = .38$ ), and attitude towards low-sugar products ( $b = -.135$ , 95% CI  $[-.430, .159]$ ,  $t = -.90$ ,  $p = .37$ ). Furthermore, no statistically significant moderating effects were found between health consciousness and the descriptive norm nudge on food choice ( $b = .099$ , 95% CI  $[-.089, .287]$ ,  $t = 1.04$ ,  $p = .30$ ), and attitude towards low-sugar products ( $b = .125$ , 95% CI  $[-.171, .422]$ ,  $t = .83$ ,  $p = .41$ ). Therefore, the hypotheses h4a, h4b, h5a, and h5b were all rejected.



## 4.4 Overview hypotheses

Based on the results of the statistical analyses described in the previous section, an overview of the tested hypotheses is presented in table 11.

Hypotheses		Result
H1a	A salience nudge in a digital choice environment will positively influence the healthiness of one's food choice as opposed to a digital choice environment where no salience nudge is presented.	Rejected
H1b	A salience nudge in a digital choice environment will positively influence the attitude towards low-sugar products as opposed to a digital choice environment where no salience nudge is presented.	Rejected
H2a	A descriptive norm in a digital choice environment will positively influence the healthiness of one's food choice as opposed to a digital choice environment where no descriptive norm nudge is presented.	Rejected
H2b	A descriptive norm in a digital choice environment will positively influence the attitude towards low-sugar products as opposed to a digital choice environment where no descriptive norm nudge is presented.	Rejected
H3a	When both nudges work simultaneously this will have a greater effect on the healthiness of one's food choice as opposed to no or one of the conditions.	Supported
H3b	When both nudges work simultaneously this will have a greater effect on the attitude towards low-sugar products as opposed to no or one of the conditions.	Supported
H4a	When one with a high level of consciousness is presented with a salience nudge it is expected to have a greater effect on the healthiness of one's food choice as opposed to one's with a low level of health consciousness.	Rejected
H4b	When one with a high level of consciousness is presented with a salience nudge it is expected to have a greater effect on the attitude towards low-sugar as opposed to one's with a low level of health consciousness.	Rejected
H5a	When one with a high level of consciousness is presented with a descriptive norm it is expected to have a greater effect on the healthiness of one's food choice low-sugar products as opposed to one's with a low level of health consciousness.	Rejected
H5b	When one with a high level of consciousness is presented with a descriptive norm it is expected to have a greater effect on the attitude towards low-sugar products as opposed to one's with a low level of health consciousness.	Rejected

Table 11. Overview of tested hypotheses

## **5. Discussion**

The main purpose of this study was to investigate the possible effects of a salience and descriptive norm nudge on one's food choice and attitude towards low-sugar products. The study took health consciousness into account as a moderator variable to see whether there were moderating effects by the level of health consciousness.

### **5.1.1 Discussion of main effects**

This study sought to examine whether the use of a salience nudge would drive individuals to make a food choice containing a lower amount of sugar and positively influence one's attitude towards low-sugar products. The results of a study by Thorndike et al (2012) indicated that a color-coded labelling (TLL) nudge increased the number of healthy products bought and decreased the sales of unhealthy products. Also, due to its simplicity, Olstad et al (2015) suggested that a traffic light label nudge would be effective in motivating healthier food choices. Based on these studies, it was expected that consumers would more often choose low-sugar products and have a more positive attitude towards low-sugar products when a product was provided with a TLL nudge. A major strength of this study is that an eye-tracking experiment was conducted with a concurrent think-aloud protocol to measure the visibility of the TLL nudge and the corresponding cognitive engagement. As traffic light labels are often misinterpreted or not understood, the usability tests indicated that the traffic light label used in this study was designed properly.

However, the results of the experiment showed no differences in the food choices or attitude towards low-sugar products compared to one's who were not presented with the salience nudge. There are several reasons that could be attributed to this inconsistency of research results. To start with, the study by Thorndike et al (2012) measured the long-term effectiveness of food labelling by gathering data over a period of 2 years, while this study measured immediate impact of a TLL nudge. Previous studies towards the short-term effectiveness of traffic light labelling provided mixed results regarding evaluative labelling in the U.S. (Roberto et al, 2010). Sacks et al (2011) suggested that consumers take longer time to adjust their eating habits and that the impact of food labels is greater over a longer period of time. As these studies were observational studies with a cross-sectional design and subject to confounding, the food industry argues that there is scientific uncertainty regarding the short-term effectiveness of labeling policies (Ludwig & Brownell, 2009).

Sacks et al (2009) suggested that consumers take longer time to adjust their eating habits and that the impact of food labels is greater over a longer period of time.

Another explanation may be found in a similar study by Roberto et al (2012). This research noted that it was a limitation when only a small set of products was examined, although a wide range of product types were tested. In addition, participants only made decisions between three products and assessed these individual products, whereas a “real world” shopping environment offers more products and requires different decision-making (Roberto et al, 2012). On that account, it can be argued that traffic light labels have a greater effect when all products were labelled in like manner, allowing consumers to easily compare the provided information across different products (Sacks et al, 2009).

An earlier study concluded that descriptive norms can effectively influence one’s food choice and attitude by providing information about the eating habits of others (Robinson et al, 2014). This was supported by a study of Stok and his colleagues (2014) who found that a descriptive norm message could positively influence adolescent’s fruit consumption. Based upon these studies, it was expected that a descriptive norm nudge would positively influence one’s food choice and attitude towards low-sugar products. In order to counter potential negative effects, the descriptive norm was only presented to the ones that were supposed to be influenced (Schultz et al, 2007). Second, the descriptive norm was framed positively and verbal quantifiers with a positive polarity were used to construct an effective message (Goldstein et al, 2008 & Schultz et al, 2008).

Yet, contrary results were found which did not correspond with the existing theories. To date, descriptive norm nudges have primarily been conducted in offline environments in the context of energy conservation, transportation, recycling, and health behaviour while this study was conducted in an online environment (Kormos, Gifford, & Brown, 2015). As Huyghe et al (2016) stated, product presentations differ in-essence offline versus online which might have a fundamental impact on purchase behaviour. The way in which the digital choice environment is designed could influence one’s choices. According to Weinmann et al (2016), it could be an explanation that the digital choice environment was not organized in an effective way and did not properly present its workflows (e.g. descriptive norm). Further, it was assumed that descriptive norms would have a greater effect on behaviour, whereas injunctive norms would have a greater effect on attitude (Melnik et al., 2010). The participants in this study were presented with a descriptive norm, and not with an injunctive

norm. This could explain why the norm nudge did not have an effect on one's attitude towards low-sugar products.

Elaborating on a research by Wilson (2016) who suggested that two complementary nudges can positively influence one's food choice, this study examined whether a salience nudge combined with a descriptive norm would positively influence one's food choice. A combined nudging intervention may also elicit a strong emotional response regarding healthfulness (Cadario and Chandon, 2020; Wilson, 2016). For this reason, it was also expected to have a positive influence on one's attitude towards low-sugar products. In accordance with these theories, the results confirmed the effectiveness of two complementary nudges. With regard to the implemented nudges, Bonini and Hadjichristidis (2018) suggested that two complementary nudges might also shed a light on the underlying processes, which is also the case for this study. The results illustrated that the effectiveness of a TLL nudge and a descriptive norm nudge depend on the degree of absence of the other.

#### **5.1.2 Moderating role of health consciousness**

Previous research (Bower et al, 2003) suggested that highly health-conscious consumers with a higher level of health concern and more nutrition knowledge are more likely to choose organic products. On top of that, consumers with a higher level of health consciousness have a greater tendency to use nutrition labels (Drichoutis et al, 2006). Hence, it was expected that it would have a greater effect when one with a high level of health consciousness was presented with a descriptive norm or a salience nudge compared to one with a lower level of health consciousness. However, no significant moderating effects were found after analysis of the gathered data. This could be attributed to the fact that light products are potentially artificially sweetened, and therefore, may be seen as "unnatural" by highly health-conscious consumers (Roininen et al, 2001). This contradicts the theory of Bower and fellow researchers (2003) and could explain why health consciousness did not show any moderating effects. The additional analysis that was conducted to measure potential demographic moderating effects did not show any significant results.

## **5.2 Implications**

### **5.2.1 Practical implications**

Using nudges as a tool to tackle non-communicable diseases that are related with an unhealthy food pattern may be a convenient approach. Current research suggests people make healthier food choices when nudged in the right direction. The food industry could use these results to reduce the sugar consumption. For instance, online supermarkets can implement both nudges relatively simple and cost effectively. This could also be applied by online restaurants or cafeterias to increase the number of healthy food sales, which often have higher profit margins than the less healthy products. While driving them towards products that contain less sugar, it contributes to creating a more positive attitude towards low-sugar products in general. Yet, the results suggest that it is only effective when the nudges are presented simultaneously. By all means, all possible ethical concerns should be taken into consideration before implementing a combination of these nudges. People should maintain their autonomy without being presented with non-factual information or getting exposed to any harm (Blumenthal-Barby & Burroughs, 2012).

### **5.2.2. Theoretical implications**

Current research adds to existing research on the field of online nudging towards healthier food choices and an affecting one's attitude, if used in the correct manner. This study provides evidence that when a salience nudge designed as a traffic light label is simultaneously presented with a descriptive norm nudge, this will positively influence one's food choice and attitude towards low-sugar products. However, when the nudges were presented separately, the results seemed to negate the main effects. Hence, this study did not provide any evidence that implementing a single nudge (i.e. salience or descriptive norm) has an effect on the healthiness of food choices nor attitude towards low-sugar products. Further, to shed a light on the underlying process, health consciousness was taken into account as a moderator variable. Although health consciousness had a direct influence on the healthiness of food choices or attitude, it did not show a moderating effect between the nudges and food choice or attitude.

Earlier studies showed that nudges were successfully employed in the field of healthy food behaviour, especially a salience and a descriptive norm nudge (Kormos et al, 2015; Wilson et al, 2016; Cadario and Chandon, 2020). However, all of these studies involved decision-making in an offline environment. To date, no studies were performed on the effects of these nudges in an online shopping environment.

This was the first study that implemented a traffic light label nudge and a descriptive norm nudge on the website of an online supermarket to stimulate healthier food behaviour and one's attitude towards low-sugar products while taking health consciousness into account. On that account, it adds to the field of research about the use of online nudges regarding healthier food behaviour. Results of this research could be used as a foundation or starting point for investigating effects of other nudges in an online shopping environment.

### **5.3 Limitations and recommendations for future research**

As with other studies, this study has its limitations. This section discusses the most important limitations and proposes several recommendations for future research. Firstly, all participants would conduct the experiment in an enclosed space to minimize the potential effects of external factors. Due to COVID-19 pandemic, it was no longer possible to use this enclosed space. The survey had to be distributed online and the external factors could no longer be controlled (e.g. slow computer or distracted by television). Additionally, all respondents were recruited through social connections of the researcher which might harm the generalizability of the results. Another limitation that may decrease the extent to which the results can be generalised is the difference in food purchasing behaviour in an online context versus a physical supermarket environment. In an online context, it is assumed that people have a higher tendency to purchase food products with which they are familiar, whereas they are more likely to browse more thoroughly in a physical supermarket (Sacks et al, 2011).

The second limitation is that this study did not conduct a pre-test to investigate which products were most suitable for this experiment. The mutual difference in tastiness between particular light-products and regular products might differ significantly, which could potentially have a negative effect on the validity of this research. Although Levine et al (2003) found that taste was one of the main drivers of making food choices and that sugar-rich products were associated with being tasty. Based on the study by Hence, Mai and Hoffmann (2015), it was suggested that health consciousness could counter the unhealthy = tasty intuition (UTI) and was therefore taken into account as a moderator variable. However, as the findings did not show any moderating effect, there is a possibility that the (un)tastiness of light-products affected the participant's food choices. This lack of main and moderating effects may have been tackled if a pre-test was performed. Therefore, future research could elaborate on this study by conducting an online experiment towards healthier food choices, while including the UTI as a construct instead of health consciousness.

Another major limitation of this study is that light products are assumed to be a healthier option, while a lot of scientific uncertainty exists about potential benefits and risks of artificial sweeteners that are often used to replace the added sugar (Chattopadhyay et al, 2014). This may have influenced the participant's decision-making, and therefore, it is suggested for future research to employ an online experiment using a salience and descriptive norm nudge while shifting the scope from sugar intake to other nutrition values that determine the healthiness of food products (e.g. fats or calories). Lastly, findings of a meta-analysis of field-experiments showed that behaviourally oriented nudges were effective in changing people's behaviour without affecting their feelings or knowledge. For example, pre-selecting the desired healthier food option as default was very effective for reducing calorie intake (Cadario and Chandon, 2020). Hence, it could be interesting to further examine the effects of a behaviourally oriented nudge (e.g. default option) combined with a cognitively (e.g. TLL) or affectively oriented nudge (e.g. descriptive norm).

#### **5.4 Conclusion**

This study sought to examine to what extent a salience or a descriptive norm nudge could positively influence the healthiness of one's food choice and attitude towards low-sugar products, and whether health consciousness had a moderating effect on this relationship. The most prominent finding was an interaction effect between both nudges. The number of low-sugar food choice increased and the attitude towards low-sugar products was positively affected when a salience nudge and descriptive norm were presented simultaneously. No main effects were found when the nudges were presented separately, and health consciousness did not show any moderating effects either. This lack of main effects contradicts with earlier research.

One of the primary explanations for this is that a salience nudge and descriptive norm nudge were never applied in an online supermarket to reduce one's sugar intake. Most of the studies regarding these nudges were conducted in an offline environment, and according to Huyghe et al (2016), online versus offline product presentations have a fundamentally different impact on purchase behaviour. To conclude, if online supermarkets or other online food shops want to stimulate the sales of low-sugar products and contribute to a more positive attitude towards low-sugar products in general, it is recommended to design and implement both nudges concurrently.

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Mark Rademaker,

Enschede, April 2021



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## Appendices

### Appendix I – Tasks usability tests

#### Welkom

Bedankt dat u de tijd wilt nemen om deel te nemen aan dit onderzoek.

Mijn naam Mark Rademaker en ik volg de Master ‘Communication Science’ aan de Universiteit Twente. Voor mijn Master thesis voer ik een experiment uit op de website van een fictieve online supermarkt. In dit experiment zult u verschillende taken uitvoeren om de functionaliteit en gebruiksvriendelijkheid van de website te testen.

#### Procedure

Voorafgaand aan het experiment wordt u ontvangen door de onderzoeker. De website wordt getest door middel van een eye-tracking experiment. U krijgt een speciale bril op (eye-tracking glasses), deze bril meet al uw oogbewegingen. Hierdoor is het inzichtelijk voor de onderzoeker waar u specifiek naar kijkt terwijl u de opgestelde taken uitvoert. Tijdens het uitvoeren van de taken is het de bedoeling dat u hardop denkt. Het is dus belangrijk dat u alles benoemt wat u ziet of ervaart (bijv. functie werkt niet naar behoren).

Het gaat in dit onderzoek om een **fictieve** online supermarkt en de producten hoeven dus **niet** daadwerkelijk betaald te worden. U ontvangt dus ook **geen** producten na het plaatsen van de bestelling. Onder alle deelnemers van dit onderzoek en het hoofdexperiment wordt een Bol.com cadeaubon verlost t.w.v. €20,-. Voor deelname aan dit onderzoek ontvangt u na afloop een klein presentje.

#### Taken experiment

##### Taak 1:

- Open de website: <https://mrademaker.nl>
- Klik op scenario 1
- U krijgt een overzicht met alle productcategorieën te zien. Voeg de volgende producten toe aan uw winkelmand:
  - Aardappelen Vrij vastkokend 3kg
  - Hak appelmoes (soort naar keuze)
  - Shampoo
- Controleer of alle producten aan de lijst zijn toegevoegd.
- Als alle producten zijn toegevoegd mag u uw bestelling afronden. Vul bij de voor- en achternaam de gegevens in die door de onderzoeker worden verstrekt.

*\*Uw e-mailadres dient alleen ingevuld te worden als u kans wilt maken op de Bol.com cadeaubon. Deze gegevens zijn alleen inzichtelijk voor de onderzoeker.\**

##### Taak 2:

- Ga naar de homepage van de Online Supermarkt.
- Klik op scenario 2
- U ziet wederom een overzicht met alle productcategorieën. Voeg het volgende product toe aan uw winkelmand:
  - Ola raketisjes

- Als u het product heeft toegevoegd aan de winkelmand mag u terug naar het overzicht met alle categorieën.
- Voeg nu het volgende product toe aan de winkelmand:
  - Heinz tomatenketchup (soort naar keuze)
- Ga door naar 'Afrekenen', voer de eerder verstrekte gegevens in en plaats uw bestelling.

### **Taak 3:**

- Ga naar de homepage van de Online Supermarkt
- Klik op scenario 3
- U ziet wederom een overzicht met alle productcategorieën. Voeg de volgende producten toe aan uw winkelmand:
  - Rundergehakt 500 gram
  - 2 x Lipton Ice Tea (soort naar keuze)
  - Pindakaas (soort naar keuze)
  - Komkommer
  - Toiletpapier
- Ga naar de winkelmand en voeg nog 2 maal een fles Lipton Ice Tea toe.
- Ga naar 'afrekenen', vul uw gegevens in en rond de bestelling af.

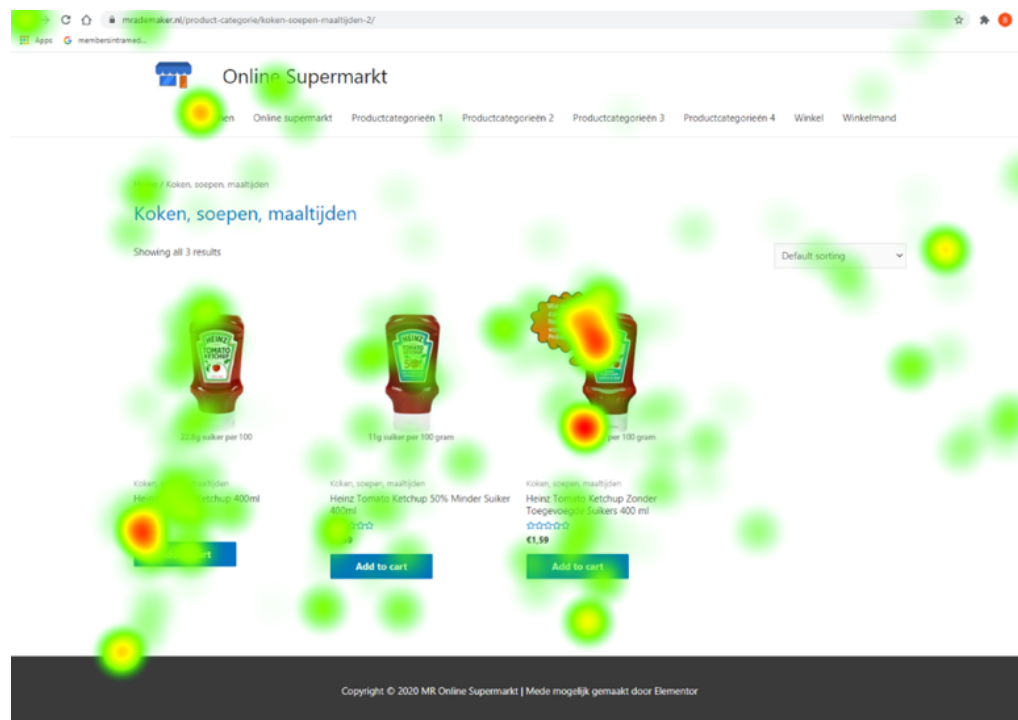
### **Taak 4:**

- Ga naar de homepage van de Online Supermarkt
- Klik op scenario 4
- U ziet wederom een overzicht met alle productcategorieën. Klik op de categorie 'Koek, gebak, snoep, chips'.
- Klik op het volgende product: Peijnenburg Ontbijtkoek Zero 5 repen.
- Lees de beschrijving en voeg het product toe aan de winkelmand.
- Ga nu terug naar de pagina met de alle productcategorieën. Voeg de volgende producten toe aan de winkelwagen:
  - Komkommer
  - Babydoekjes
  - Eieren
  - Grolsch Premium Pilsner (fles 24x)
- Ga naar de winkelmand en verwijder de babydoekjes uit de winkelmand.
- Ga door naar 'Afrekenen', vul uw gegevens in en rond uw bestelling af.

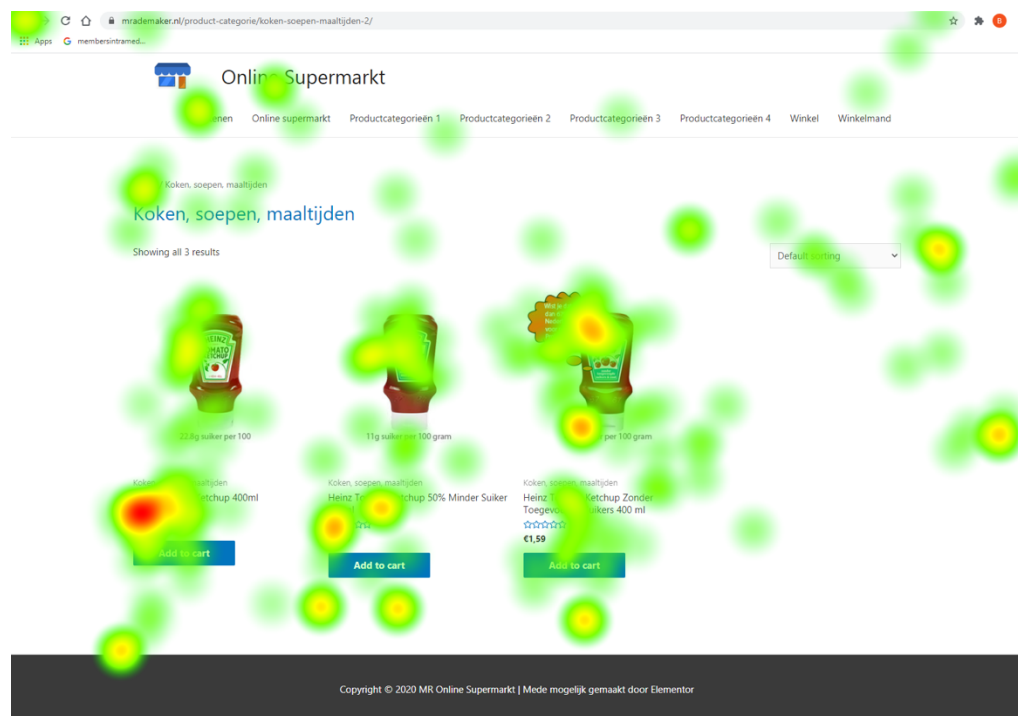
Bedankt voor uw deelname aan dit onderzoek!

Mark Rademaker

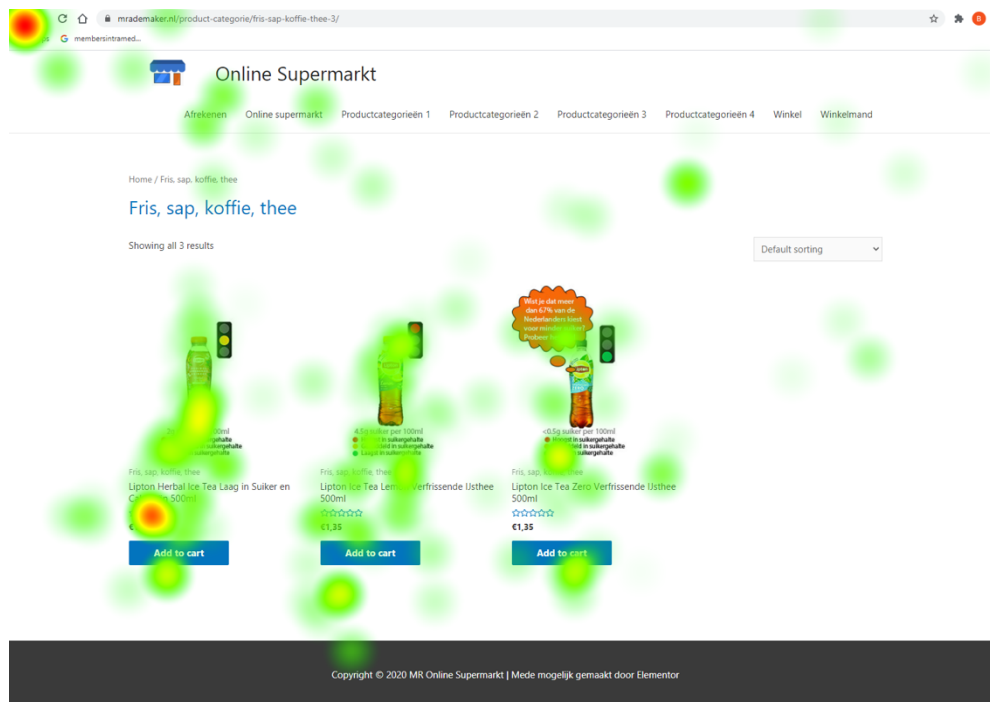
## Appendix II - Eye-tracking experiment



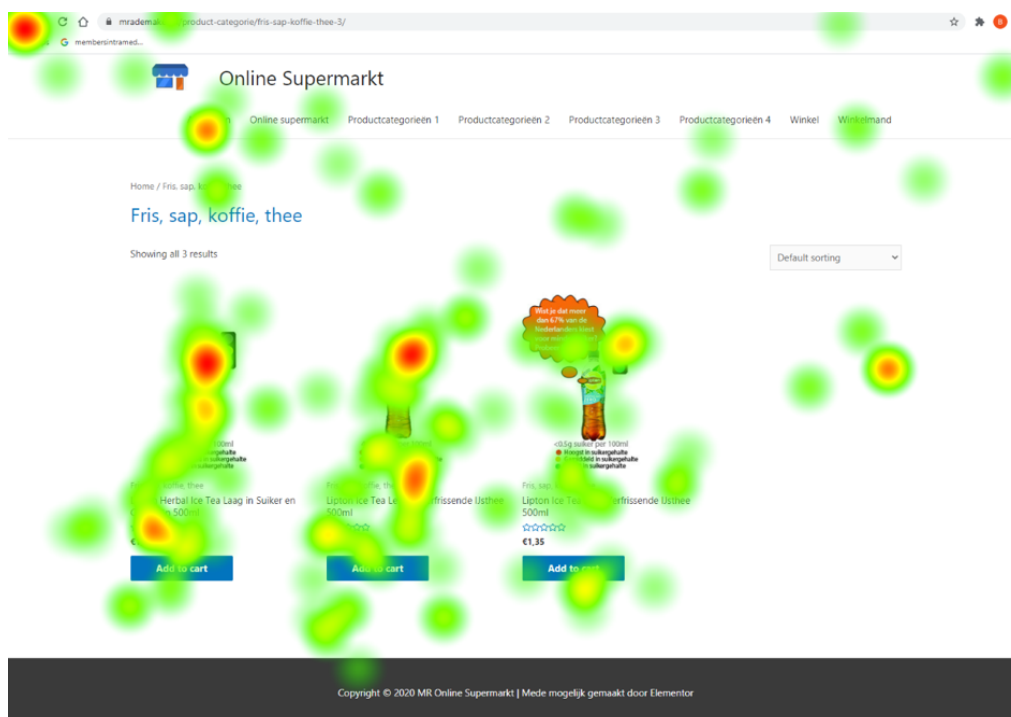
*Heatmap tomato ketchup – relative duration*



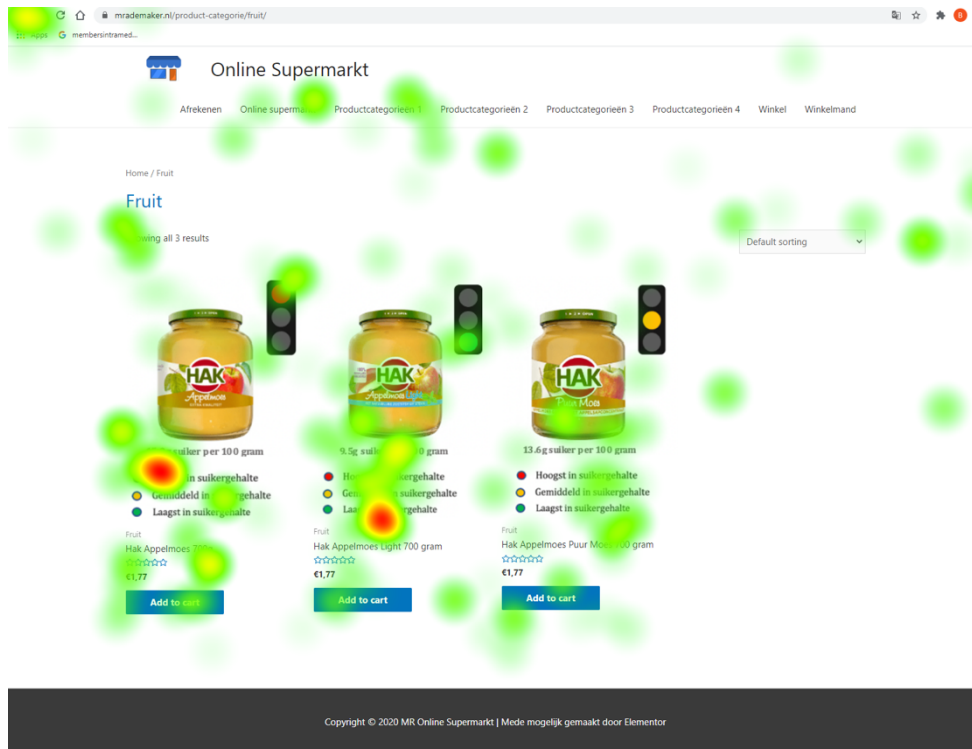
*Heatmap tomato ketchup – Relative count*



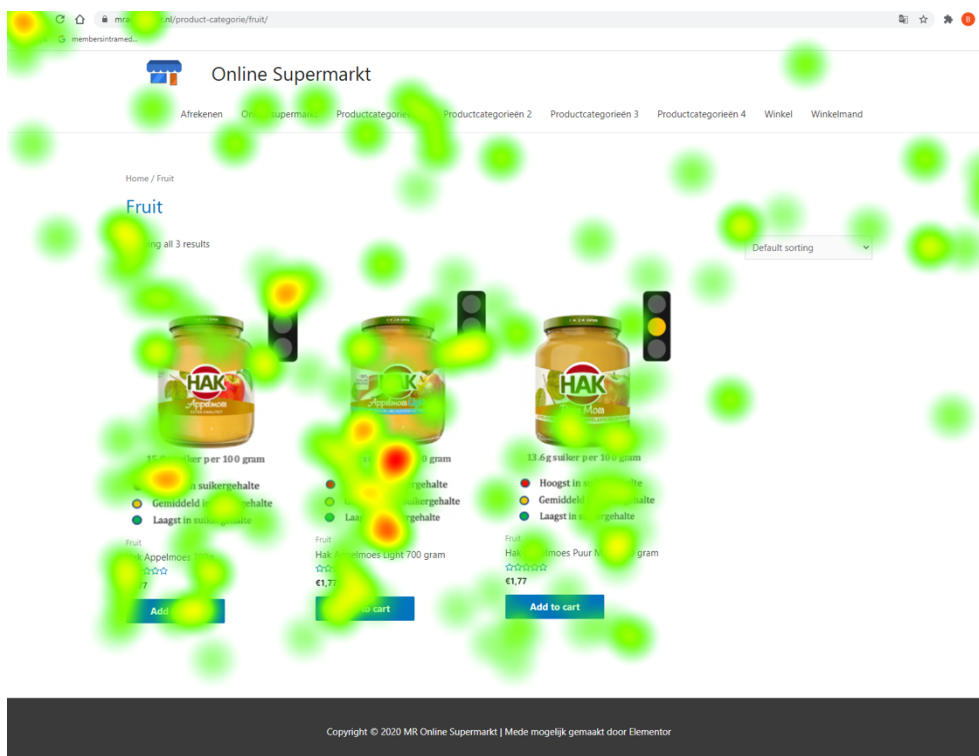
*Heatmap ice tea – Relative duration*



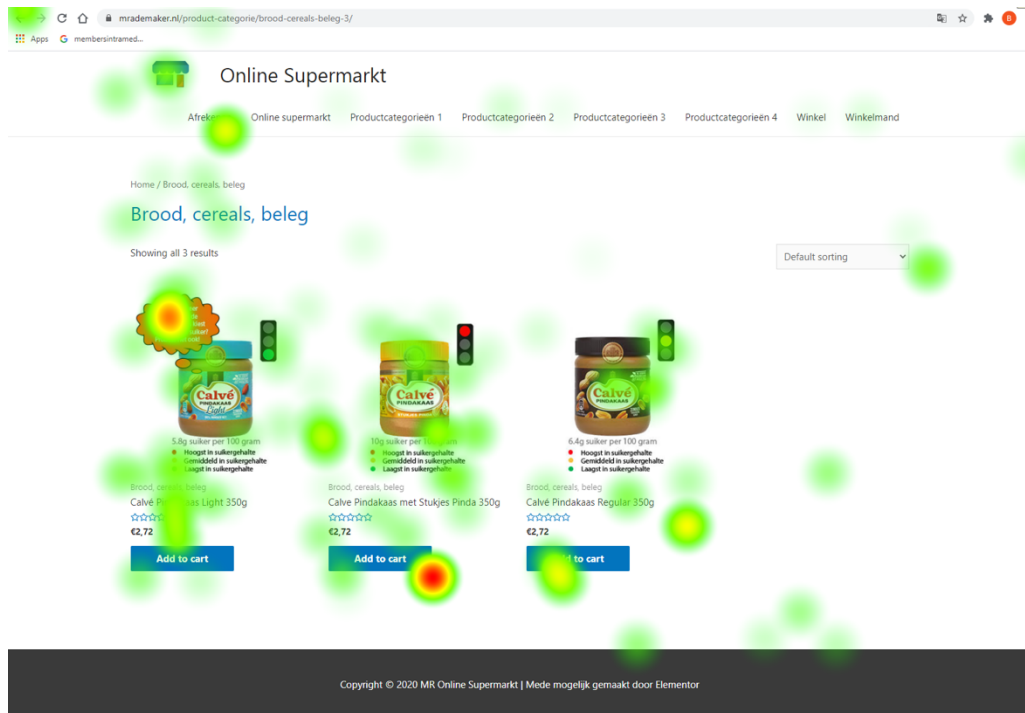
*Heatmap ice tea – Relative count*



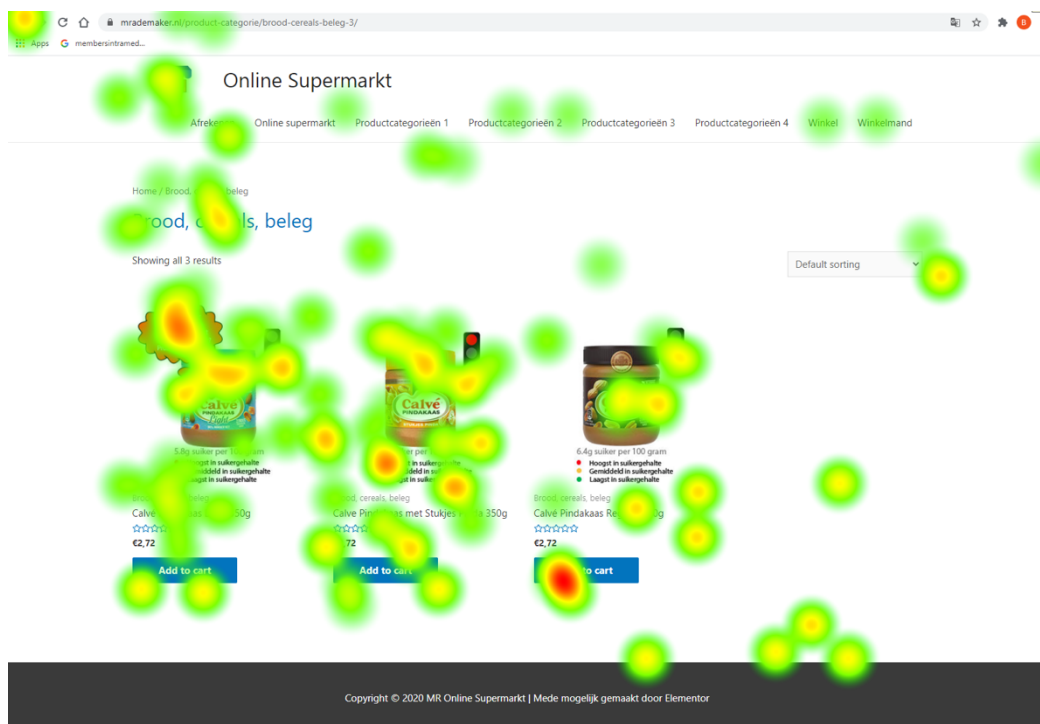
*Heatmap apple sauce – Relative duration*



*Heatmap apple sauce – Relative count*



*Heatmap peanut butter – Relative duration*



*Heatmap peanut butter – Relative count*



## **Appendix III Transcripts Think-a-loud protocol**

### **Participant I**

**Researcher:** It is important that you say everything you think out loud.

*Participant:* Click on scenario 1. Potatoes, into the shopping cart. Applesauce. Shampoo, I can find this one. Let me see, applesauce. Vegetables? No. \*Clicks on fruit and selects original applesauce. Goes back to previous page\*. Wait, I have noticed something on the product page of the applesauce. Highest in level of sugar. I do not want that. Ah, it does not matter. I can proceed with purchasing the products?

**Researcher:** Yes, you can continue.

*Participant:* Ok. I now go to the home page of the online supermarket. Click on scenario 2. You are shown an overview with all product categories. Add the following products to your basket: Ola ice cream. Freezer. Add to shopping cart. When you have added the product to your shopping cart, you may return to the product category page. Heinz tomato sauce. Into the shopping cart. Proceed to purchase. Go to the home page of the online supermarket and click on scenario 3. Ground beef. Add peanut butter. Added cucumber and toilet paper. Two bottles of Lipton. You are presented with an overview of all product categories. Click on the category 'Biscuits, pastries, and chips'. Click on 'Peijnenburg gingerbread'. Read the description. Eggs and beer. That was it, done. It went fine.

### **Participant II**

**Researcher:** You can start with reading the assignment.

*Participant:* Ok. I am going to start with task 1 now. Open the website. Click on scenario 1. You are presented with an overview with all product categories. Add the following products: potatoes. I click on potatoes, rice, and pasta. Add to shopping cart. Then, apple sauce. I click on 'previous'. Let me see where it is. I guess that it is categorized under fruit. Kind of your choice. Previous. Drugstore, Andreon shampoo. Check if all products are added to the shopping cart. If all products are added you may continue with finishing the order. Check shopping cart. I have got two, but I only want one. Adjusting shopping cart. Ok, done. Proceed to purchase. Place order. Go to the homepage of the online supermarket. Scenario 2. Again, you see an overview with all product categories. Add the following products to the basket: Ola ice cream. Freezer. Add to basket. \*Searching how to go back\*.

**Researcher:** I can see that you are having troubles going back to the category page?

*Participant:* Yes, I thought that I would go back to the page with all scenarios if I would press on the 'home' button. So, I did not know how I could go back to the page with all product categories. Ok, next. Heinz tomato ketchup. I have to take some time to find the sauces. I guess it will belong to the category 'cooking, soups, and meals'. Yes. I saw mayonnaise on the image, but that was a bit lucky, I think. You would expect that it would stated 'sauces' as well. Purchase.

**Researcher:** How is the readability?

*Participant:* I can read it just fine. Do I have to place the order again?

**Researcher:** Yes.

*Participant:* Task 3. This one?

**Researcher:** Yes, that one.

*Participant:* Ok. Ground beef, add to shopping cart. Where do I have to click when I want to go back to the previous page?

**Researcher:** You can press 'previous' on the upper left corner.

*Participant:* Ok, because you go all the way back when you press the 'home' button. Two bottles of Lipton Ice tea. Highest level in sugar and medium level in sugar. I take this one because I think it is tasty. Peanut butter. It is nice that all prices are equal, so it will not affect my choices. Cucumber, vegetables. Toilet paper. I guess it is over here. Nope. Household? Yes. Add to shopping cart and proceed to shopping basket. Add another two bottles of ice tea. Adjust shopping basket. Great. Biscuits, paties, and chips. Next product: Peijnenburg gingerbread Zero. Read description and add to shopping basket. Baby wipes will be over here, I guess. Eggs. And finally, beer. Go the shopping cart and delete the baby wipes. Purchase. That is it, great.

### **Participant III**

**Researcher:** Okay, when you are ready, you may start with reading the assignment.

*Participant:* \*Starts reading\*. I need to think out loud?

**Researcher:** Yes! You can say everything you see and think.

*Participant:* Ok. I will click on scenario 1, the green bar. I am clicking on the potatoes right now.

**Researcher:** You can use a computer mouse if you want to.

*Participant:* Ok, much better. I have put the potatoes in my shopping cart. I go back to the home page like an amateur, and I am searching for the applesauce.

**Researcher:** Why like an amateur?

*Participant:* Because I couldn't find a 'previous' button. As you can see, grocery shopping is not something I do very often haha. I cannot find the applesauce. I guess it can be found under the category 'dairy produce, eggs, butter'. \*Did not found the applesauce and is looking for a 'previous' button again.\*

**Researcher:** You can click on the 'previous page' button in the top left corner.

*Participant:* Ok, I did not click on that one because I was not sure if the site would save all selected products. Is there a searching bar?

**Researcher:** No.

*Participant:* Ok, it is going to be a long day then haha. I was checking the lights of the traffic light. Not sure if I have to mention this?

**Researcher:** Yes, good that mention it.

*Participant:* Applesauce, found it. I can pick the type I want. Some products say 700g, while others state 700 grams. I am going for the orange one (traffic light color). Then, shampoo. I click on the category 'drugstore'. Check if all products are added to the list? Ok, done. Continue to purchase. Can I place my order?

**Researcher:** Yes.

*Participant:* I can proceed to scenario 2?

**Researcher:** Yes.

*Participant:* Ola ice cream. Add it to the shopping cart. Now I have to go back to the overview with all categories. Tomato ketchup, hmm. Again, I went to the wrong category. Ah, there it is. Kind of your choice. I pick the normal Heinz tomato ketchup because I am familiar with the label. Purchase. Click on scenario 3. Ground beef, add to cart. Lipton ice tea. Again, I choose for the middle one. I like this one after a football training. Peanut butter. That is nice, I am a real peanut butter lover. With extra nuts, that is my favorite. There is also a light one I see. Cucumber, I never know if this belongs to vegetables or fruit. Add to shopping cart. Finally, toilet paper. I go to the category 'household, animals'. Task 4. Biscuit, pastries, and chips. Cucumber. Baby wipes. Eggs. And finally, beer.

## **Participant IV**

**Researcher:** You can start with reading the assignment.

*Participant:* Ok, I am done. Click on scenario 1. I need to think out loud, right?

**Researcher:** Yes.

*Participant:* Potatoes. I have pressed on previous, is it still in my shopping cart?

**Researcher:** Try to find it out yourself first. If you cannot find it, I will help you further.

*Participant:* How can I go back to the previous page?

**Researcher:** You can go back to the previous page by clicking the button on the upper left corner.

*Participant:* Where is the applesauce? \*Adding the shampoo first\*. Where is the applesauce, I still cannot find it?

**Researcher:** Keep looking.

*Participant:* Fruit? I take the one with the highest level of sugar. Purchase. Ola Ice cream, freezer. Heinz ketchup. Refreshening ice tea, twice. Peanut butter, hmm with extra pieces. I take that one. Purchase. Biscuits, pastries, and chips. Read the description. Cucumber. Baby wipes. Why are the products random?

**Researcher:** To create a more realistic grocery list.

*Participant:* I now see that I just did something wrong. I had to go to the shopping cart and add two bottles of Lipton ice tea. I thought I had to check if I had two bottles in my shopping cart. I am now deleting the baby wipes. Shall I do task 3 again?

**Researcher:** Yes, you may do that task again.

*Participant:* Ok, done.

## **Participant V**

**Researcher:** You can start with reading the assignment.

*Participant:* Do I need to tell everything I am doing? When I am clicking on scenario 1 for example?

**Researcher:** Yes, it is important that you say everything out loud.

*Participant:* I am going to start now. I click on scenario 1. I am clicking on potatoes, rice, and pasta. I add the potatoes to the shopping cart. I want to go back, so I go to the home page. I think I have to go back to scenario 1. Normally, there is a 'previous' button or a button to go back to the overview of categories. Then, applesauce. I never buy this, so I do not know

where to search. Ah Fruit. I can pick a kind by my choice. I go for the 'Pure appelmoes'. Then, I go to the drugstore and add shampoo to my shopping cart. Continue and purchase. I can place my order?

**Researcher:** \*Nods\*

*Participant:* Go to the home page of the online supermarket. I can continue right?

**Researcher:** Yes.

*Participant:* Ok. Click on scenario 2. Ola ice cream, freezer. Add the following product to the shopping cart: Heinz tomato ketchup. I pick this category because I can see mayonnaise on the image. I go for the original one. Continue to purchase. Shopping cart. Yes. Then, I go back to scenario 3. I am going to search for the ground beef. I am going to the category 'meat', and add it. We go back to ice tea. Soda's. I choose one Lemon and one Herbal, sounds nice. Then, we go back again. Let me see, peanut butter. I will check the category 'spreads'. Peanut butter with extra nuts, delicious! Cucumber, that one is categorized under the vegetables, I just saw that. Toilet paper can be found under household. Go to the shopping cart and add another two bottles of ice tea. Shopping cart. Purchase. Homepage. Scenario 4. The lay-out could have been better but the functionality is good. Click on the category 'Biscuits'. A search bar would be nice. I would like to buy the 'Peijnenburg Parelkandij'. Is that possible? No, it is not. Too bad. Click on the following product (\*clicks on Peijnenburg original\*). Added to shopping cart. Another cucumber, vegetables. We go back for the baby wipes. Dairy products and eggs. The beer is expensive, can I have a discount haha? Go to the shopping cart and delete the baby wipes from the shopping cart. Proceed to purchase and place the order. Done.

## **Participant VI**

*Participant:* Click on product category 1. This is the right one?

**Researcher:** Yes, that is right.

*Participant:* Potatoes, there is only one, right?

**Researcher:** Yes.

*Participant:* Applesauce. Where is it? Vegetables and fruit? Ah, there it is. I need some sugar in it, otherwise, I do not like the taste. Shampoo, I go to the category 'drugstore'. Do you have a coupon code?

**Researcher:** No haha.

*Participant:* Haha such a shame. Ola ice cream, hmm where can I find this one? Freezer it is. Go back to the overview with all categories. Heinz tomato ketchup. Should it be here? Yes. No added sugars, that is just tomato. Add to cart. Continue to purchase. Task 3, I have to continue to scenario 3, right?

**Researcher:** Yes.

*Participant:* Ground beef. Ice tea. Hmm, I pick this one. Products without sugar always have added sweeteners, I do not want that. Peanut butter, spreads. Oops, I have to add Lipton ice tea twice. Changing the shopping cart is convenient on this website. Task 4. Baby wipes. Place order. Hmm, I see that I forgot to delete one product.

**Researcher:** No problem, it is ok.

## Appendix V

### Measurement scales

#### **Health-consciousness (Jayanti & Burns, 1998; Gould, 1988; Michaelidou & Hassan, 2008):**

7-point Likert scale: *strongly disagree* (1) to *strongly agree* (7)

1. I think about my health everyday
2. I am generally aware of my health
3. I pay attention to the feelings I have about my health.
4. I am alert to changes in my health
5. I take responsibility for the state of my health
6. I am interested in information about my health.
- 7.. I am more concerned about my health than the average person.

#### **Attitude towards low-sugar products (Krystallis et al., 2003; Roininen et al., 2001; Michaelidou & Hassan, 2008, and Rifon et al, 2004)**

7-point Likert scale: *strongly disagree* (1) to *strongly agree* (7)

1. I think that low-sugar products are good for my health
2. I think that low-sugar products are unpleasant
3. I think that low-sugar products are favourable for my health
4. I have negative feelings towards low-sugar products
5. I am very particular about the amount of sugar in food.
6. It is important for me that my products contain a low amount of sugar.
7. By eating light products, one can eat more without consuming too many calories.
8. I think that low-sugar products are healthier than regular products.

## Appendix VI: Information sheet participant - experiment

### Procedure

Wanneer u zo op de link klikt in de online enquête, wordt u doorverwezen naar een online supermarkt. Hieronder staat een boodschappenlijst met producten die u moet aanschaffen. Alle producten kunnen eerst aan de winkelmand worden toegevoegd en vervolgens worden afgerekend. Het gaat om een fictieve supermarkt, er hoeft dus **niet** echt betaald te worden en u ontvangt ook **geen** producten.

**Let op!** Na het plaatsen van de bestelling verschijnt een ordernummer in beeld. **Onthoud dit nummer of schrijf deze even op. Dit nummer heeft u namelijk nog nodig in de enquête.** Als u dit heeft gedaan kunt u het tabblad sluiten en verdergaan met de enquête.

### Instructies experiment

1. Klik op de link. U wordt doorverwezen naar de website van de online supermarkt.
2. U ziet een overzicht met verschillende productcategorieën (bijv. Aardappel, groente, fruit; Ontbijtgranen, beleg, tussendoor etc.). Neem gerust de tijd om alvast te bekijken waar de verschillende productcategorieën zich bevinden. Bedenk alvast onder welke categorie een product zou vallen (bijv. tomatensoep onder ‘koken, soepen, maaltijden’). **Klik nog niet op de productcategorieën!**
3. Hieronder volgt de boodschappenlijst. Van elk type product zijn meerdere soorten en merken te vinden. Zo wordt er naast ‘Coolbest Premium Orange’ ook ‘Coolbest Mango’ aangeboden. U mag zelf bepalen welk product u toe wilt voegen aan het winkelmandje. Het is belangrijk dat u zich aan de volgorde van het lijstje houdt.

### Boodschappenlijst

1. Ontbijtkoek
  2. Tomaten
  3. Appelmoes
  4. Vissticks
  5. Tomatenketchup
  6. Pasta
  7. Ice tea
  8. Eieren
  9. Calvé pindakaas
  10. Afwasmiddel
- 
4. Controleer of alle producten zijn toegevoegd aan de winkelmand. Klik vervolgens op de button ‘Proceed to checkout’ en vervolgens op ‘place order’.
  5. Aan de linkerkant van uw scherm verschijnt nu een ordernummer. Onthoud dit nummer of schrijf het even op. U kunt het tabblad nu sluiten en u kunt verdergaan met de enquête.


Bedankt voor uw deelname aan dit onderzoek!















Mark Rademaker



## Appendix VII

### Experimental design - online supermarket

 Online Supermarkt Winkelmand

				
Aardappel, rijst, pasta	Vlees, vis, vegetarisch	Groente	Fruit/fruitconserven	Koken, soepen, sauzen, maaltijden
				
Diepvries	Brood, cereals, beleg	Zuivel, eieren, boter	Koek, gebak, snoep, chips	Fris, sap, koffie, thee
				
Wijn, bier, sterke drank	Drogisterij	Baby, peuter	Huishouden, dieren	

### Overview product categories

Home / Aardappel, rijst, pasta

#### Aardappel, rijst, pasta

[Terug naar overzicht](#)

Showing all 8 results

Default sorting



Aardappel, rijst, pasta  
Aardappelen Vrijvastkokend 3kg  
€3,39

[Voeg toe aan winkelwagen](#)



Aardappel, rijst, pasta  
Aviko SuperCrunch Airfryer Dunne Friet  
€2,05

[Voeg toe aan winkelwagen](#)



Aardappel, rijst, pasta  
Grand'Italia Penne Tradizionale  
€1,16

[Voeg toe aan winkelwagen](#)



Aardappel, rijst, pasta  
Grand'Italia Spaghetti Tradizionali  
€1,32

[Voeg toe aan winkelwagen](#)



Aardappel, rijst, pasta  
Honig Macaroni Vlugkokend  
€1,11

[Voeg toe aan winkelwagen](#)



Aardappel, rijst, pasta  
Lassie Couscous Maroc  
€1,35

[Voeg toe aan winkelwagen](#)



Aardappel, rijst, pasta  
Mini krieltjes  
€0,95









[Voeg toe aan winkelwagen](#)











Aardappel, rijst, pasta  
Oranje Zoete Aardappelen  
€2,99

[Voeg toe aan winkelwagen](#)









### Overview of subcategories

<p>Aardbeien Hollands 400g €4,59</p> <p>Voeg toe aan winkelwagen</p>	<p>Banacol Bananen 7 Stuks €1,62</p> <p>Voeg toe aan winkelwagen</p>	<p>Conference Peer 1kg €1,84</p> <p>Voeg toe aan winkelwagen</p>	<p>Del Monte Ananasschijven op Sap €0,79</p> <p>Voeg toe aan winkelwagen</p>
			
<p>Fruit Elstar Appels 1,5kg €3,24</p> <p>Voeg toe aan winkelwagen</p>	<p>Fruit Frambozen 125g €2,54</p> <p>Voeg toe aan winkelwagen</p>	<p>Fruit Hak Appelmoes 700g €1,77</p> <p>Voeg toe aan winkelwagen</p>	<p>Fruit Hak Appelmoes Light 700 gram €1,77</p> <p>Voeg toe aan winkelwagen</p>
			
<p>Fruit Hak Appelmoes Puur Moes 700 gram €1,77</p> <p>Voeg toe aan winkelwagen</p>	<p>Fruit Mandarijnen 1kg €2,09</p> <p>Voeg toe aan winkelwagen</p>	<p>Fruit Witte Druven Pitloos €1,85</p> <p>Voeg toe aan winkelwagen</p>	<p>Fruit Zespri Green Kiwifruit 1kg €3,75</p> <p>Voeg toe aan winkelwagen</p>

## Overview of subcategories in condition 1

<p>Aardbeien Hollands 400g €4,59</p> <p>Voeg toe aan winkelwagen</p>	<p>Banacol Bananen 7 Stuks €1,62</p> <p>Voeg toe aan winkelwagen</p>	<p>Conference Peer 1kg €1,84</p> <p>Voeg toe aan winkelwagen</p>	<p>Del Monte Ananasschijven op Sap €0,79</p> <p>Voeg toe aan winkelwagen</p>
			
<p>Fruit Elstar Appels 1,5kg €3,24</p> <p>Voeg toe aan winkelwagen</p>	<p>Fruit Frambozen 125g €2,54</p> <p>Voeg toe aan winkelwagen</p>	<p>Fruit Hak Appelmoes 700g €1,77</p> <p>Voeg toe aan winkelwagen</p>	<p>Fruit Hak Appelmoes Light 700 gram €1,77</p> <p>Voeg toe aan winkelwagen</p>
			
<p>Fruit Hak Appelmoes Puur Moes 700 gram €1,77</p> <p>Voeg toe aan winkelwagen</p>	<p>Fruit Mandarijnen 1kg €2,09</p> <p>Voeg toe aan winkelwagen</p>	<p>Fruit Witte Druven Pitloos €1,85</p> <p>Voeg toe aan winkelwagen</p>	<p>Fruit Zespri Green Kiwifruit 1kg €3,75</p> <p>Voeg toe aan winkelwagen</p>

## Overview of subcategories - condition 2

<p>Aardbeien Hollands 400g €4,59</p> <p>Voeg toe aan winkelwagen</p>	<p>Banacol Bananen 7 Stuks €1,62</p> <p>Voeg toe aan winkelwagen</p>	<p>Conference Peer 1kg €1,84</p> <p>Voeg toe aan winkelwagen</p>	<p>Del Monte Ananasschijven op Sap €0,79</p> <p>Voeg toe aan winkelwagen</p>
 <p>Fruit Elstar Appels 1,5kg €3,24</p> <p>Voeg toe aan winkelwagen</p>	 <p>Fruit Frambozen 125g €2,54</p> <p>Voeg toe aan winkelwagen</p>	 <p>Fruit Hak Appelmoes 700g €1,77</p> <p>15g suiker per 100 gram        ● Hoogst in suikergehalte        ● Gemiddeld in suikergehalte        ● Laagst in suikergehalte</p> <p>Voeg toe aan winkelwagen</p>	 <p>Fruit Hak Appelmoes Light 700 gram €1,77</p> <p>9.5g suiker per 100ml        ● Hoogst in suikergehalte        ● Gemiddeld in suikergehalte        ● Laagst in suikergehalte</p> <p>Wilt je dat meer dan 67% van de Nederlanders kiest voor minder suiker? Probeer het ook!</p> <p>Voeg toe aan winkelwagen</p>
 <p>Fruit Hak Appelmoes Puur Moes 700 gram €1,77</p> <p>13.6g suiker per 100        ● Hoogst in suikergehalte        ● Gemiddeld in suikergehalte        ● Laagst in suikergehalte</p> <p>Voeg toe aan winkelwagen</p>	 <p>Fruit Mandarijnen 1kg €2,09</p> <p>Voeg toe aan winkelwagen</p>	 <p>Fruit Witte Druven Pitloos €1,85</p> <p>Voeg toe aan winkelwagen</p>	 <p>Fruit Zespri Green Kiwifruit 1kg €3,75</p> <p>Voeg toe aan winkelwagen</p>

### Overview of subcategories – condition 3