# HAPPILY HEALTHY

*THE EFFECTS OF (VERBAL VERSUS VISUAL) MULTI-SENSORY IMAGERY-ELICITING STIMULI ON FOOD CHOICES AND PORTION SIZES OF HEALTHY FOODS*

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## PREFACE

At this moment you are starting to read my Master thesis, a project were I have been working on over the past months. I am very proud to present the final version of this document. Finishing this thesis means the end of my master and the beginning of a new period. I am looking forward to the new challenges and opportunities the future will bring. However, before I am looking forward, I would love to look back for a short period of time to express my sincere gratitude to all persons who supported me during this process.

First of all, I wish to thank my supervisor, Betina Piqueras-Fiszman, for her expertise and clear guidance throughout the whole project. In particular, I wish to thank her for her commitment, useful comments, patience and flexibility. She gave me a lot of freedom, but was always available for questions and advice. Secondly, I would like to thank Ellen van Kleef. She was not only the second reader of my thesis, but she also gave me advice during my search for participants. Without her advice and connections I would not have been able to collect such an amount of respondents and data. Finally, special thanks go out to my family and dearest friends, who have been always the source of motivation and inspiration for me. Without their support I would not be where I am now.

Next to that I wish to thank Wageningen University & Research, as I feel very privileged to have been given the opportunity to study at this university. The various subjects of the Master program *Management, Economics and Consumer studies* always kept me interested and motivated, which made it a delight to work on the different subjects. Besides that, this study gave me the opportunity to develop research skills and gave me more insights in the multidisciplinary fields of business-, economical and sociological processes concerning consumers. Many courses, teachers (and other staff) and students have left an indelible mark in my mind which I am sure would also influence and guide me in the future.

*Heleen Nijland – Utrecht, October 2019*

## ABSTRACT

Based on the current rate of overweight, obesity and undesired health effects, consumers do not always choose the best options for their own health. To promote consumers to make more healthy food choices, the current study was aimed to gain insights about the influence of various multi-sensory imagery eliciting stimuli (verbal versus visual) on the evaluation and consumption of healthy foods. According to the outcomes, recommendations could be given to use the multi-sensory imagery mechanism more efficiently in for example advertisements, without either hurting food sales or eating enjoyment. In order to test the hypotheses, a cross-sectional design study was set up in the form of an online questionnaire. In total, 251 consumers participated in this study, in which they were assigned to one of the two multi-sensory imagery conditions (verbal versus visual) or one of the two control conditions (verbal versus visual). Based on the results of the main study, no significant results could be found which could indicate which type of multi-sensory imagery stimuli (verbal versus visual) was most powerful in influencing consumers food choices. However, surprisingly results were found on level of the influence of consumers' healthiness (and sensory) focus, on the choice for healthy (over unhealthy) foods and the total amount of calorie intake. Those results could indicate that not only enjoyment is a salient choice attribute, but currently, also healthiness attributes play an important role in evaluating heathy foods. Therefore, it could for both consumers as marketers be an outcome if healthiness aspects would be included in advertisements.

**Keywords:** multi-sensory imagery, cognitive style, sensory focus, healthiness focus, expected enjoyment, food choice, healthy foods, portion sizes

## TABLE OF CONTENT

# 1. INTRODUCTION

## 1.1. BACKGROUND OF THE PROBLEM

Consumers make about two-hundred food decisions a day (Wansink & Sobal, 2007). However, based on the current rate of overweight and obesity, consumers do not always choose the best options for their own health. In 2014, worldwide more than 1.9 billion of the adults (39% of world's adult population) were overweight and of these adults, 600 million (13% of wold's adult population) were obese (WHO, 2016). The raised BMI, which is greater or equal to 25 in case of overweight and greater or equal to 30 in case of obesity, could have many undesirable effects. For example, consequences could be found for the psychological state of people (e.g. depression, anxiety and low self-esteem), the psychosocial state of people (e.g. less friends, lower employment and less likely to marry) and the physical state of people (e.g. reduction of life expectancy and disability; Hills et al., 2010; Doll, Petersen, & Stewart-Brown, 2000). Because of these alarming rates and unwanted effects, which are accompanied with massive societal and financial burdens, it is important to understand how food decisions are made. This understanding can be used to encourage consumers to choose the best food options for their own health, such as the less calorie-dense foods and smaller portion sizes (WHO, 2016; Chandon & Wansink, 2012).

To promote consumers to decrease the amount of calories consumers take in, the government and many health institutions are trying to encourage consumers and producers to consume and produce foods which are found to be more healthy and responsible (Rijksoverheid, 2017). However, contradictory thereto, most food companies are using advertisements to increase consumers' brand awareness and purchase intentions, which could (unintentionally) promote an increase of consumers' calorie intake (Larson, Redden, & Elder, 2014; Halford, Boyland, Hughes, Oliveira, & Dovey, 2007; Harris et al., 2009). Hence, food marketing is often be seen as one of the leading causes of the current obesity epidemic (Chandon & Wansink, 2012). Moreover, in the current world, the daily life of the average consumer is filled with advertisements. According to Media Dynamics Inc (2014), on an average day, the number of advertisements a person is exposed to is stated around 362 and around 153 of those can attract the audience's full attention for a few seconds or more. In addition to that, the number of advertisements a person could see per day may even be more than twice as much as 30 years ago (Story, 2007). This growth can partly be explained by the facts that, on the one hand, media usage is growing and on the other hand, food marketers are increasingly relying on non-traditional communication, such as internet, games and social media (Harris, Schwartz, & Brownell, 2010). Consequently of these large (and increasing) amount of advertisements a consumer is exposed to on an average day, it is important to find out if there are marketing techniques which food marketers could use in their advertisements to meet their business objectives, while simultaneously help consumers to make more healthy food choices.

## 1.2. EXISTING LITERATURE

### 1.2.1. MENTAL SIMULATIONS AND MENTAL IMAGERY

A regularly used marketing tactic to influence consumers' calorie intake is using *mental simulations* (i.e. Larson et al., 2014; Morewedge, Huh, & Vosgerau, 2010; Xie, Minton, & Kahle, 2016). This mechanism can

be explained as the imitative representation of events in consumers' mind (Taylor & Schneider, 1989). A specific type of mental simulation is *mental imagery*, in which the mental processes that perform a simulation emulate the processes that would actually work in the real scenario, across sensory modalities (see Figure 1; Moulton & Kosslyn, 2011; Pearson, 2007). For example, in case an individual is imagining the characteristics of a strawberry, the processes that are activated for the imagination of the smell and appearance of this food product are comparable with the processes which would be activated in case the strawberry could really be seen and smelt. These mental images can arise from retrieving high level stored information. Subsequently, this information will be presented in the working memory, with help of low level sensory representations (Kosslyn, Anderson & Gluck, 2012; MacInnis, 1987; Keogh & Pearson, 2017).

### 1.2.2. REPEATED MENTAL IMAGERY

According to several researchers, different forms of mental imagery could be used to influence consumers to choose smaller portions sizes (see Figure 1). One of these methods is *repeated mental imagery*, which can be described as the repeatedly stimulation of consumption thoughts of a particular kind of food (i.e. Huh, Vosgerau, & Morewedge, 2016, Kappes & Morewedge, 2016, Larson et al., 2014). For example, Morewedge et al. (2010) have shown that participants who were instructed to imagine eating 30 M&M's, subsequently consumed fewer M&M's than participants who were instructed to imagine eating only three M&M's. For most people, this effect sounds unexpected, as they believe that thinking about a desirable food increases the hedonic response to the stimulus and as a result also the consumption of that food. Indeed, for example, imagining the smell of a freshly baked apple pie elicits an increase in salivation and the liking to eat it (Dadds, Bovbjerg, Redd, & Cutmore, 1997), but the thought of the tenth bite of this same pie is for most consumers desired less than the thought of the first bite. In other words, the desire to consume a food product decreases after a particular amount of repetitions of the imagination of that food. This decrease in desire could occur due to two closely interrelated mechanism: *habituation* and *sensory-specific satiety*. The first mechanism, habituation, can be described as the decrease in biological, motivational and behavioural responses to a particular kind of food, as the food is no longer surprising because of its repeated exposure (Epstein, Temple, Roemmich, & Bouton, 2009). The latter one, sensory-specific satiety, is often represented as an example of the more general term of habituation (Piqueras-Fiszman & Spence, 2014). This term can be described as consumers' pleasantness rating of the food that is eaten, compared to uneaten foods with different sensory qualities. Moreover, food that is already eaten will generally have more negative ratings compared to uneaten foods, as each additional (thought of a) mouthful of the eaten food remains relatively unchanged (Rolls, Rolls, Rowe, & Sweeney, 1981).

In line with the explanation of the above mentioned concepts (habituation and sensory-specific satiety), recent studies have shown that repeatedly imagining the consumption of a specific kind of food (at least more than 18 times) could reduce the actual consumption of that same food (Haasova, Elekes, Missbach, & Florack, 2016; Missbach, Florack, Weissmann, & König, 2014). Moreover, research has demonstrated that habituation and/or sensory-specific satiety, as a result of repeated mental imagery, could take place in many situations and forms. For example, across different food types, such as chocolate cake, M&M's, cheese cubes and walnuts (Morewedge et al., 2010; Missbach, Florack, Weissmann, & König, 2014; Cornil & Chandon, 2016) and across different amount of repetitions, such as eighteen, twenty, thirty and sixty (Larson et al., 2014; Morewedge et al., 2010; Missbach et al., 2014).

### 1.2.3. MULTI-SENSORY IMAGERY

A backfire of the, in Paragraph 1.2.2 explained, repeated mental imagery process is the fact that this mechanism could drop the eating enjoyment of the food that is imagined. This could be a disadvantage for both consumers and food marketers (Larson et al., 2014; Cornil & Chandon, 2016). Therefore, Cornil & Chandon (2016) have tested an alternative form of mental imagery, *multi-sensory imagery* (see Figure 1), to find out if imagining a particular kind of food implicitly has to lead to a decrease in eating enjoyment. Multi-sensory imagery can be described as the simultaneous activation of unique sensory imageries, such as the sight, taste and smell of food (Lacey & Lawson, 2014). For example, by stimulating multi-sensory imagery, thoughts about the smell, taste and texture of a particular food, such as a strawberry, could simultaneously come to mind. This alternative form of mental imagery can be distinguished best from repeated mental imagery in two ways: 1) by its focus on the different senses which are simultaneously activated and 2) the imagination process of multi-sensory imagery which does not necessarily have to be repeated.

Cornil and Chandon (2016) have found that multi-sensory imagery made (not-hungry and not-dieting) consumers choose smaller portions of hedonic foods and that it made them, besides that, willing to pay at least as much and expecting at least as much eating enjoyment from their chosen portion. Formulated differently, smaller chosen portions of hedonic foods are evaluated as more healthy and enjoyable as a result of multi-sensory imagery. Next to this advantage for consumers, there is an advantage for producers. The smaller portions become relatively more profitable (Cornil & Chandon, 2016). Cornil and Chandon explain these findings by the fact that multi-sensory imagery helps people realize that sensory pleasure peaks with smaller portions, as each extra mouthful is not surprising anymore (sensory-specific satiation; see Paragraph 1.2.2.). Moreover, consumers' overall enjoyment is not an accumulation of pleasure from each bite, but the average pleasure experienced from all bites (van Kleef, Shimizu, & Wansink, 2013) or even only the enjoyment of the last bite (Garbinsky, Morewedge, & Shiv, 2014). Next to its influence on consumers' eating enjoyment as a result of sensory-specific satiety, multi-sensory imagery could also increase the relative importance of sensory pleasure over the importance of other criteria, such as health concerns and level of hunger. This increased importance of sensory pleasure could also make consumers choosing smaller portion sizes and expecting them to enjoy the chosen portion sizes more than the one's they would have chosen otherwise (Cornil & Chandon, 2016).

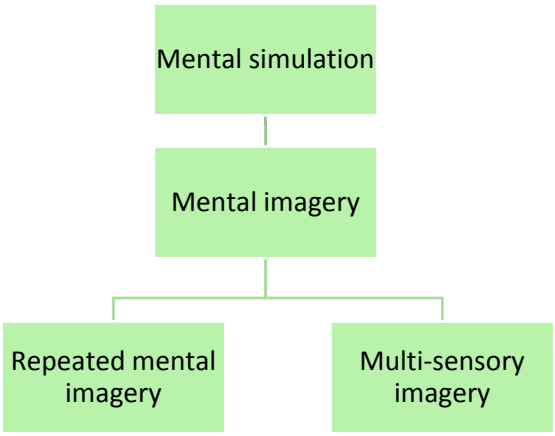


**Figure 1.** Mental simulation, mental imagery and its different forms.

## 1.3. FOCUS OF CURRENT STUDY

In their study, Cornil and Chandon (2016) have integrated multi-sensory imagery by showing participants pictures of hedonic foods, while instructing them to think about the five senses and to imagine the consequences of eating the particular food. Put differently, they made simultaneously use of both verbal stimuli (instructing texts) and visual stimuli (pictures) to evoke multi-sensory imagery. However, the effects of the individual stimuli (verbal and visual) to arouse multi-sensory imagery are not understood completely well. Therefore, it could be interesting to examine if different ways of stimulating multi-sensory imagery could lead to different effects on the consumption and enjoyment of particular foods. If, for example, it can be shown that stimulating multi-sensory imagery with help of visual stimuli has stronger effects, on both choosing healthy foods over unhealthy foods and eating consumers enjoyment, than verbal imagery-eliciting stimuli (or vice versa), these findings could be applicated to advertisements. In this case, food marketers could choose to focus, in their imagery-eliciting advertisements, on visual stimuli instead of verbal stimuli to benefit either their own sales as consumers' health.

Next to the simultaneous use of verbal and visual stimuli, Cornil and Chandon (2016) focus in their study on portion sizes of hedonic calorie-dense foods, such as chocolate cake, conditional on people who already have decided to eat. They have chosen to focus on these kind of foods as most portion sizes of hedonic foods are much larger than recommended, which has a negative impact on obesity and overweight. However, the key to losing weight does not necessarily have to be conceived as eating smaller portion sizes (Spake, 2005; Slavin, 2005). For example, several studies have found that foods high in fibre, such as fruits, vegetables and whole grain products, are inversely associated with body weight and body fat (Nelson & Tucker, 1996; Alfieri, Pomerleau, & Grace, 1997). Heaton (1973) explains this effect by the fact that adding fibre to a diet can, among other things, limit consumers' overall food intake. Moreover, fibre could increase chewing, which promotes the secretion of saliva and gastric juice, that results in an expansion of the stomach and increased satiety. Next to that, the intake of more healthy food products makes it difficult to maintain the same take in of unhealthy food products, as the unhealthy products are simply displaced by the healthy products (Heaton, 1973). In line with these findings, the current Dietary Guidelines (2015 – 2020) recommend individuals to consume a variety of fruits, vegetables, dairy and grains each day (U.S. Department of Health and Human Services, 2015). However, currently most consumers do not include enough foods according to these guidelines or add too many non-recommended foods to their diet (Alpert, 2013; U.S. Department of Health and Human Services, 2015). For that reason, it could be useful to find out if multi-sensory imagery can make individuals choosing healthy foods over unhealthy foods, and in case they actually have chosen the healthy foods, if it can make them choosing larger portion sizes of those foods. Formulated differently, research of Cornil and Chandon (2016) can be extended, by finding out if multi-sensory imagery, next to the influence on portion sizes of hedonic foods, also has a positive effect on portions sizes of more healthy foods (how much to eat) and on food choice (what to eat).

## 1.4. RESEARCH QUESTION

To summarize, because of the large number of advertisements a consumer is exposed to on an average day, it is important to understand how food marketers could use those advertisements to

meet their business objectives, while simultaneously help consumers to make more healthy food choices. Cornil and Chandon (2016) have already found that multi-sensory imagery can be a successful outcome to decrease consumers' portions sizes of hedonic foods, without either hurting food sales or eating enjoyment. However, there is limited knowledge available about its influence on portion sizes of more healthy foods and on consumers' food choice in case there is a choice between different kind of foods. Next to that, knowledge can be gained about the individual influence of the different imagery-eliciting stimuli (verbal versus visual) on the consumption and evaluation of foods. By answering the following general research question (GRQ), the above described fields of interest could be examined:

*'To what extent can different multi-sensory imagery-eliciting stimuli (verbal versus visual) affect the food choice for- and portion sized of healthy foods?'*

## 1.5. RESEARCH OBJECTIVES

The objective of the current research is to contribute to research about how to reduce the alarming rates of overweight and obesity. This will be done by studying ways to influence consumers' in making more healthy food choices, without either hurting food sales or consumers' eating enjoyment. In other words, there is an aim to find out the effects of different forms of multi-sensory imagery (verbal versus visual) on portion sizes and food choices. With help of those outcomes, recommendations about how to use the multi-sensory imagery mechanism more effectively (i.e. using verbal- or visual stimuli, or a blend) could be given from an academic perspective.

## 1.6. STRUCTURE OF THE RESEARCH

This thesis will be structured as follow: Chapter 2 will start with a theoretical explanation of multi-sensory imagery. There will be focused on the cognitive process of this specific form of imagery and how this differs from comparable processes, such as perception and mental imagery. Subsequently, a conceptual framework, containing the antecedents, processes and consequences of multi-sensory imagery, will be given and interpreted. Based on this conceptual framework, hypotheses will be established. In Chapter 3, the execution and results of the pre-test will be described. In this pre-test, different forms of imagery-eliciting stimuli and food products will be evaluated on its ability to use during the main study. The next chapter will offer an outline for the methodology which will be used during the main test. In the fifth chapter, the results of this empirical study will be explained. Based on those results, the hypotheses can be evaluated. Finally, these findings will be further elaborated and evaluated in the conclusion and discussion section of Chapter 6.

## 2. THEORETICAL BACKGROUND & CONCEPTUAL FRAMEWORK

Multi-sensory imagery can be seen as a complex cognitive process (Lacey & Lawson, 2014). In the first part of the current chapter (Section 2.1) this process will therefore be explained extensively. Next to that, attention will be given to other related processes, such as perception and mental imagery. Subsequently, an existing model, constructed by MacInnis and Price (1987), will be described (see Figure 2). This model has an important role, as it will be used as the base of the conceptual framework of the current study. In Section 2.2 to 2.4, more attention will be paid to this conceptual framework. In those Sections, the three different stages (antecedents, processes and consequences) of the framework will be explained in more detail, accompanied with the establishment of different hypotheses.

### 2.1. INTRODUCTION: THE COGNITIVE PROCESS OF MULTI-SENSORY IMAGERY

To ensure smooth interactions between a person and its environment, our mental system extracts information from the outside world (Lacey & Lawson, 2014). This process is possible because of *perception*: the identification, organization, classification and interpretation of sensory information (Lindsay & Norman, 2013). Put differently, our senses, which can be seen as the windows to the world, feed the brain with sensory information from the environment. Subsequently, the brain interprets this information and matches it with stored information, such as information about what has happened earlier (Lindsay & Norman, 2013). Mental imagery is often confused with this related process of perception, as imagery relies on the perceptual representations which make the same types of information accessible as registered during perception (Moulton & Kosslyn, 2011). However, despite perception and mental imagery share numerous common processes, they differ in their source (the senses and memory, respectively; Suess & Rahman, 2015; Morewedge et al., 2010). In other words, perception relies on information from the outside world (bottom-up), while mental imagery is created by processes in which information is retrieved and represent from the inside brain (top-down; Mechelli, Price, Friston, & Ishai, 2004). For that reason, during the mental imagery process, internal representations could be reactivated in the absence of retinal input (Ishai, 2010). This assumption has, among others, been proven by the case study of Behrmann, Winocur and Moscovitch (1992), in which they have found that patients with severe visual agnosia, so people who cannot recognize objects, actually can draw those objects with considerable details from memory. This could indeed suggest that mental imagery is different from perception.

Mental imagery is used in many processes of our daily life, especially when external stimuli are absent (Lacey & Lawson, 2014). An example of the use of this mechanism is by answering questions such as 'Is a hamster smaller than a mouse?'. By using mental imagery, those two animals can be seen 'with the mind's eye' (Ishai, 2010). In other words, mental representations are activated, which are similar to the visual representations that are formed when the physical object (such as the hamster or mouse) could really be seen (Lacey & Lawson, 2014). Based on the representation of the information in the working memory, a visual comparison between the mouse and the hamster can for example be made. Next to visual mental imagery, where most studies solely focus on, mental imagery also works for our other sense (i.e. taste, smell, hearing and touch; Ellen & Bone, 1991). More concrete, imagining going out for dinner can evoke visual imageries of the décor and the sight of the food, but when multi-sensory imagery is activated, also simulations of the taste, texture and smell of the food and the sound of the music which is played, can for instance be simulated. As described in Chapter 1, the simultaneous activation of these unique sensory imageries can be

defined as multi-sensory imagery, in short MSI (Lacey & Lawson, 2014; Stein et al., 2010).

The two above described mechanisms, mental imagery and multi-sensory imagery, will be in the remaining of this study used interchangeably, as some studies focus on mental imagery and others on multi-sensory imagery. Next to that, multi-sensory imagery can be seen as an example of the broader term mental imagery (see Figure 1) and for that reason, many processes are comparable.

Despite the fact that mental imagery is believed to occur even in the absence of external stimuli, research has shown that several stimuli, such as pictures or concrete words, could elicit mental imagery (MacInnis & Price, 1987). In their model for mental imagery, MacInnis and Price (1987) define these imagery-eliciting stimuli as the *antecedents* of the mental imagery process (see Figure 2). Besides this antecedents stage, they differentiate two other stages: the mediating mental imagery construct (*processing*) and the outcomes of mental imagery (*consequences*).

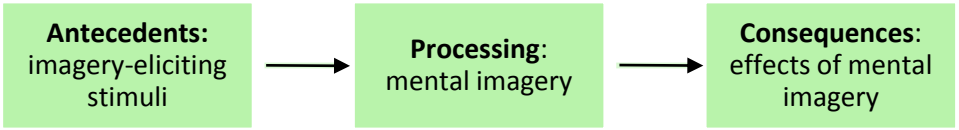


**Figure 2.** The mental imagery process, according to MacInnis and Price (1987).

In the current study, the mental imagery process described by MacInnis and Price (1987), will be used as a base. The imagery-eliciting stimuli where will be focused on in the antecedents phase of the current study will be verbal and visual stimuli. In the processing stage, attention will be paid to the multi-sensory imagery process. Finally, in the consequences stage, the influence on the consumption of- and choice for healthy foods will be studied. The therefrom resulting conceptual framework could be found in Figure 3. This framework will be used in the remaining of this study and will be more detailly explained in the upcoming sections.

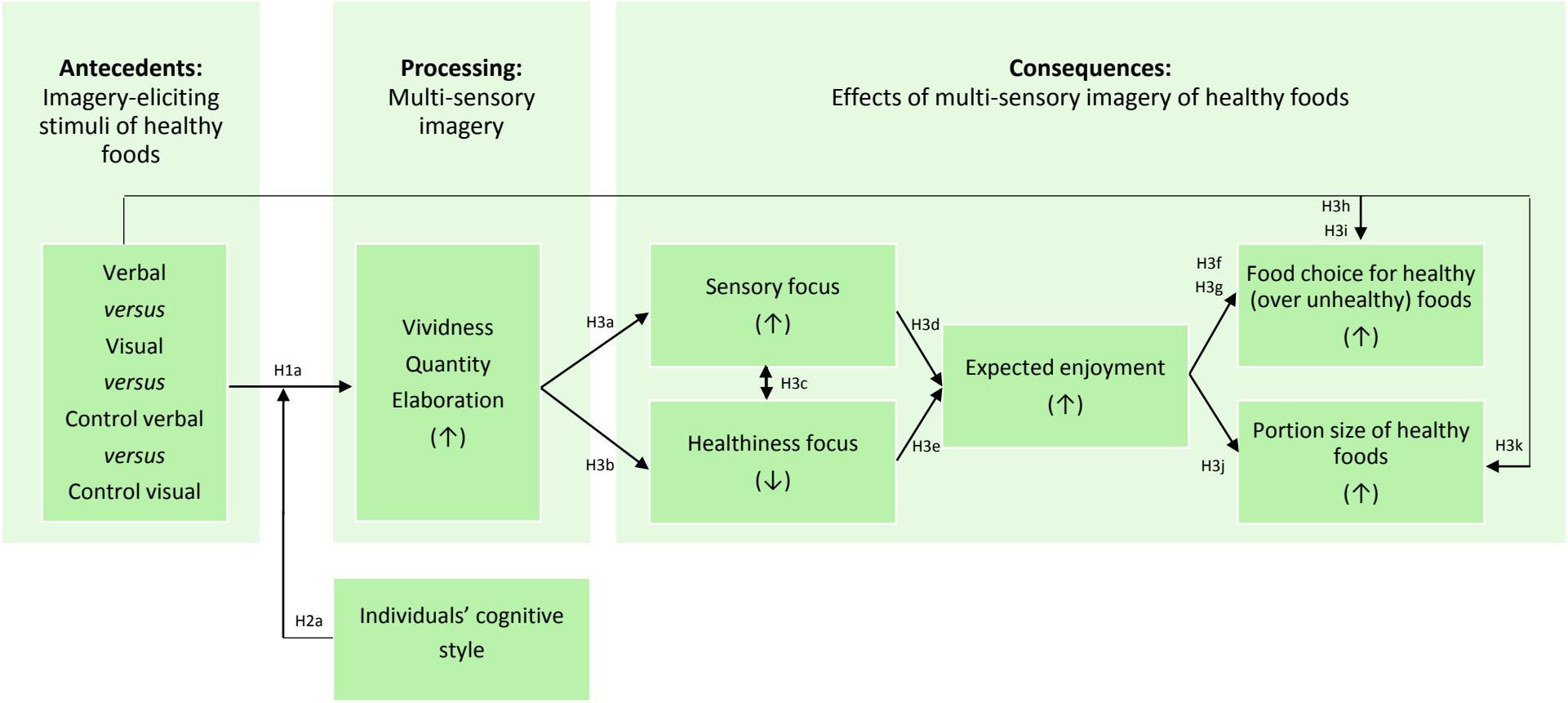


**Figure 3.** Conceptual framework of the impact of (verbal vs. visual vs. control verbal vs. control visual) imagery-eliciting stimuli on the multi-sensory imagery process and its consequences on the consumption of healthy foods.

## 2.2. THE IMPACT OF VERBAL VERSUS VISUAL STIMULI ON MULTI-SENSORY IMAGERY

In many advertisements, imagery stimuli are used as marketing tactic to evoke mental imagery (or multi-sensory imagery). For example, in a commercial of Disney (2013), consumers are stimulated to "*Imagine a place for family where everyone can relax or play*", Volkswagen (2014) fosters people to "*Imagine having one. A new Volkswagen*" and Barbie (2015) let girls "*Imagining everything they might one day become*". Also for food products, mental imagery can be applied. Consumers can for instance be instructed to imagine consuming a particular kind of food, such as *"Imagine the consumption of gummy bears"* (Missbach et al., 2014). In all examples described above, textual instructions are used to stimulate consumers to mentally imagine particular situations or products. One stream of mental imagery research heavily relies on this (textual) method, but also other methods to evoke mental imagery could be applied, such as using pictures (i.e. Paivio, 1969; Rossiter, 1982), concrete words (Rossiter, 1982; Lutz & Lutz, 1978) or guided imagery (Wollman, 1981). To compare those different imagery-eliciting methods, the current study will categorize the different stimuli as either verbal or visual stimuli.

To better understand the use of verbal and visual elements to evoke multi-sensory imagery, a clear distinction between those two stimuli has to be made. In the current study, v*erbal* stimuli will be defined as stimuli in which words are used, whether spoken or written (Bauman, 1975; Harper, 2013). The definition of *visual* stimuli will be based on research of Messaris (1997), who has described that visual communication can be distinguished most clearly from verbal by its combinations of lines, shapes and colours. This form of communication can include, among other things, sings, graphic designs, pictures and films (Messaris, 1997). Neuro-imaging studies have shown that verbal information in general resides in the left side of the brain, while brain regions in the right side of the brain are usually involved by visual information processing (Kraemer, Rosenberg, & Thompson-Schill, 2009; Kosslyn & Thompson, 2003; Smith & Jonides, 1998). Because verbal and visual thinking are processed differently, verbal and visual imagery-eliciting stimuli could probably differ in their effects on- and extent of multi-sensory imagery.

Prior to the investigation of the differences between verbal versus visual stimuli, it is important to make clear how imagery processing could be measured. Moreover, multi-sensory imagery can be seen as a latent construct and therefore, the measurement of this construct has found to be challenging (Babin & Burns, 1998). Many researchers are for that reason not able to measure imagery processing, but focus instead of this on the measurement of the independent and dependent variables of the imagery process. In case the independent variables, which are expected to stimulate imagery processing, have the hypothesized effects on the dependent variables, there is often assumed that mental imagery is activated (Babin & Burns, 1998). However, in this way it is unknown if the mental imagery construct is responsible for the mediating effect, or that other processes are activated.

Researchers such as Ellen and Bone (1991) and Babin and Burns (1998) have sought for possibilities to measure the mental imagery construct itself. According to Ellen and Bone (1991), and later on enhanced by Babin and Burns (1998), mental imagery comprises, and can be measured by three important components: vividness, quantity and elaboration (see Figure 3). Already since Galton (1883), *imagery vividness* has been identified as a major dimension of individual's intensity of mental

imagery. This construct can refer to both the degree of perceptual detail that is experienced when mentally imagining, as well as to the extent to which an individual's subjective experience of imagery is similar to actual perceptual experience (Oertel et al., 2009; Pearson, Beni & Cornoldi, 2001). For example, the more vividly someone is imagining eating a particular kind of food, the more clear the smell, taste and sight of this food is in that person's mind. Next to that, the more in line the presentation in his mind is with the presentation of that food if it would be physically presented. The next dimension proposed by Ellen and Bone (1991) is *imagery quantity*, which refers to the number of images that come to mind while processing information (McGill & Anand, 1989). For example, by imagining an apple, only one kind of apple can be imagined or several pictures of different apples or different pictures of that same apple can come to mind. Imagery quantity does not necessarily have to be related to the vividness of a mental image, as one particular individual may evoke only a single, very vivid image, while another for example may experience numerous images which may be much less vivid. The final dimension, *imagery elaboration,* could be defined as the activation of stored information, beyond what is provided by the stimulus (Babin & Burns, 1998). For instance, by imagining consuming strawberries, fantasies of those strawberries can come to mind, such as the consumption of them individually but also in combination with yoghurt or biscuits. In other words, this concept refers to the extent in which an individual, during mental imagery, can make linkages to the past and fantasies about the future, evoked by an imagery-eliciting stimulus. Thus, imagery elaboration describes that much of what is imagined, is constructed by the individual himself (MacInnis & Jaworski, 1989).

As verbal and visual imagery-eliciting stimuli are processed differently, they could have different effects on the vividness, quantity and elaboration of multi-sensory imagery. The nature of the mental presentation that is triggered by the stimulus and the manner in which it is processed can be explained by Paivio's dual-coding theory (see Figure 4), which is fully described in many of his articles and books (i.e. Paivio, 1965; 1969; 1990). This theory assumes that the human brain consist of two cognitive subsystems: one specialized in dealing with verbal processes (*logogens*) and one for the processing of non-verbal objects/events (*imagens*). As mentioned before, the current study is focussing on the differences between verbal and visual stimuli, instead of Paivio's distinction between verbal and non-verbal stimuli (Clark & Paivio, 1991). However, the effects of visual and non-verbal stimuli could in this case be comparable, as visual stimuli can be covered by the broader non-verbal category.

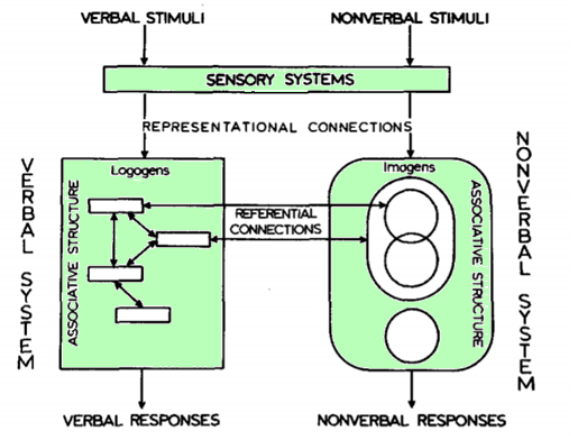


**Figure 4**. Model of dual-coding theory: units, connections and implied processes. Adapted from (Paivio, 1990).

Beside the two different subsystems in the dual-coding theory (the verbal and non-verbal subsystem), three different types of connections could be identified: representational, referential and associative connections (Clark & Paivio, 1991; Paivio, 2014; see Figure 4). Which connection/connections (representational, referential or associative) is/are activated by the verbal and visual imagery-eliciting stimuli, and what its effect is on the vividness, quantity and elaboration of that mental representation, is depending on several factors. Below, these different factors, such as level of concreteness, spontaneity and easiness, will be explained in more detail. Subsequently, in the last sub-section (Section 2.2.4) a comparison between the imagery-eliciting stimuli (verbal and visual) will be given, based on the different factors.

### 2.2.1. THE IMPACT OF CONCRETENESS OF THE MULTI-SENSORY IMAGERY STIMULI

An important determinant of imagery processing is the concreteness of the stimuli that is used to evoke mental imagery (Clark & Paivio, 1991). According to Paivio, Yuille and Madigan (1968) c*oncrete stimuli* can be defined as stimuli that refer to tangible objects, materials or persons. As its opposite, *abstract stimuli* can refer to more abstract, intangible concepts, which cannot be experienced by the senses. For example, objects such as an 'apple' or a 'tree' can be seen as concrete concepts, while words as 'success' or 'fear' are more abstract in their nature. The dual coding theory states that some concepts, especially abstract ones, are primarily represented in the verbal, instead of in the non-verbal system. In contrast, concrete ones can be represented in both the verbal and non-verbal system (Revlin, 2012). For example, you can think of the word 'success' verbally, but it is difficult to imagine a mental picture associated with it. On the other hand, thinking about concrete words, such as 'tree', might be both evoke a mental image as a verbal representation of that tree.

In addition to that, several research has demonstrated that the level concreteness of the stimuli has a strong influence on the associated imagery. First of all, according to Paivio and Marschark (1991), the more concrete the stimuli is, the more concrete and vivid imagery will be evoked. Next to that, McDaniel and Cornoldi (1991) have found that concrete stimuli elicit mental imagery much easier and faster than abstract stimuli. Thirdly, concrete stimuli elicit mental images that contain more instances than images evoked by more abstract stimuli (Stöber, 1998). Linking these findings to the fact that concreteness of the stimuli is generally greatest for pictures, less for concrete words and the least for abstract words (MacInnis & Price, 1987), there can be expected that visual stimuli elicit images with an increased vividness, higher speed and larger quantity, compared to verbal stimuli. In other words, as visual stimuli are generally more concrete than verbal stimuli, visual stimuli will, based on the higher level of concreteness, presumably evoke multi-sensory imagery to a greater extent than verbal imagery-eliciting stimuli (see Table 1).

### 2.2.2. THE IMPACT OF EASINESS OF THE MULTI-SENSORY IMAGERY STIMULI

In the context of cognitive psychology, research has generally shown that visual communication is more *easily* processed than verbal communication (i.e. Lutz & Lutz, 1978; Kaplan, Kaplan & Sampson, Jeffrey, 1968). The superior ability to process visual stimuli over verbal stimuli can be best explained by the *picture superiority effect*. This effect holds that individuals have an almost limitless visual memory, and therefore pictures tend to be remembered far better, easier and longer than words (Paivio, 1990; Madigan, 2014). Additionally, the verbal equivalent of a picture is mostly not a single word, but rather a whole story or a description (Lutz & Lutz, 1978), and for that reason, many researchers state that a picture is worth a thousand words (i.e. Hum et al., 2011; Ruef, 2008). As a result, in case for example pictures (compared to words) are used in advertisements, these are far more easily recognized again, due to the

consisting pictures an individual has in memory and which thus can be retrieved.

Next to that, the brain can process visual information much faster than verbal information (Paivio, 1990; Lacey & Lawson, 2014), which could explain why we often find ourselves re-reading the same sentence over and over again and still have no idea what we have actually read, while we can interpret a picture at a glance. In line with the findings described above, Babin and Burns (1998) are reasoning that if it is easier to stimulate mental imagery (which is presumably the case by using visual instead of verbal imagery-eliciting stimuli), more images may be stimulated as well (see Table 1). Moreover, they imply that easiness and quantity of mental imagery are highly correlated.

### 2.2.3. THE IMPACT OF SPONTANEITY OF THE MULTI-SENSORY IMAGERY STIMULI

Besides the level of concreteness and easiness of the stimuli, imagery-eliciting stimuli can differ on level of spontaneity. *Spontaneous* mental imagery can be described as the automatic sensory experience of something in someone's mind, without being instructed to evoke that mental image (Lacey & Lawson, 2014). For example, showing a picture of a chocolate cake can induce (multi-sensory) imagery in a more spontaneous manner than instructing consumers to imagine eating this cake (Xie et al., 2016). Spontaneous mental simulations can take place without consumers' awareness, while by contrast, instructed mental simulations are generally more conscious and effortful (Barsalou, 2008; Larson et al., 2014). Moreover, according to Lacey and Lawson (2014), the level of consciousness in which a mental image is processed may actually correspond to how vivid that image is. This can be explained by the fact that when an individual is aware of the mental imagery process, more information from long-term memory will be retrieved into consciousness (Marks, 1999). In other words, a higher level of imagery elaboration can take place. In this way, the more clear and detailed information will be loaded into the buffer, resulting in a more vivid image. Next to that, among others McGill and Anand (1989) have found that the use of imagery instructions could also result in a greater number of evoked scenes and inferred attributes (quantity). In sum, these argumentations can be applied to the current study by expecting that less spontaneous stimuli will be processed more consciously and the mental image will therefore be more vivid. However, no conclusions can be drawn about the difference in level of spontaneity between visual or verbal stimuli (see Table 1).

### 2.2.4. COMPARISON OF THE IMPACT OF VERBAL VERSUS VISUAL MULTI-SENSORY IMAGERY STIMULI

To sum up, verbal and visual stimuli can be distinguished on different aspects, such as the level of concreteness, spontaneity and easiness. Compared to visual stimuli, verbal stimuli are generally expected to have a lower level of concreteness and easiness to imagine (see Table 1). However, no binding distinctions between verbal and visual stimuli can be made on a level of spontaneity of the stimuli. For example, in case textual instructions are used to evoke multi-sensory imagery compared to showing pictures of food products without instructing the individual to imagine something, the visual stimuli can be estimated to be more spontaneous than the verbal stimuli. Nevertheless, it can also work the other way around by using instructing pictures versus spontaneous texts, or as a last option, both kinds of stimuli can even have the same level of spontaneity by using for example non instructing texts and pictures. For that reason, the level of spontaneity will be controlled in the current research, in a way that verbal and visual are equally spontaneous (see Table 1), to prevent an influence of this factor.

**Table 1.** Comparison of different factors of verbal versus visual stimuli and its impact on multi-sensory imagery (MSI).

| | **Verbal (versus visual) imagery-eliciting stimuli** | |
|---|---|---|
| | **Degree of different factors** | Impact on MSI |
| **Level of concreteness** | Less concrete → | Less impact on MSI |
| **Level of easiness** | Less easy processed → | Less impact on MSI |
| **Level of spontaneity** | Equally spontaneous → | Equal impact on MSI |

By keeping in mind that verbal (versus visual) imagery-eliciting stimuli are, from a theoretic perspective, found to be less concrete, less easily processed and equally spontaneous, visual stimuli will probably have a greater impact on evoking multi-sensory imagery than verbal stimuli (see Table 1). Moreover, in Section 2.2.1 there is explained that the more concrete the stimuli, the more vivid (Paivio & Marschark, 1991), the more easy and fast (McDaniel & Cornoldi, 1991) and the higher the quantity of the multi-sensory imagery that will be evoked. Next to that, in Section 2.2.2 there is described that pictures tend to be remembered far better, easier and longer than words. As a result, pictures are expected to be retrieved much easier and in a higher amount from memory (Paivio, 1990; Madigan, 2014; Babin and Burns, 1998). Based on that, the following hypothesis is proposed:

***Hypothesis 1a:*** *Visual multi-sensory imagery-eliciting stimuli will have a greater impact on eliciting multi-sensory imagery (vividness, quantity and/or elaboration) than verbal imagery-eliciting stimuli.*

## 2.3. THE MODERATING IMPACT OF INDIVIDUALS´ COGNITIVE STYLE

Next to the direct effects of imagery-eliciting stimuli on the extent of multi-sensory imagery that is activated, also moderating factors could have an influence. Individuals' difference in cognitive style is such a moderating factor. Moreover, a variation among individuals could be seen in the tendency and capacity to use (multi-sensory) imagery (Clark & Paivio, 1991). Some people may use imagery for example very easily and spontaneously under many conditions. At the same time, others could have a difficulty in activating the imagery process, which could result in an only rarely use of this process. The individual differences in the level of activation of imagery could be explained by the fact that each individual has his own unique cognitive style (Mendelson & Thorson, 2004). This cognitive style can be defined as variation in how individuals interact with their environment, extract, perceive and remember information from it, and organize this information in our mind (Jonassen & Grabowski, 1993; Riding, Burton, Rees & Sharratt, 1995). According to Mendelson and Thorson (2004), many different cognitive styles, such as reflective and impulsive processing, field independence and dependence, holistic and analytic processing, and visualizing and verbalizing cognitive styles can be distinguished. Especially the latter cognitive style is important for the current study.

Persons with a high verbalizer style are generally relying mostly on verbal material and showing high fluency with words. Contrary to that, a high visualizing cognitive style is characterized by being image oriented and therefore they process information mostly in a visual manner (Jonassen & Grabowski, 1993; Mendelson & Thorson, 2004). However, people do not necessarily have to be considered as either visually or verbally predisposed. They could also be a blend, or equally good in verbally as in visually processing (Marks, 1973).

From a theoretic perspective, there could be expected that an individual's cognitive style could influence the way that imagery-eliciting stimuli is processed. Moreover, individuals who are relying mostly on visual material (visualizers) will presumably produce multi-sensory imagery to a higher extent than individuals who are mostly relying on verbal material (verbalizers), or people who are relying on both verbal and visual elements. These findings can be explained by the fact that verbalizing modes of thinking take (mostly) place in the verbal subsystem, while visualizers mostly rely on the non-verbal subsystem, where multi-sensory imagery can be activated (see Figure 4). In other words, imagery-eliciting stimuli will be processed more easily by persons with a more visualizing cognitive style (in compare to those ones who have a more verbalizing cognitive style, see Figure 3). More formally:

***Hypothesis 2a****: The more an individual has a visualizing cognitive style (compared to a verbalizing cognitive style), the greater the impact of (both verbal and visual) multi-sensory imagery-eliciting stimuli on multi-sensory imagery will be.*

## 2.4. THE IMPACT OF MULTI-SENSORY IMAGERY ON THE CONSEQUENCES OF HEALTHY FOODS

As already described in Figure 2 and 3, in the framework for mental imagery three stages could be differentiated, namely the antecedents-, processing- and consequences stage. The first two stages are already covered by Section 2.2 and 2.3, whereas the current section will focus on the last stage of the framework (the consequences of multi-sensory imagery on healthy foods). In Sub-section 2.4.1. the consequences on the focus of healthy foods will be described. Subsequently, in Sub-section 2.4.2, the impact of multi-sensory imagery on individuals' expected enjoyment of the healthy foods will be explained. Finally, Sub-section 2.4.3 will give an overview of the impact on the food choice (what to eat) and portion sizes (how much to eat).

### 2.4.1. THE IMPACT OF MULTI-SENSORY IMAGERY ON THE (HEALTHINESS OR SENSORY) FOCUS OF HEALTHY FOODS

According to Xie et al. (2016), food products could either be chosen and evaluated for their process expectations or their outcome expectations. *Process expectations* can be defined as expectations about the product, which will be experienced during the consumption. Examples are smelling and tasting foods. At the other hand, *outcome expectations* can be seen as the results and outcomes of the consumption of the food. For example saturation of consumers' level of hunger or health benefits. Although consumption processes and outcomes are essential components of all food experiences, different food items can have varying strengths of process and outcome thoughts in a consumer's mind (Xie et al., 2016). In general, healthy food products are predominantly chosen for their end nutrition benefits (outcomes), while less healthy foods are mainly chosen based on expectations about the sensory enjoyment of those foods (process). For example, the consumption outcomes *attaining a good health* or *losing weight* are one of the main reasons to consume healthy foods. At the other hand, as more unhealthy foods lack such nutritional benefits, those products are mostly chosen for their *enjoyment*, the consumption process. When consumers evaluate healthy food products, they principally focus on health attributes instead of sensory attributes. However, with help multi-sensory imagery, consumers' focus could be driven away from the healthiness focus to a more sensory focus (as they are stimulated to focus on sensory attributes). In other words, multi-sensory imagery could probably increase the importance of sensory pleasure over the importance of other criteria, such as health concerns (see Figure 3). More formally:

***Hypothesis 3a:*** *The greater the multi-sensory imagery process, the greater individuals' sensory focus of healthy foods will be.*

***Hypothesis 3b:*** *The greater the multi-sensory imagery process, the smaller individuals' healthiness focus of healthy foods will be.*

Combining the two above mentioned hypotheses results in:

***Hypothesis 3c:*** *The greater individuals' sensory focus of healthy foods, the smaller their healthiness focus (and vice versa) will be.*

### 2.4.2. THE IMPACT OF MULTI-SENSORY IMAGERY ON THE EXPECTED ENJOYMENT OF HEALTHY FOODS

In the current era many healthy food items are labelled with logos declaring the products to be 'healthy' or 'good for you'. Therefore most consumers are able to categorise products on a dimension related to health benefits (Lobstein & Davies, 2009). However, the fact that consumers are able to indicate which products are healthy food choices and which are not, does not necessarily mean that they actually adapt (or not adapt, respectively) these products to their eating pattern. Moreover, most individuals do not include enough foods according to the dietary guidelines, such as a variety of fruits, vegetables and whole grains, or do include too many not recommended foods in their diet (U.S. Department of Health and Human Services, 2015).

According to Raghunathan, Naylor and Hoyer (2006) consumers' commonly unhealthy diet can be explained by the fact that people think that there is an inversely relationship between things that are, for example, 'healthy' and 'wholesome' and those that are 'fun' and 'satisfying'. For example, people generally estimate an attractive car which is fun to drive, such as a sports car, as less safe than an unattractive and less enjoyable car (Raghunathan et al., 2006). This theory can also be applied on food products. Most people estimate foods that are healthy as not tasty and products that are not healthy as tasty. Also Xie et al. (2016) have, in line with that, found that healthy food products are often expected as tasting plain and unpleasant. In other words, the healthier a food product is perceived to be, the less satisfying consumers expect the food to be, and vice versa. These food expectations could typically lead to unhealthy diets, in which people consume too many unhealthy- and too less healthy foods.

Raghunathan et al. (2006) suppose that missing attributes are the driving factors of people's 'unhealthy = tasty' intuitions. Moreover, in many cases, consumers do not exactly know how a food product will taste, so they evaluate the product on other characteristics. For example, if an individual has the choice between a salad or a piece of cake and he or she does not exactly know how the salad or the piece of cake would taste, the choice may be based on other factors, such as healthiness expectations or level of saturation. Therefore, based on tastiness evaluations, the cake will probably be chosen over the salad, as the unhealthy food is expected to be more tasty.

Multi-sensory imagery could possibly be an outcome to evade this 'healthy ≠ tasty' intuition. To clarify, in case multi-sensory imagery is stimulated, consumers' focus could be driven away from a healthiness focus to a more tastiness (or sensory) focus (see Sub-section 2.4.1). Consequently, when filling in the gab of missing attributes, consumers will rely more on sensory attributes instead of health attributes. Therewith,

the 'healthy ≠ tasty' intuitions could be evaded. Moreover, according to Raghunathan et al. (2006), consumers will expect the same food as more tasty when it is portrayed as less healthy, which could imply that multi-sensory imagery could possibly increase the expected enjoyment of the healthy food product. These predictions, which are also presented in Figure 3, could be formulated more formally as follow:

***Hypothesis 3d:*** *The greater individuals' sensory focus of healthy foods, the greater their expected enjoyment will be.*

***Hypothesis 3e:*** *The smaller individuals' healthiness focus of healthy foods, the greater their expected enjoyment will be.*

### 2.4.3. THE IMPACT OF MULTI-SENSORY IMAGERY ON THE CONSUMPTION OF HEALTHY (OVER UNHEALTHY) FOODS

As already described in Sub-section 2.4.1, food products are often chosen for their consumption goals, such as taste, nutritional benefits or prior habits (Xie et al., 2016; Bettman, Luce, & Payne, 1998). However, according to several researchers, from all consumption goals, enjoyment is suggested to be the most predominant reason for selecting a food (i.e. Tepper & Trail, 1998; Dhar & Simonson, 1999). In other words, enjoyment can be seen as a more salient choice attribute than for example health attributes. By linking these findings to the 'healthy ≠ tasty' inferences (see Sub-section 4.2.4), there can be expected that, the higher consumers' expected enjoyment of healthy foods, the higher their choice for those foods will be. Next to that, in case consumers have an option to choose between healthy and unhealthy food products, consumers who have higher enjoyment expectations of healthy foods will choose more often for healthy products over unhealthy products compared to consumers who have lower enjoyment expectations of those healthy foods. These expectations have resulted in the following hypotheses:

***Hypothesis 3f:*** *The greater individuals' expected enjoyment, the greater their choice for healthy products will be.*

***Hypothesis 3g:*** *The greater individuals' expected enjoyment, the greater their choice for healthy- over unhealthy foods will be.*

***Hypothesis 3h:*** *The greater the amount of (both verbal and visual) multi-sensory imagery-eliciting stimuli, the greater the choice for healthy foods will be.*

***Hypothesis 3i:*** *The greater the amount of (both verbal and visual) multi-sensory imagery-eliciting stimuli, the greater the choice for healthy over unhealthy foods will be.*

Next to the expectations of multi-sensory imagery (and the resulted increase in expected enjoyment) on *what* food consumers choose to eat, also expectations about *how much* consumers choose to eat can be made, in case those consumers have already made the decision about what they want to eat. Moreover, as already described in Chapter 1, Cornil and Chandon (2016) have found that multi-sensory imagery made (not-hungry and not-dieting) consumers choosing smaller portions of hedonic calorie-dense foods (chocolate cake). The proposed underlying mechanism for that finding is that multi-sensory imagery helps people to realize that sensory pleasure peaks at the first few mouthfuls and declines with each additional mouthful, as an extra bite is not surprising anymore (sensory-specific satiation). This explanation is also in line with research of Van Kleef et al. (2013), who have found that consumers' overall enjoyment can

rather be seen as the average pleasure experienced over all bites or even only the last bite, than an accumulation of pleasure from each bite.

Although the effect of multi-sensory imagery on portion sizes of unhealthy foods is already examined by Cornil and Chandon (2016), the effect on portion sizes of more healthy foods is still unexplored. For that reason, it could be interested to find out if multi-sensory imagery could have the dual advantage of decreasing portion sizes of unhealthy foods, while it at the same time increases the portion sizes of more healthy foods. However, so far known, until now there is a lack of academic literature about the effect of multi-sensory imagery on the portion sizes of healthy food products. Therefore, this effect will in the current study be predicted by use of logical reasoning.

The proposed effects of multi-sensory imagery on the portion sizes of unhealthy and healthy foods will be explained with help of an example. The daily diet of person X, who is a 'normal eater', which means that he/she is not dieting, hungry or manipulated by multi-sensory imagery, contains for example of 70% unhealthy food products and 30% more healthy food products (see Table 2). However, in the ideal situation, this diet would contain a smaller percentage of unhealthy foods and a larger percentage of healthy foods, as recommended by the Dietary Guidelines (2015 – 2020). As described in Chapter 1, according to Cornil and Chandon (2016), individuals who are manipulated to focus on multi-sensory imagery by choosing between portions of hedonic foods will realize that sensory pleasure peaks with smaller portions. Therefore, in case person X is manipulated to focus on multi-sensory imagery, he/she will probably choose smaller portions of hedonic foods than he/she would do in the 'normal' situation (see Table 2). At the other hand, in the case of more healthy food products, this process will presumably work the other way around. In the 'normal' situation, person X will evaluate the portion probably mostly on the benefits for his/her health, while in the multi-sensory imagery situation he/she will also expect enjoyment from eating this kind of food. For that reason, multi-sensory imagery will help the individual realize that the sensory pleasure of eating the healthy food will peak if he/she takes some additional bites. As a result, in case multi-sensory imagery is used, the diet of person X will relatively contain a smaller percentage of hedonic foods and a larger percentage of more healthy food products, compared to the 'normal' situation. For example 50% unhealthy foods instead of 70% and 50% healthy foods instead of 30% in the 'normal' situation (see Table 2).

**Table 2.** Exemplary % of healthy and unhealthy foods in diet of person X in normal- versus multi-sensory imagery situation.

| | **Healthy food products** | **Unhealthy food products** |
|---|---|---|
| **Normal situation** | 30 % | 70 % |
| **Multi-sensory imagery situation** | 50 % | 50 % |

Increasing effect

Decreasing effect

This prediction, which is also presented in Figure 3, could be formulated more formally as follow:

***Hypothesis 3j:*** *The greater individuals' expected enjoyment of healthy foods, the greater their portions sizes of those healthy foods will be.*

***Hypothesis 3k:*** *The greater the amount of (both verbal and visual) multi-sensory imagery-eliciting stimuli, the greater the portion sizes of healthy foods will be.*

In order to test all the hypotheses which are described in this chapter, the subsequent step is to collect

data. The upcoming chapter, Chapter 3, will describe what data is needed and how these data will be gathered.

## 3. PRE-TEST

Prior to the main study, a pre-test was carried out to test which (verbal and visual) imagery-eliciting stimuli, such as instructing texts, concrete words or pictures, could best be used for the different conditions during the main test. By investigating those different forms of imagery-eliciting stimuli, a special attention has been given to the spontaneity of the stimuli. In other words, the stimuli was pre-tested in order to identify if the verbal and visual stimuli were indeed equal on level of spontaneity (see Section 2.2.4). Besides the different forms of imagery-eliciting stimuli that were pre-tested, the pre-test was also conducted to find out which food products could be used during the main study.

### 3.1. PARTICIPANTS

The sample of the pre-test consisted of a total of 23 participants, from which 65,2% (*N* = 15) was female and 34,8% (*N* = 8) was male. The average age was 27.0 years (*SD* = 8.8), ranging from 21 to 56 years old. The participants were recruited through an email invitation or via announcements on social media. Their participation was voluntary and anonymous. No further information about the purpose of the study was given.

### 3.2. IMAGERY-ELICITING STIMULI

Participants evaluated six different imagery-eliciting stimuli, from which three verbal and three visual stimuli (see Table 3). Each of these stimuli, which were retrieved from different sources, will be defined and described in turn.

**Table 3.** Used (verbal and visual) imagery-eliciting stimuli for the pre-test.

| Verbal imagery-eliciting stimuli | Visual imagery-eliciting stimuli |
|---|---|
| Concrete words | Food pictures |
| Textual instructions to imagine | Food pictures and food rating |
| Sensory descriptions | Food pictures with sensory focus |

#### 3.2.1. CONCRETE WORDS

According to several researchers (i.e. Paivio & Csapo, 1973; Paivio et al., 1968) *concrete words* are a useful method to evoke mental imagery. Moreover, the higher the rate of concreteness of the words, the higher the rate of imagery (Paivio et al., 1968). For that reason, words that are most concrete as possible, such as ‘apple’ or ‘chocolate’, were used for this pre-test, to find out if they had the desired effect on evoking multi-sensory imagery.

#### 3.2.2.TEXTUAL INSTRUCTIONS TO IMAGINE

Recently, several studies have used *textual instructions* to evoke mental imageries of consuming particular kind of foods (i.e. Cornil & Chandon, 2016; Missbach et al., 2014; Morewedge et al., 2010). In most of these studies, participants were asked to take a look at pictures of food, followed by being instructed to imagine the food’s taste, smell and texture as vividly as possible. Based on these studies, the same kind of instructions were used during the pre-test of the current study. However, to maintain the stimuli completely verbal, the instructions were not accompanied with pictures.

### 3.2.3. SENSORY DESCRIPTIONS

The third verbal stimuli that was tested during the pre-test are sensory descriptions. Lately, those descriptions are becoming more and more popular, as they are found to be a goldmine to charm the human senses (Swahn, Mossberg, Öström, & Gustafsson, 2012; Wansink, Painter, & Ittersum, 2001). Moreover, instead of concentrating solely on sight and hearing, which can be seen as our higher senses, many food companies have found out that it is also worth trying to take advantage of the other senses, such as the taste, feeling and smell (Hultén, Broweus, & Dijk, 2009). The wine industry is a good example where sensory descriptions are used, by establishing a sensory language and methods for describing the product's sensory characteristics (Herdenstam, Hammarén, Ahlström, & Wiktorsson, 2009). This type of language is used in marketing in many ways to influence and communicate. For example in advertisements, on bottle labels, on restaurant menus, by sommeliers, in beverage stores and so on. Recently, this method is also used for other food categories, such as for different kind of apples (Swahn et al., 2012). In their study, Swahn et al. (2012) promote the sales of the well-known Jonagold apple for example with help of the following description: "*High odour intensity in peel and flesh, odour of pear. Very Juicy and tender, some mealiness, low chewing toughness. Sweet apple, low acidity, flavour or pear, quite high flavour intensity*.". As far as known, this method is not yet used to evoke multi-sensory imagery. Therefore, the pre-test had to find out if sensory descriptions are a useful method to evoke multi-sensory imagery.

### 3.2.4. FOOD PICTURES

Many researchers, such as Xie et al. (2016) and Larson et al. (2014) are using food pictures to stimulate multi-sensory imagery. In these example studies, clear pictures of healthy or unhealthy foods were used. When someone, according to Larson et al. (2014), is seeing a picture of a particular kind of food and evaluating that food as looking appetizing, that evaluation relied on a sensory simulation of the taste of the pictured food. For that reason, they propose that this kind of mental imagery is much like actually consuming the food, which implies that food pictures could be a useful method to evoke mental imagery.

### 3.2.5. FOOD PICTURES AND FOOD RATING

Instead of solely focussing on the visual characteristics of the pictured food, in the *food pictures and food rating* condition attention was also be paid to the evaluation of the food. According to Larson et al. (2014), by using the simple task of evaluating food pictures, such as "please rate how appetizing you find this picture", the taste centres of the brain are stimulated to evaluate the food in a nonconscious way.

### 3.2.6. FOOD PICTURES AND SENSORY FOCUS

Another method to put consumers in a sensory imagery mindset, without implicitly instructing them to do so, could be by showing them pictures that stimulate the participant to focus on sensory evaluations. Moreover, the *food pictures with a sensory focus* are containing a representation of the particular kind of food, combined with a sensory activity, such as smelling, touching or tasting the food. So far known, this method has not been studied yet, so the pre-test had to prove if *food pictures with a sensory focus* is a useful method to evoke multi-sensory imagery.

## 3.3. FOOD STIMULI

Beside the different forms of verbal and visual imagery-eliciting stimuli that had a need to be pre-tested, it was important to find out which *food products* were most applicable to the current study. During the main study, food products will be used for two different purposes and will be shown at two different moments. Firstly, at the start of the main study, to evoke multi-sensory imagery, and later on, to evaluate participants' final food choices (what to eat and how much to eat). As target product for all food products during the main study, there was chosen to use ready-to-eat snack foods. Those foods can be described as foods that are consumed between the traditional three meals a day and which do not have to be prepared (Forbes, Kahiya, & Balderstone, 2016). There was chosen to use those kind of products, as snacking has become increasingly common in the current society and is a major component of modern eating behaviour (McGill & Appleton, 2009; Piernas & Popkin, 2010). Next to that, there are various times during the day or night and various situations or locations in which they can be consumed (Cross, Babicz, & Cushman, 1994). This can be an advantage for the current study, as the study in that way could be carried out at different times and locations.

There is chosen to use malleable food products at the start of the main test. Those foods can be defined as products that either can be categorized as healthy as unhealthy. Moreover, those products can be seen as healthy foods as they contain some healthy elements (i.e. fruits or vegetables), but because of their indulging character they can also be seen as unhealthy foods. Examples of those malleable snacks are veggie chips or cookies filled with small pieces of fruit. There is chosen to use malleable foods instead of foods that per definition could be categorized as healthy or unhealthy to avoid triggering a particular focus (i.e. healthiness- or sensory focus, see Sub-section 2.4.1).

Contradictory to the malleable foods, later on during the study typical healthy and unhealthy snack products will be used. Those foods can either be categorized as healthy or as unhealthy, but they do not fit in both categories at the same time. In other words, they do contain the healthy character but not the indulging character, or the other way around.

Before malleable-, healthy- and unhealthy snacks could be found, it was important to come up with a clear definition of what can be seen as malleable-, healthy- and unhealthy foods. Although it sounds like a fairly simple question what foods can be labelled as 'healthy' and which ones as 'unhealthy' foods, research has shown that this definition turns out to be not that simple, as various factors may influence the healthy/unhealthy categorization of foods (Hawkes, 2009; Lobstein & Davies, 2009; Jong, 2018; Carels, Konrad, & Harper, 2007). Foods rich in fats, sugars and salt make it for an individual overall hard to meet the healthy eating guidelines. Those kind of foods are for that reason distinguished as more unhealthy foods, which should be consumed less frequently (Lobstein & Davies, 2009). In line with that, the current study has categorized the healthy and unhealthy snacks that are used on the basis of the criteria of the Ik Kies Bewust foundation, Het Vinkje. This foundation aimed to make the healthy choice the easy choice, by using positive front-of-pack logos on those food products that are found to be a more healthy- or conscious choice, in their product category. Since October 2018, those logos are not used on packages anymore, as they would lead to confusions among consumers, but the criteria to define healthy and unhealthy products could still be used (Consumentenbond, 2017). The criteria to acquire Het Vinkje are based on independent scientists and international dietary guidelines and are different for each food-group (Stichting Ik Kies Bewust, 2015). According to these criteria, snack products that earn 'Het Vinkje' contain limited amounts of saturated fats, sugar and salt, and next to that, less than 110 kcal per portion

(see Table 4).

**Table 4.** Criteria to acquire 'Het Vinkje' in the product category of snacks, according to Stichting Ik Kies Bewust (2015)

| Criteria | Maximum amounts |
|---|---|
| **Saturated fat** | ≤ 6.0 g/100 g |
| **Trans fat** | ≤ 0.2 g/100 g |
| **Salt (natrium)** | ≤ 1.0 g/100 g (≤ 0.4 g/100 g) |
| **Added sugars** | ≤ 20.0 g/100 g |
| **Energy** | ≤ 110 kcal/portion |

### 3.3.1. FOOD PRODUCTS TO EVOKE MULTI-SENSORY IMAGERY (MALLEABLE FOODS)

As can be seen in Figure 3, the participants of the main study will be divided into four different conditions: the verbal-, the visual-, the control verbal- and the control visual condition. During the main study, participants of the first two conditions have to evaluate a malleable food product, to evoke multi-sensory imagery. The same food product will be used will for both conditions, but the representation will be varying (a verbal representation versus a visual representation).

During the pre-test, participants evaluated four different malleable foods, from which two sweet- and two savoury snacks (see Table 5). With help of the pre-test, two products (one sweet and one savoury) were chosen to use during the main study, based on participants' (perceived healthiness) evaluations of- and familiarity with the products.

**Table 5.** Examined (savoury and sweet) malleable snacks during the pre-test.

| Sweet malleable food products | Savoury malleable food products |
|---|---|
| Oat cookies cranberry | Mixed nuts |
| Banana chips | Veggie chips |

### 3.3.2. FOOD PRODUCTS TO EVALUATE THE FINAL FOOD CHOICES

Next to the malleable food products, also healthy and unhealthy snacks were used to evaluate participants' final food choices (see Figure 3). In other words, by using those products, the effects of multi-sensory imagery on consumers' choices about what to eat and how much to eat could be examined. The pre-test was carried out to find out which products were most applicable for the different food categories (healthy versus unhealthy snacks). During the pre-test, participants evaluated a total of sixteen different ready-to-eat snack foods, from which four healthy- and sweet snacks, four healthy- and savoury snacks, four unhealthy- and sweet snacks and four unhealthy- and savoury snacks (see Table 6). As mentioned in Section 3.3, those foods were selected on the basis of the 'Ik kies bewust' criteria (see Table 4). With help of the pre-test, there could be found out if participants categorized the healthy and unhealthy products in line with those criteria, and next to that, if they were familiar with the different food items. Based on these evaluations, eight snacks were selected to use during the main study, from which two healthy- and sweet snacks, two healthy- and savoury snacks, two unhealthy- and sweet snacks and two unhealthy- and savoury snacks.

**Table 6.** Examined (healthy and unhealthy) food products during the pre-test, based on the 'Ik kies bewust' criteria (per standard portion size).

| **Healthy food products** | | **Unhealthy food products** | |
|---|---|---|---|
| **Sweet** | Savoury | Sweet | Savoury |
| Strawberries (125 g) | Snack tomato (200 g) | M&M's peanut (44 g) | Sausage roll (70 g/1 roll) |
| Watermelon (150 g) | Snack cucumber (200 g) | Apple pie (125 g) | Lays paprika chips (30 g) |
| Peijnenburg Zero% sugar (30 g/1 slice) | Crespini breadstick rosemary (25 g) | Ben & Jerry Ice cream Cookie dough (150 ml) | Duyvis cocktail nuts (30 g) |
| Apple chips (25 g) | Snack a jack crispy cheese (25 g/1 package) | Redband winegum (50 g) | Cheese cubes 48+ (50 g) |

## 3.4. PROCEDURE

Participants were asked to fill out an online questionnaire (see Appendix I). This questionnaire contained four parts: 1) introduction and instructions, 2) questions about the different imagery-eliciting stimuli, 3) questions about the different food products and 4) general questions, such as gender and age. The questionnaire was identical for all 23 participants of the pre-test.

## 3.5. MEASURES

The different imagery-eliciting stimuli (see Table 3) were evaluated with help of two different focus points: 1) the extent of multi-sensory imagery they evoked, and 2) the level of spontaneity of the different stimuli. To evaluate the food products, attention was paid to: 1) participants' perceived healthiness of the different snacks, and 2) their familiarity of- and prior experience with the food products (see Table 5 and 6).

### 3.5.1. MULTI-SENSORY IMAGERY PROCESSING

The multi-sensory imagery construct can be measured with help of three important components: vividness, quantity and elaboration (see Section 2.2). Based on the studies of Ellen and Bone (1991) and Babin and Burns (1998), those three different constructs were in the current study measured by the six items which can be found in Table 7 and Appendix I. All different items were measured on a 7-point Likert scale (not at all – extreme), and one of them was reverse scored afterwards. With help of Cronbach Alpha there could be measured if the two items for the different components could be combined in a single scale. For the component vividness, a Cronbach's Alpha of .972 was calculated and for the components quantity and elaboration, a Cronbach's Alpha of respectively .588 and .959 was found. In other words, in case of the vividness and elaboration of multi-sensory imagery, the two items could be combined. However, whereas the threshold for Cronbach's Alpha is 0.7 (Nunnally, 1967), the two items for quantity have to be analysed separately in the remainder of the study.

### 3.5.2. SPONTANEITY

Besides the measurement of the extent of imagery processing (vividness, quantity and elaboration) which has been evoked, also the level of spontaneity of the different stimuli has been measured. The measurement of spontaneity has been based on research of Brysbaert, Warriner and Kuperman (2014), in which they first used some instructions to explain the concepts, followed by a measurement (rating) of those concepts (see Table 7 and Appendix I). For the explanation of *spontaneous mental imagery,* the definition of Lacey and Lawson (2014) was used: "the automatic sensory experience of something in someone's mind, without being instructed to evoke that mental image". The item "*The stimuli was spontaneous"* was measured on a 7-points Likert scale (not at all – extreme).

**Table 7.** Different items to measure the vividness, quantity and elaboration of the multi-sensory imagery process, according to Ellen and Bone (1991) and Babin and Burns (1998). Next to that, one item to measure the spontaneity of the stimuli, based on research of Brysbaert, Warriner and Kuperman (2014).

| Vividness | Quantity | Elaboration | Spontaneity |
|---|---|---|---|
| The imagery that came up in my mind was clear | I really only experienced one image* | I fantasized about the product | The stimuli was spontaneous |
| The imagery that came up in my mind was vivid | I imagined a number of things | I imagined what it would be like to use the product | |

* Item is reverse scored.

### 3.5.3. PERCEIVED HEALTHINESS

The perceived healthiness of the healthy-, unhealthy- and malleable snack products was measured with help of three items, based on research of Provencher, Polivy and Herman (2009) and Weijzen (2008; see Table 8 and Appendix I). All statements were measured on a 7-point Likert scale (not at all – extreme). Given the high reliability ($\alpha$ = .962), the three items could be combined in a single scale for perceived healthiness.

### 3.5.4. FAMILIARITY AND PRIOR EXPERIENCE

With respect to the development of mental imageries, the dual-coding theory (see Figure 4) explains that individuals' familiarity with the stimuli could influence the degree of imagery activation. Moreover, Rigney and Lutz (1976) have among others found that imagery is not effective in case individuals face difficult concepts or when they lack experience with those concepts. For example, many people are not familiar with the word 'ferrule' or a visual presentation of this object, which may impeded their ability to generate meaningful mental images. Next to that, in case another person, in contrast to most people, is familiar with the stimuli, this could also influence the activation of mental imagery compared to individuals who lack experience with the stimuli. Therefore, it is important to control the influence of the familiarity of and prior experience with the stimuli, by making sure that the used food products are (equally) known among individuals.

Based on research of Raudenbush and Frank (1999), three items were used to measure participants' familiarity with the different snack products (see Table 8 and Appendix I). All three items were measured with help of a 7-point Likert scale (not at all – extreme). A Cronbach's Alpha of .914 was calculated for the items 'I am familiar with the snack product' and 'I have prior experience with the snack product', so these

items could be analysed as a combined factor. The item 'My prior experience with the food product is positive' will be used as a single item, as this item is measuring a different construct (the value of the prior experience and not the amount of prior experience).

**Table 8.** Different items to measure the perceived healthiness, familiarity and prior experience of the different (malleable-, healthy- and unhealthy-) food products, based on research of Provencher, Polivy and Herman (2009), Weijzen (2008) and Raudenbush and Frank (1999).

| Perceived healthiness | Familiarity and prior experience |
|---|---|
| This snack product is a more healthy option in the snack product category | I am familiar with the snack product |
| I consider this snack as appropriate in the healthy snack category | I have prior experience with the snack product |
| If I would eat this snack regularly, this will not negatively affect my weight and health | My prior experience with the food product is positive |

## 3.6. DATA ANALYSIS AND RESULTS

### 3.6.1. IMAGERY-ELICITING STIMULI

To find out which forms of verbal and visual imagery-eliciting stimuli could be best used for the different conditions during the main test, the spontaneity and extent of multi-sensory imagery (vividness, quantity and elaboration; Ellen and Bone, 1991; Babin and Burns, 1998) have been measured. In the verbal category, 'textual instructions to imagine' have the highest total MSI-score (total MSI: 16.45; see Table 9). For visual stimuli, the highest total MSI-score was for 'food pictures with sensory focus' (total MSI: 15.75). In other words, based on the amount of multi-sensory imagery that is evoked by the different stimuli, the 'textual instructions to imagine' can be used best for the verbal category, and 'food pictures with sensory focus' can be used best for the visual category.

However, next to the total MSI-score, also the level of spontaneity is an important factor to take into account. As described in Section 2.2.3, the level of spontaneity of the stimuli may influence how vivid the mental image is in someone's mind (Lacey and Lawson, 2014). To check if there was indeed an influence of this factor, a simple linear regression was calculated (independent variable: spontaneity of the stimuli, dependent variable: vividness of the image). The test has shown a significant regression equation ($F$ (1, 136) = 6.561, $p$ = .012), with an $R^2$ of .046. Moreover, the vividness of participants' mental image could be predicted as follow: 5.762 - 0.186 (level of spontaneity), in case both variables are measured on 1-7 point Likert scale. In other words, a significant (negative) relation between the level of spontaneity and the level of vividness of the mental image was found, which is in line with research from Lacey and Lawson (2014).

Based on those findings, it is preferred to find a verbal and visual stimuli which are comparable at the level of spontaneity (to overcome an influence of this factor). An independent samples t-test was conducted to compare the level of spontaneity of the verbal and visual stimuli with the highest total MSI-score ('Textual instructions to imagine' and 'Food pictures with sensory focus'). The 'Food pictures with sensory focus' ($M$ = 3.445, $SD$ = 1.161) reported a significantly higher level of spontaneity than the 'Textual instructions to imagine' ($M$ = 2.304, $SD$ = 1.146), $t$ (44) = -3.324, $p$ = .002. Despite these significant

results, there is chosen to use the verbal and visual stimuli mentioned above. This choice can be underpinned by fact that the influence of spontaneity is already party included in the calculation of the MSI (Lacey and Lawson, 2014). In addition to that, the score of MSI weights in the current study heavier than the score of spontaneity, as MSI is the independent variable of the main study. However, in order to check if the imagery-eliciting stimuli is working in the intended way (without influence of the spontaneity factor), a manipulation check has to be executed during the main study.

**Table 9.** Evaluation of different imagery-eliciting stimuli, by measuring the means (SD) of the vividness, quantity, elaboration and spontaneity of the stimuli, on 7-point Likert scale (not at all – extreme).

| | Spontaneity | Vividness | Quantity (one image) | Quantity (number of things) | Elaboration | Total MSI* |
|---|---|---|---|---|---|---|
| **Concrete words** | 4.6 (1.8) | 3.6 (1.3) | 3.7 (1.8) | 3.0 (1.8) | 3.3 (1.6) | 10.25 |
| **Textual instructions to imagine** | 2.3 (1.1) | 5.5 (1.3) | 5.3 (1.7) | 5.0 (1.9) | 5.8 (1.5) | 16.45 |
| **Sensory descriptions** | 2.0 (0.8) | 5.2 (1.4) | 4.4 (2.1) | 4.6 (2.1) | 5.5 (1.8) | 15.20 |
| **Food pictures** | 4.4 (1.6) | 5.0 (1.4) | 3.2 (1.9) | 2.9 (1.3) | 4.6 (1.6) | 12.65 |
| **Food pictures and food rating** | 3.7 (1.6) | 5.9 (1.0) | 3.4 (1.9) | 3.5 (1.6) | 5.5 (1.5) | 14.85 |
| **Food pictures with sensory focus** | 3.4 (1.2) | 5.5 (1.1) | 5.0 (2.0) | 4.7 (1.9) | 5.4 (1.5) | 15.75 |

* Total MSI can be calculated by taking the sum of vividness, (average) quantity and elaboration. An average is taken from the two different constructs that were measuring the quantity of multi-sensory imagery (quantity (on image) and quantity (number of things)) that is evoked by the stimuli.

### 3.6.2. FOOD STIMULI

As described in Section 3.1.2, during the pre-test, different food products had to be found to use in the verbal and visual conditions of the main study. From the total (20) of products: two malleable snacks (one sweet and one savoury), four healthy snacks (two sweet and two savoury) and four unhealthy snacks (two sweet and two savoury) had to be chosen. The products were compared on level of perceived healthiness, prior experience/familiarity and positive/negative experience (see Table 10).

Based on the results which are showed in Table 10, the following products will be used during the main test: 'Banana chips' (sweet malleable snack product category), 'Mixed nuts' (savoury malleable snack product category), 'Strawberries' and 'Watermelon' (sweet healthy snack product category), 'Snack tomato's' and 'Snack cucumbers' (healthy savoury snack product category), 'M&M's peanut' and 'Apple pie' (sweet unhealthy snack product category) and 'Lay's paprika chips' and 'Cheese cubes' (unhealthy savoury snack product category).

**Table 10.** Evaluation of different (malleable-, healthy and unhealthy-) snack products by measuring the means (SD) of the perceived healthiness, prior experience/familiarity and positive/negative experience, on a 7-point Likert scale (not at all – extreme) and comparing those means with an ideal score.

| | Perceived healthiness | Prior experience/ familiarity | Positive/ negative experience | Total difference compared to I* |
|---|---|---|---|---|
| **Sweet malleable snacks (I)*** | 4 | 7 | 7 | 0 |
| • **Oat cookie cranberry** | 2.2 (1.0) | 5.0 (1.4) | 5.3 (1.5) | 5.5 |
| • **Banana chips** | 4.1 (1.0) | 4.5 (1.5) | 4.6 (1.4) | 5.0 |
| **Savoury malleable snacks (I)*** | 4 | 7 | 7 | 0 |
| • **Mixed nuts** | 5.4 (0.9) | 5.7 (0.9) | 5.4 (1.0) | 4.3 |
| • **Veggie chips** | 4.1 (1.4) | 4.3 (1.5) | 4.7 (1.6) | 5.1 |
| **Sweet healthy snacks (I)*** | 7 | 7 | 7 | 0 |
| • **Strawberries** | 6.2 (1.6) | 6.7 (0.5) | 6.7 (0.4) | 1.4 |
| • **Watermelon** | 6.6 (0.6) | 6.8 (0.4) | 6.2 (1.2) | 1.4 |
| • **Peijnenburg Zero%** | 4.4 (1.0) | 5.2 (1.4) | 5.0 (1.2) | 6.4 |
| • **Apple chips** | 4.6 (1.6) | 3.4 (1.7) | 4.0 (1.6) | 9.0 |
| **Savoury healthy snacks (I)*** | 7 | 7 | 7 | 0 |
| • **Snack tomato** | 6.5 (1.3) | 6.6 (0.6) | 5.7 (1.2) | 2.2 |
| • **Snack cucumber** | 6.4 (1.3) | 6.4 (0.7) | 5.7 (1.2) | 2.5 |
| • **Crespini breadstick rosemary** | 3.6 (1.1) | 3.5 (1.5) | 3.8 (1.5) | 10.1 |
| • **Snack a jack crispy cheese** | 3.7 (1.5) | 5.0 (1.3) | 5.1 (1.5) | 7.2 |
| **Sweet unhealty snacks (I)*** | 1 | 7 | 7 | 0 |
| • **M&M's peanut** | 1.1 (0.3) | 6.3 (0.7) | 5.9 (1.4) | 1.9 |
| • **Apple pie** | 1.4 (0.9) | 6.2 (0.9) | 6.0 (1.2) | 2.2 |
| • **Ben & Jerry's Cookie dough** | 1.1 (0.3) | 5.6 (1.5) | 5.8 (1.6) | 2.7 |
| • **Redband winegums** | 1.4 (0.6) | 5.2 (1.0) | 4.0 (1.4) | 5.2 |
| **Savoury unhealthy snacks (I)*** | 1 | 7 | 7 | 0 |
| • **Sausage roll** | 1.1 (0.4) | 5.5 (1.4) | 4.7 (1.8) | 3.9 |
| • **Lays paprika chips** | 1.1 (0.3) | 6.3 (0.8) | 5.6 (1.2) | 3.2 |
| • **Duyvis cocktail nuts** | 1.7 (0.5) | 5.7 (1.0) | 4.8 (1.3) | 4.2 |
| • **Cheese cubes** | 2.1 (0.8) | 5.9 (1.4) | 5.4 (1.8) | 3.8 |

***** An ideal level (I) has been constructed (based on a 7-point Likert scale) to compare the products on level of perceived healthiness, prior experience/familiarity and positive/negative experience. The total difference compared to I can be calculated by summing up the differences between the measured means of the single products and the ideal means. For example, the sweet malleable snacks have an ideal score of 4 on perceived healthiness (as malleable foods are foods that not per definition could be categorized as healthy or unhealthy), 7 on prior experience/familiarity and 7 on positive/negative experience. Comparing those scores with for instance the scores of 'Oat cookie cranberry', shows in a

score on total difference of 5.5, compared to the ideal. To clarify, the perceived healthiness shows a difference of 1.8 (4.0 – 2.2), the prior experience/familiarity a difference of 2.0 (7.0 – 5.0) and the positive/negative experience a difference of 1.7 (7.0 – 5.3). Summing up those three numbers gives a total score of 5.5. The same calculations can be applied to all other food products. Based on those calculations, the products with the best scores (the scores closest to the ideal score, so the ones closest to zero) could be chosen.

# 4. METHODS

This chapter will offer an outline for the methodology that was used for the main study, to test the hypotheses and answer the research question (see Chapter 2). The participants, design, procedure and measurement methods will be discussed.

## 4.1. PARTICIPANTS

A total of 293 persons participated in this study. From this total, 42 participants failed to respond to all items, so their data was not included in the analyses. Based on that, the final sample of the main test consisted of a total of 251 participants, from which 76,9% (*N* = 193) was female, 22,7% (*N* = 57) was male and 0.4% (*N* = 1) preferred not to say (see Table 11). The average age was 44.4 years (*SD* = 18.7), ranging from 17 to 82 years old. Both a Dutch and an English version of the questionnaire was released, which had to ensure that participation was not only limited to Dutch people. In order to prevent the sample from containing too many students of Wageningen University, most participants were selected from a more unbiased, online adult panel. Moreover, the student population of Wageningen University is generally relatively healthy, which could have an influence on the outcomes. Participants of the panel were recruited through an email invitation (see Appendix II). The other participants were recruited through announcements on social media. No further information about the purpose of the study was given. Next to that, participation was voluntary and anonymous. To compensate their participation, participants had a chance to win a (€25,- bol.com) voucher. The participants were randomly assigned to one of the four conditions (*verbal condition, visual condition, verbal control condition and visual control condition*).

**Table 11.** Overview of total amount of participants and their gender and age.

| | |
|---|---|
| **Total (N)** | 251 |
| **Gender (N)** | |
| **Male** | 57 (22.7%) |
| **Female** | 193 (76.9%) |
| **Prefer not to say** | 1 (0.4%) |
| **Age in years (M)** | 17 – 82 |

## 4.2. DESIGN

In order to test the predictions and answer the research questions, a survey in the form of an online questionnaire has been done. This cross-sectional design study (see Table 12) was distributed and administrated online by using the Qualtrics software (version 24). For all analyses, the rejection level was set at $p = .05$.

**Table 12.** Cross-sectional design (conditions).

| | Verbal | Visual |
|---|---|---|
| **Manipulation (multi-sensory imagery)** | Textual instructions to imagine | Food pictures with sensory focus |
| **Control** | Verbal control | Visual control |

## 4.3. STIMULI

Based on the pre-test, ten different snack products were selected to use during the pre-test (see Section 3.6.2). To specify, banana chips and mixed nuts were used as malleable foods in the verbal and visual condition. The other eight foods (strawberries, watermelon, M&M's peanut, apple pie, Lay's paprika chips and cheese) were used later on in the study to measure participants' food choices.

## 4.4. PROCEDURE

As the survey of the current research was online, no particular location was linked to the study. In other words, participants could choose themselves when and where they would like to fill it out. The questionnaire contained of six parts (see Figure 5): 1) introduction and instructions, 2) questions about participants' emotional state and level of satiety/hunger, 3) either manipulation- or control questions, 4) food choices in buffet-form, 5) questions about the motivation to choose the particular food product and 6) general questions, such as gender, age and cognitive style. Except the manipulation part, all questions were identical for the total 251 participants of the main test. Each question had a forced response and the participants were not able to go back to the previous page. They had as much time as they wanted to complete their response, but their participation took on average around eight minutes. The exact questionnaire can be found in Appendix III.

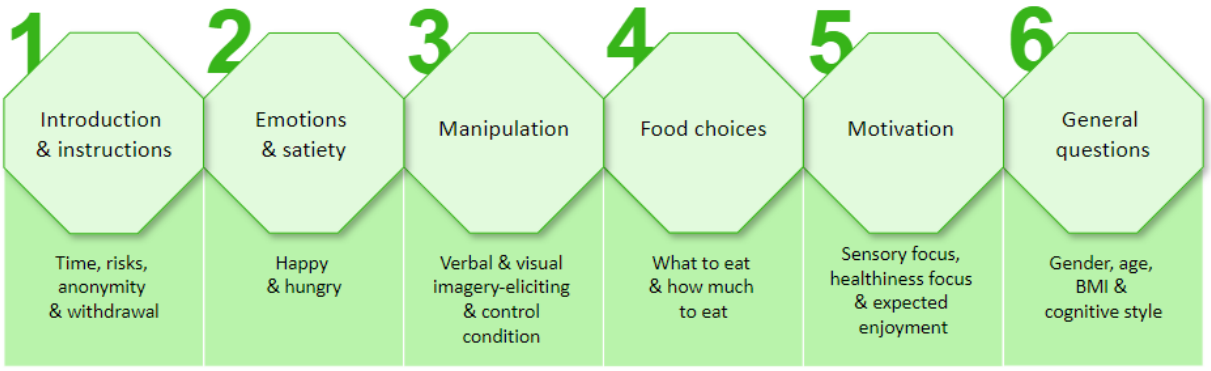


**Figure 5.** Flow chart of the questionnaire that was used during the current study.

The introduction and instructions included information about the required time to finish the questionnaire, foreseeable risks, anonymity and withdrawal of the test (part 1). After the participants had agreed to the informed consent, they were asked to indicate how happy and hungry they felt at the moment of the test (part 2).

Thereafter, the manipulation part started (part 3). Participants were assigned to one of the four conditions (see Table 12). In both the visual and verbal condition imagery-eliciting stimuli were used in order to evoke multi-sensory imagery. Obviously, participants of the verbal condition were manipulated by the use of verbal stimuli while visual stimuli was shown to participants of the visual condition. In both conditions, two different food products were used (banana chips and mixed nuts; see Section 3.6.2). After the manipulation, participants' multi-sensory imagery processing (vividness, elaboration and quantity) was measured with help of the evaluation of six statements. Next to that, they had to indicate to what extent they evaluated the stimuli as being spontaneous.

In order to generate the same amount of distraction as in the multi-sensory imagery condition, control stimuli was used for both the visual- as verbal control condition. Moreover, Robinson, Kersbergen and Higgs (2014) have shown that eating less 'attentively' could influence consumers to eat larger portion sizes. In other words, in case the participants of the control conditions did not have to perform a task, a smaller amount of food intake could be expected for participants of the control conditions compared to participants of the (verbal and visual) multi-sensory imagery conditions. Based on study of Tversky (1969) participants of the verbal control condition had to fulfil a verbal task. Different relatively uncommon names were shown to them for twenty seconds. The participants had to try to remember those names. After the twenty seconds passed by, a new screen appeared. On this screen they were asked to indicate which of the following names was not shown to them on the screen before. The visual control condition was similar to the verbal control condition. Based on the same research, different (happy, unhappy or neutral) faces were shown to the participants for twenty seconds (Tversky, 1969). After the time passed by, they had to fill out which of the faces they did not recognize from the screen before. The questions described above were not aimed to measure participants' memory, which means that it was not important that participants gave the right answers. By contrast, the memory tasks were solely used to provoke an equivalent level of distraction in all the four different conditions.

The questions that followed after the manipulation parts were identical for all conditions. In the first section after the manipulation, participants' food choices were measured (part 4). Eight different snack products (see Section 3.6.2) were shown to them in a random way. All of them were portrayed in seven different portion sizes. Participants had to indicate if they would like to consume the snack product on a self-chosen moment that day, and in case they wanted to, which portion size they preferred. They did not necessarily have to choose only one of the eight products or only one portion size. They could also mix the different products and portion sizes.

After finishing the questions about what and how much they wanted to eat, participants' motivation to make those choices has been measured (part 5). With help of three questions, participants' sensory focus, healthiness focus and expected enjoyment was asked. Next to that, they had to evaluate the eight different snack products on level of familiarity and prior experience.

In part 6, which was also the last part of the test, participants had to fill out some general questions, such as gender, age and BMI. Next to that, there was measured to what extent health was important for them and if they in general have a visualising or verbalising cognitive style. After submitting all of their materials, the participants had the opportunity to ask any questions they had about the survey.

## 4.5. MEASURES

The independent factor of the current study were the multi-sensory imagery stimuli. The effects of those stimuli were measures with help of six dependent variables: multi-sensory imagery processing, participants' sensory focus, healthiness focus, expected enjoyment, food choice for healthy over unhealthy foods, and their chosen portion sizes of healthy foods. Next to that, individuals' cognitive style was measured to check for its moderating effect. Finally, also some control variables were measured, such as BMI, emotional state, level of hunger, health importance, familiarity and prior experience. All above mentioned variables will be described in turn.

### 4.5.1. MULTI-SENSORY IMAGERY PROCESSING

One of the key dependent variables of this study was participants' extent of multi-sensory imagery processing that was evoked by the independent variable. As already described in Section 2.2 and 3.5.1., the multi-sensory imagery construct could be measured with help of three important components: vividness, quantity and elaboration. Based on the studies of Ellen and Bone (1991) and Babin and Burns (1998), each of those three components was measured by two items. Those items can be found in Table 7 and Appendix (I and) III. All different items were measured on a 7-point Likert scale (not at all – extreme), and one item was reverse scored afterwards. A factor analysis on these six items showed that the overall 'multi-sensory imagery components' could be divided into two factors (see Appendix IV for the scree plot, items and factor loadings). The first factor was called 'multi-sensory imagery processing' (Eigenvalue 3.14) and explained 52% of the total variance ($\alpha$ = .85) when 'one image' was excluded ($\alpha$ = .74 when included). The other item 'one image' represented the second factor (Eigenvalue 1.27), which explained 21% of the variance. In the analysis of the main study, only the first factor (multi-sensory imagery components) was included, as a one item factor (one image) is not useful. In the remainder of the study, the multi-sensory imagery component will be called multi-sensory imagery processing.

### 4.5.2. SENSORY FOCUS

To measure the effect of the multi-sensory imagery process on participants' healthiness focus, a measurement scale based on study of Benson et al. (2018) has been used. In this way, participants' healthiness focus was measured with help of the following item: '*To what extent did you choose the snack product(s) on level of sensory benefits (e.g. taste, smell, texture)?*'. This item was measured on a 7-point Likert scale (not at all – extreme).

### 4.5.3. HEALTHINESS FOCUS

Comparable to participants' sensory focus, also their healthiness focus was measured with help of one item based on research of Benson et al. (2018): '*To what extent did you choose the snack product(s) on level of expected health benefits (e.g. controlling calorie intake or preventing diseases)?'.* To measure this item, a 7-point Likert scale (not at all – extreme) was used.

### 4.5.4. EXPECTED ENJOYMENT

Participants' expected enjoyment was one of the dependent variables of the current study. Based on study of Robinson (2014), this factor has been measured with help of one item: '*To what expect do you expect to enjoy the chosen snack products?'*. The ratings were made on a 7-point Likert scale (not at all – extreme).

### 4.5.5. FOOD CHOICE FOR HEALTHY FOODS OVER UNHEALTHY FOODS

In line with study of Bucher & Keller (2015) and Benson et al. (2018) participants´ food choice for healthy-over unhealthy foods was measured with help of a set of photographs on which food products were portrayed (in a buffet-form, see Appendix III). These photographs were especially taken for the current study. Based on the pre-test, four of the (total of eight) products (strawberries, watermelon, snack tomato's and snack cucumbers) were considered as being healthy, while the other four (M&M's peanut, apple pie, Lay's paprika chips and cheese cubes) were labeled as unhealthy. Participants had to indicate if they wanted to choose each of the products and, if the answer was yes, which portion sizes they would select. In case the individual was choosing the product, this products was labeled as '1'. In case the products was not chosen by that particular participant, this product was labeled as '0'. By summing up those scores, for both of the categories (healthy vs. unhealthy), each participant could get a score varying from 0 to 4 (as there were four healthy and four unhealthy products). In this way, there could be measured how many healthy and how many unhealthy food products each participant would totally choose.

### 4.5.6. PORTION SIZES OF HEALTHY FOODS

Portion sizes of healthy (and unhealthy foods) were measured with help of same tool as the tool that was used for measuring food choice for healthy over unhealthy foods (see Section 4.4.5; Benson et al. (2018); Bucher & Keller (2015)). For each of the eight food products, participants had to select one of the portions from a show card which contained a series of seven portion size photographs (see Figure 6 and Appendix III). The sizes of the different portions were calculated with help of standard portion sizes that could be found on the packages (nutritional values) of the product. The fourth/middle portion was set as the standard portion size. Based on this size, the other six portion sizes could be calculated (see Appendix V, Table 25). Associated with the portion sizes, also the amount of energy (calories) of the selected products could be calculated (see Appendix V, Table 26; Calorielijst, 2019). With help of this measure, participants' chosen products and portion sizes could be easily compared afterwards.


**Figure 6.** Example of portion size selection that was used in the questionnaire.

### 4.5.7. INDIVIDUALS' COGNITIVE STYLE

Individual's cognitive style has been measured to check for its moderating effect. As described in Section 2.3.2., individual's cognitive style could influence the way in which imager-eliciting stimuli are processed, as some individuals are relying mostly on visual elements, while others mostly use verbal modes of thinking, or are either a blend of those two styles (Marks, 1973). In the current study, participants' verbal or visual preference has been measured by the use of the Verbal-Visual Learning Style Rating (VVLSR), established by Mayer and Massa (2003). This instrument was validated against a number of other instrument and was used here because of its simplicity (a single question). In this way, participants' cognitive style has been measured by the following item: '*To what extent do you prefer visual over verbal elements when getting information?*'. This item has been measures on 7-point Likert scale (strongly prefer visual elements – strongly prefer verbal elements).

### 4.5.8. CONTROL VARIABLES

**BMI**

According to Temple, Giacomelli, Roemmich and Epstein (2007) obese adults habituate slower to food stimuli (compared to those who do not have overweight), which could relate to greater energy intake. Therefore, it is important to avoid an influence of participants' body proportions, by controlling this factor. The following questions were used to measure participants' body proportions: '*What is your weight in kilos?*' and '*What is your height in centimetres?*'. For both items, a slider has been used to make participants feeling more comfortable when filling out the questions. With help of the self-reported height and weight, participants' Body Mass Index (BMI) could be computed (weight in kilograms divided by square of height in metres). This index is useful for comparing participants' body proportions. The World Health Organization (2019) cut-offs were used to classify respondents to underweight (<18.50), normal weight (18.50–24.99), and overweight (>25).

**Satiety**

As hunger obviously leads people to choose larger portion sizes (Polivy & Herman, 1987), it is important to control participants' current appetite status. Based on study of Benson et al. (2018) this factors was measured using a 7-point Likert scale for the item: '*How hungry do you feel right now?*' (not at all – extreme).

**Emotions**

Participants' emotional state was measured in the same way as their appetite status: '*How happy do you feel right now?'*, using a 7-point Likert scale (not at all – extreme; Benson et al. (2018)). It was important to control for this factor, as portion sizes could be influenced by the way a person is feeling at that moment (Bongers, Jansen, Havermans, Roefs, & Nederkoorn, 2013; Fahrenkamp et al., 2019). Moreover, according to Bongers et al., (2013) participants' in the emotional condition (either positive or negative) showed a higher food intake than participants' of the neutral condition. The more extreme the emotion is found to be, the greater the portion sizes will be.

**Health importance**

Not for nothing people state that '*you are what you eat*' (Fox & Ward, 2008). Linked to that, persons who want to be healthy, are generally trying to consume healthy food products. Moreover, Glanz, Basil, Maibach, Goldberg and Snyder (1998) have found that consumers, especially chronic dieters, determine their portion sizes on level of impact on their health and weight. In order to prevent the results from an influence of participants' health importance, this factor had a need to be controlled in the current study. To do so, participants' health importance has been measured with help of the following item: **'***To what extent is your health important for you?',* based on research of Hsieh (2004).

**Familiarity and prior experience**

As already has been explained in Section 3.5.4., participants' familiarity and prior experience with the stimuli could influence the degree of imagery activation (Rigney & Lutz, 1976). Therefore, it was important to make sure that the used food products were equally known by the participants. Based on research of Raudenbush and Frank (1999) and the outcomes of the pre-test, the familiarity and prior experience of the four healthy- and four unhealthy foods have been measured with help of two items: '*I am familiar with the product'* and *'My prior experience with the product is positive/negative'*. As measurement scale, a 7-point Likert scale (extreme unfamiliar – extreme familiar, extreme negative – extreme positive) was used.

### 4.5.9. BACKGROUND CHARACTERISTICS

At the last part of the questionnaire, some general classification measures were included. These measures contained the demographic characteristics *gender* and *age*.

## 4.6. DATA ANALYSIS

In order to evaluate the hypotheses and answer the research question, the analysis has been carried out using IBM SPSS Statistics 24.0. To test whether the conditions of the current study were comparable, Chi-square test and one-way ANOVA tests were conducted. Next to that, an independent sample t-test was carried out to additionally check if the level of spontaneity was successfully controlled. The effects on the dependent variables (multi-sensory imagery processing, sensory focus, healthiness focus, expected enjoyment, choice for healthy foods and portion sizes) were measured by a series of one-way ANOVA tests, Pearson correlation coefficients, simple linear regressions, hierarchical multiple regression analyses and Logistic regression analyses. All data were analyzed using A significance level of $P<0.05$.

## 5. RESULTS

In this chapter, the outcomes of the main test will be explained, with help of statistical analyses. The chapter has been divided into several subchapters. The first part of the chapter contains a check of the data (randomization check and additional check to measure the level of spontaneity). Thereafter, starting from Section 5.3, the key dependent variables (multi-sensory imagery processing, sensory focus, healthiness focus, expected enjoyment, food choice for healthy over unhealthy foods and portion sizes of healthy foods) will be discussed one by one. In Sub-section 5.9, the moderating variable (individuals' cognitive style) will be discussed and at the end of the chapter (Sub-section 5.10), a visual overview of all findings and hypotheses will be given.

### 5.1. RANDOMIZATION CHECKS

The total 251 participants of the current study were randomly assigned to one the four conditions (*verbal condition, visual condition, verbal control condition and visual control condition*). To check if the conditions were comparable on levels of gender, age and other descriptive factors, a randomization check was carried out (see Table 13). A Chi square test was performed to determine whether gender was equally divided across the four different conditions. This test indicated that men and women did not significantly differ between the different four conditions, $\chi^2$ (6) = 5.58 ($p$ = .472). Next to that, a one-way ANOVA was conducted to compare participants' age, BMI, emotional state, level of hunger and health importance, across the four different conditions. The test showed that also participants' age ($F$(3) = .358, $p$ = .784), BMI ($F$(3) = .381, $p$ = .767), emotional stage ($F$(3) = 1.343 , $p$ = .261), level of hunger ($F$(3) = 1.338, $p$ = .643) and health importance ($F$(3) = .307, $p$ = .820) did not significantly differ between the conditions.

**Table 13.** Randomisation check: participants' gender, age, BMI, emotional state, level of hunger and health importance per condition.

| | **Verbal (*N* = 59)** | **Visual (*N* = 59)** | **Verbal control (*N* = 65)** | **Visual control (*N* = 68)** |
|---|---|---|---|---|
| **Gender (*N*)** | | | | |
| **Male** | 11 (18,6%) | 13 (22,0%) | 19 (29,2%) | 14 (20,6%) |
| **Female** | 48 (86,4%) | 45 (76,3%) | 46 (70,8%) | 54 (79,4%) |
| **No answer** | 0 (0%) | 1 (1,7%) | 0 (0%) | 0 (0%) |
| **Age (*M*)** | 45.5 (*SD* = 18.4) | 43.0 (*SD* = 18.5) | 45.7 (*SD* = 20.3) | 43.4 (*SD* = 17.8) |
| **BMI (*M*)** | 24.0 (*SD* = 4.4) | 24.2 (*SD* = 4.7) | 24.8 (*SD* = 4.2) | 24.3 (*SD* = 4.4) |
| **Emotional state (*M*)*** | 5.0 (*SD* = 1.1) | 4.8 (*SD* = 1.2) | 4.9 (*SD* = 1.2) | 5.1 (*SD* = 0.8) |
| **Level of hunger (*M*)*** | 2.4 (*SD* = 1.5) | 2.6 (*SD* = 1.6) | 2.6 (*SD* = 1.5) | 2.8 (*SD* = 1.6) |
| **Health importance (*M*)*** | 5.7 (*SD* = 0.7) | 5.6 (*SD* = 0.8) | 5.7 (*SD* = 0.8) | 5.6 (*SD* = 0.7) |

* Numbers represent mean scores on 7-point Likert scales.

Another randomization check has been done to check if the familiarity and prior experience of the different healthy and unhealthy snack products differed between the four conditions (see Appendix VI, table 27). A one-way ANOVA showed that the none of the eight products (strawberries ($F(3) = .703$, $p = .551$), watermelon ($F(3) = .155$, $p = .927$), snack tomato's ($F(3) = .633$, $p = .594$), snack cucumbers ($F(3) = .370$, $p = .775$), M&M's peanut ($F(3) = .647$, $p = .589$), apple pie ($F(3) = .554$, $p = .646$), Lay's paprika chips ($F(3) = 1.147$, $p = .331$) and cheese cubes ($F(3) = .210$, $p = .889$)) significantly differed on level of familiarity. Neither they did on level of prior experience (strawberries ($F(3) = .193$, $p = .901$), watermelon ($F(3) = .682$, $p = .564$), snack tomato's ($F(3) = .277$, $p = .842$), snack cucumbers ($F(3) = 1.324$, $p = .267$), M&M's peanut ($F(3) = .080$, $p = .971$), apple pie ($F(3) = .480$, $p = .697$), Lay's paprika chips ($F(3) = .344$, $p = .794$) and cheese cubes ($F(3) = .200$, $p = .896$)). In other words, there could be assumed that all eight food products are equally known by the participants of the different conditions. An influence of this factor can therefore be excluded.

## 5.2. ADDITIONAL CHECKS

Next to the randomization checks, it was also important to check if the level spontaneity of the verbal- and visual stimuli (to evoke multi-sensory imagery) was controlled (see Section 2.2.4). An independent sample t-test showed that the level of spontaneity that was experienced by the stimuli did not significantly differ ($t$ (116) = .550, $p = .583$) between the verbal- ($M = 3.610$, $SD = 0.2$) and the visual condition ($M = 3.449$, $SD = 0.2$). Based on those results there could be stated that the execution to control the level of spontaneity between the verbal and visual group was successful.

## 5.3. MULTI-SENSORY IMAGERY PROCESSING

From a theoretic perspective, verbal imagery-eliciting stimuli are expected to be less concrete and less easily processed compared to visual imagery-eliciting stimuli. Therefore, there would be expected (*hypothesis 1a*) that visual stimuli (the visual condition) will have a greater impact on eliciting multi-sensory imagery, than verbal stimuli (the verbal condition). Unfortunately, this prediction could not be confirmed by the findings. Moreover, by using one-way ANOVA, no significant difference could be found on the level of multi-sensory imagery processing ($F$ (1, 116) = .236, $p = .628$). In other words, there could not be confirmed that visual imagery-eliciting stimuli have a greater impact on eliciting multi-sensory imagery than verbal imagery-eliciting stimuli (*hypothesis 1a*).

## 5.4. SENSORY- AND HEALTHINESS FOCUS

According to the hypotheses, there would be expected that the greater individuals' multi-sensory imagery process, the greater their sensory focus of healthy foods will be (*hypothesis 3a*). Therefore, a Pearson correlation coefficient was computed to access the correlation between the amount of multi-sensory imagery the participants experienced and the extend in which they evaluated the healthy foods on level of sensory attributes. Unfortunately, no significant correlation has been found between the multi-sensory imagery that has been processed and the sensory focus of healthy foods ($r = .102$, $N = 118$, $p = .272$). This finding could also be confirmed by the results of a regression analysis. A simple linear regression was used to predict participants' sensory focus as a result of their multi-sensory imagery processing, Only 3% of the sensory focus could be predicted by the amount of multi-sensory imagery that was processed. Next to that, no significant regression could be found ($F$ (2, 115) = .1.790, $p = .172$). As this model was not significant, no further elaboration of the coefficients was needed. By summing up the results, a positive

influence of the extent of multi-sensory imagery processing on the sensory focus of those individuals could not be confirmed (*hypothesis 3a*).

Next to the sensory focus of healthy food, also an effect of the multi-sensory imagery process would be expected on participants' healthiness focus of healthy foods. According to the predictions, the greater participants' multi-sensory imagery process, the smaller their healthiness focus of healthy foods will be (*hypothesis 3b*). In line with the outcomes on sensory focus, Pearson correlation coefficient showed also for the healthiness focus no significant results ($r$ = .178, N = 118, $p$ = .054). These results could be double checked by conducting a simple linear regression. The model showed that only 4% of the healthiness focus could be predicted by the extent to which individuals process multi-sensory imagery ($F$ (2, 115) = 2.331, $p$ = .102). Based on those non-significant results, no further elaboration of the coefficients was needed. To sum up, hypothesis 3b could not be confirmed by the results, which holds that a positive effect of multi-sensory imagery on the healthiness focus of participants could not be approved.

Besides the direct influence of multi-sensory imagery processing on individuals' healthiness- and sensory focus, also an effect of participants' healthiness focus on their sensory focus (and vice versa) was expected. In other words, the greater individuals' sensory focus of healthy foods, the smaller their healthiness focus probably will be (*hypothesis 3c*). The same effect is expected the other way around (*hypothesis 3c*). Indeed, Pearson correlation coefficient showed a negative correlation between the healthiness- and sensory focus ($r$ = -.107, $N$ = 251, $p$ = .091). This means that the greater participants' sensory focus is, the smaller is their healthiness focus. However, the value of $r$ (-.107) indicates that the associating is not strong and besides that, the correlation is not significant ($p$ = .091). These non-significant results are corresponding with the outcomes of a linear regression analysis. This analysis shows that 11% of the healthiness focus could be predicted by the sensory focus ($F$ (1, 249) = 2.872, $p$ = .091), but this prediction is not significant ($p$ = .091). In sum, based on the outcomes of the correlation- and regression analysis, there could not be approved that individuals' sensory focus is related to their healthiness focus when evaluating healthy foods (*hypothesis 3c*).

## 5.6. EXPECTED ENJOYMENT

From a theoretic perspective, the greater individuals' sensory focus of healthy foods, the greater the expected enjoyment will be expected (*hypothesis 3d*). To test this hypothesis on all participants of the study instead of only the ones that were in the multi-sensory imagery conditions (verbal- and visual condition), dummy variables needed to be created. By calculating those variables, the verbal control condition was used as reference variable. Pearson correlation coefficient showed a significant correlation between individuals' sensory focus of healthy foods and their expected enjoyment ($r$ = .352, $N$ = 251, $p$ <.001). These results could be further elaborated by computing a linear regression analysis. This analysis showed that 14% of participants' expected enjoyment could be predicted by the extent of sensory focus ($F$ (4, 246) = 10.364, $p$ < .001). The coefficients table showed that there is no significant influence of the different conditions on the extent of expected enjoyment (visual condition ($t$ (246) = -1.056, $p$ = .292), verbal condition ($t$ (246) = .293, $p$ = .770) and visual control condition ($t$ (246) = -1.862, $p$ = .064)). In sum, although the condition to which the participants were classified did not influence the results, there could be concluded that participants' sensory focus has a positive influence on their expected enjoyment. Based on those results, hypothesis 3d could be confirmed.

According to the hypotheses, also participants' healthiness focus could probably influence their expected enjoyment of healthy foods (*hypothesis 3e*). For the analysis of this prediction, the earlier computed

dummy variables could be used again. Pearson correlation coefficient showed no significant correlation between participants' healthiness focus and their expected enjoyment ($r$ = .065, $N$ = 251, $p$ = .307). These findings could be confirmed by a linear regression analysis ($F$ (4, 246) = 1.278, $p$ = .279) which shows that only 2% of the expected enjoyment could be explained by the healthiness focus of the participants. As this model was not significant, no further elaboration of the coefficients was needed. By summarizing the results, a positive influence of participants' healthiness focus on their expected enjoyment could not be approved (*hypothesis 3e*).

## 5.7. FOOD CHOICE FOR HEALTHY (OVER UNHEALTHY) FOODS

Next to the cognitive variables (sensory focus, healthiness focus and expected enjoyment), the current study also focused on behavioural consequences of multi-sensory imagery. Moreover, according to the hypotheses, a positive influence of individuals' expected enjoyment (*hypothesis 3f*) and multi-sensory imagery processing (*hypothesis 3h*) would be expected on the amount of choice for healthy food products. In line with these predictions, a positive influence of individuals' expected enjoyment (*hypothesis 3g*) and multi-sensory imagery processing (*hypothesis 3i*) would also be expected on participants' choice for healthy foods products **over** unhealthy foods. To examine hypotheses 3f and 3h, a three stage hierarchical multiple regression model was carried out. The latter two hypotheses (hypothesis 3g and 3i) were examined by the conduction of a Logistic regression analysis. Both analyses were carried out twice, as the conditions were classified in two ways. The first analyses were performed by the use of a variable which divided the participants into two groups, to measure **if** they were manipulated. They were assigned to 'Yes' when they were in the verbal or visual condition and to 'No' when they were one of the participants of the verbal or visual control groups. The second classification of the conditions gave more insight in **what kind of** manipulation the participants experienced. In other words, a variable was used in which the participants were classified as verbal, visual or control (dummy variables, see i.e. Section 5.6). An overview of those four analyses could be found in Table 14. In the upcoming Section, those analyses will be more detailly described.

**Table 14.** Overview of the four analyses to measure participants' food choice for healthy (over unhealthy) foods.

| | **Manipulation versus no manipulation** | **Verbal versus visual versus control** |
|---|---|---|
| **Choice for healthy food products** | Hypotheses 3f and 3h<br>(Three stage hierarchical multiple regression - Table 15) | Hypotheses 3f and 3h<br>(Three stage hierarchical multiple regression - Table 16) |
| **Choice for healthy over unhealthy food products** | Hypotheses 3g and 3i<br>(Logistic regression - Table 17) | Hypotheses 3g and 3i<br>(Logistic regression - Table 18) |

At the first stage of the three stage hierarchical multiple regression analyses, the different manipulations/conditions were entered.. In the second stage of both analyses, participants' sensory- and healthiness focus were added. In the last stage, also the expected enjoyment was entered.

Based on the results of the first hierarchical multiple regression analysis (see Table 15), the first model was found to be significant ($F$ (1, 249) = 6.085, $p$ = .014). This model explained 2.4% of the variance of participants' choice for healthy food products. When the healthiness- and sensory focus were added

(stage 2) again, a significant model could be found ($F$ (3, 247) = 7.105, $p$ < .001). Based on those results, a total of 7.9% (so a significant change of 5.6% ($p$ = .001)) of the choice for healthy foods could be explained by this model. Also the third model was found to be significant ($F$ (4, 246) = 5.315, $p$ < .001), but this significance did mainly exist due to the second model. Moreover, the third model explained 8.0% of the healthy food products which are chosen by the respondents which means a change of 0.1% ($p$ = .886). The significant results could be further elaborated by evaluating the coefficients of the model. These coefficients showed that the manipulation ($\beta$ = .249, $p$ = .014) and participants' healthiness focus ($\beta$ = .093, $p$ = .001) were found to be the significant predictors of the model. In other words, when participants were assigned to the manipulation conditions (verbal- and visual condition) a higher amount of healthy foods would be chosen compared to participants' of the non-manipulated conditions (verbal- and visual control condition). Next to that, the coefficients showed that the greater participants' healthiness focus, the greater their choice for healthy foods. The other predictors of the model were not found to be significant, which holds that no other regressions could be statistically proved.

The conduction of the second hierarchical multiple regression analysis (see Table 16) could contribute to a deeper specification of the manipulation variable. During this analysis, the variable to measure participants' manipulation (yes versus no) was replaced by the three (dummy) condition variables. The other independent variables (sensory focus, healthiness focus, expected enjoyment and the choice for healthy over unhealthy foods) remained the same. Contradictory to the first analysis, in the second analysis the first model was not found to be significant ($F$ (3, 247) = 2.580, $p$ = .054), but the others were (model 2: $F$ ($F$ (5, 245) = 4.389, $p$ = .001 and model 3: $F$ (6, 244) = 3.646, $p$ = .002). The models explained respectively 3.0%, 8.2% and 8.2% of the variance of participants' choice for healthy food products. The significant results could be further elaborated by evaluating the coefficients of the model. Those results showed that within the manipulation condition, only the visual condition was found to be a significant predictor of the model ($\beta$ = .336, $p$ = .018). In other words, participants' of the visual condition chose (compared to the verbal control condition) a higher amount of healthy foods. Next to that, in line with the predictions of the first regression analysis, only participants' healthiness focus was found to be another significant predictor of the model ($\beta$ = .092, $p$ = .002).

To summarize, there could be confirmed that the greater the amount of imagery-eliciting stimuli (visual- and verbal condition versus visual control- and verbal control condition) the greater the amount of chosen healthy foods will be (*hypothesis 3h*). When zooming in on this variable, this effect could be mainly explained by the difference between the visual condition compared to the verbal control condition. Hypothesis 3f could not be confirmed by the findings, as both regression analyses did not show any significant results on the effect of expected enjoyment on participants' choice for healthy foods.

**Table 15.** Three staged hierarchical multiple regression analysis, with the amount of chosen healthy products as dependent variable and the manipulation (yes versus no), sensory focus, healthiness focus and expected enjoyment as independent variables.

| | **Model 1** | | | **Model 2** | | | **Model 3** | | |
|---|---|---|---|---|---|---|---|---|---|
| | β | SE | p | β | SE | p | β | SE | p |
| **Constant** | 3.226 | .069 | .000 | 3.174 | .216 | .000 | 3.214 | .319 | .000 |
| **Manipulation** | .249 | .101 | .014 | .257 | .099 | .010 | .258 | .099 | .010 |
| **Sensory focus** | | | | -.060 | .034 | .080 | -.058 | .037 | .115 |
| **Healthiness focus** | | | | .093 | .029 | .001 | .094 | .029 | .001 |
| **Expected enjoyment** | | | | | | | -.010 | .057 | .866 |
| **df** | (1, 249) | | | (3 247) | | | (4, 246) | | |
| **F** | 6.085 | | | 7.105 | | | 5.315 | | |
| **p** | .014 | | | .000 | | | .000 | | |
| **$R^2$** | .024 | | | .079 | | | .080 | | |

**Table 16.** Three staged hierarchical multiple regression analysis, with the amount of chosen healthy products as dependent variable and the condition (verbal, visual, visual control), sensory focus, healthiness focus and expected enjoyment as independent variables.

| | Model 1 | | | Model 2 | | | Model 3 | | |
|---|---|---|---|---|---|---|---|---|---|
| | β | SE | p | β | SE | p | β | SE | p |
| **Constant** | 3.185 | .099 | .000 | 3.139 | .235 | .000 | 3.174 | .334 | .000 |
| **Verbal condition** | .205 | .144 | .154 | .219 | .140 | .119 | .221 | .141 | .119 |
| **Visual condition** | .375 | .144 | .010 | .336 | .141 | .018 | .336 | .141 | .018 |
| **Visual control condition** | .080 | .139 | .564 | .042 | .137 | .756 | .042 | .137 | .759 |
| **Sensory focus** | | | | -.057 | .035 | .105 | -.055 | .037 | .143 |
| **Healthiness focus** | | | | .092 | .029 | .002 | .092 | .029 | .002 |
| **Expected enjoyment** | | | | | | | -.008 | .057 | .883 |
| **df** | (3, 247) | | | (5, 245) | | | (6, 244) | | |
| **F** | 2.580 | | | 4.389 | | | 3.646 | | |
| **p** | .054 | | | .001 | | | .002 | | |
| **$R^2$** | .030 | | | .082 | | | .082 | | |

A Logistic regression analysis was carried out in order to analyze participants' choice for healthy foods **over** unhealthy foods (*hypothesis 3g* and *3i*). This test was appropriate to examine these hypotheses, as this test is able to analyse dichotomous variables. Moreover, the dependent variable *food choice for healthy over unhealthy foods* was in the current test dichotomous in nature (*the amount of chosen healthy products was larger than the amount of unhealthy products* versus *the amount of chosen healthy products was equal/smaller than the amount of unhealthy products*). In line with the three stage hierarchical multiple regression model, the independent variables analysed in the regression were manipulation/condition, sensory focus, healthiness focus and expected enjoyment. The second Logistic regression model included dummy variables for each condition, which contrasted to the verbal control condition (see Section 5.6). The results of both analyses are presented in Table 17 and 18.

The first Logistic regression model (see Table 17) was found to be statistically significant ($X^2$ (4) = 27.465, $p$ < .001). Next to that, 13.8% (Nagelkerke $R^2$) of the variance of food choice for healthy over unhealthy foods was explained by the independent variables and 61.0% of the cases were correctly classified. The model showed that an increase of healthiness focus of 1 point was likely to increase the choice for healthy focus with 1.425 point. Besides that, no significant associations of the manipulation, sensory focus and expected enjoyment on the dependent variable (food choice for healthy over unhealthy foods) were found. Compared to the first analysis, the second Logistic regression analysis did not show any new significant results (see Table 18). In other words, the classification of the conditions did not influence the results. To sum up, the influence of multi-sensory imagery stimuli (*hypothesis 3i*) and expected enjoyment (*hypothesis 3g*) on consumers' choice for healthy- over unhealthy food products could not be approved by the current findings.

**Table 17.** Logistic regression of manipulation (yes versus no), sensory focus, healthiness focus and expected enjoyment on food choice for healthy over unhealthy foods.

| | B | SE | p | OR |
|---|---|---|---|---|
| **Constant** | -.151 | .897 | .867 | .860 |
| **Manipulation** | .299 | .269 | .267 | 1.348 |
| **Sensory focus** | .354 | .103 | .085 | .838 |
| **Healthiness focus** | -.177 | .082 | .000 | 1.425 |
| **Expected enjoyment** | -.069 | .158 | .660 | .933 |

| | |
|---|---|
| -2LL | 320.300 |
| Nagelkerke $R^2$ | .138 |
| Hosmer & Lemeshow test | $p$ = .174 |
| Classification accuracy | 61 % |
| $X^2$ | 27.465, $df$ = 4, $p$ < .001 |

**Table 18.** Logistic regression of condition (verbal, visual and visual control), sensory focus, healthiness focus and expected enjoyment on food choice for healthy over unhealthy foods.

| | β | SE | p | OR |
|---|---|---|---|---|
| **Constant** | .285 | .881 | .770 | 1.294 |
| **Verbal condition** | -.530 | .385 | .168 | .588 |
| **Visual condition** | -.421 | .378 | .265 | .656 |
| **Visual control condition** | -.354 | .371 | .339 | .702 |
| **Sensory focus** | -.163 | .103 | .115 | .850 |
| **Healthiness focus** | .352 | .082 | .000 | .1422 |
| **Expected enjoyment** | -.069 | .159 | .665 | .934 |

| | |
|---|---|
| -2LL | 219.312 |
| Nagelkerke $R^2$ | .143 |
| Hosmer & Lemeshow test | $p = .359$ |
| Classification accuracy | 61 % |
| $X^2$ | 28.453, $df = 6$, $p < .001$ |

## 5.8. PORTION SIZES OF HEALTHY FOODS

From a theoretic perspective, there would be expected that the extent to which individuals expect to enjoy healthy food products has a positive influence on their portion sizes of healthy foods (*hypothesis 3j*). Next to that, also a direct positive effect of the amount of (verbal and visual) imagery-eliciting stimuli on these portion sizes would be expected (*hypothesis 3k*). A three stage hierarchical multiple regression was conducted four times (see Table 19). During the first and second analysis, the average portion sizes of the four healthy foods were used as dependent factor (see Table 20 and 21), while the third and fourth analysis focused on the total amount of calories participants chose (see Table 22 and 23). In line with the analyses of Section 5.7, the first and second (and respectively the third and fourth) model differed from each other by the way in which the conditions were classified. Moreover, during the first analysis (see Table 20) the conditions were classified as manipulation (yes versus no). In the second analysis (see Table 21) the variable portrayed the different conditions (dummy variables: visual condition, verbal condition, visual control condition). The verbal control condition was used as reference condition. The third (see Table 22) and fourth condition (see Table 23) were structured in the same way, but in those cases the total amount of calories which the participants' chose were used as dependent variable. All four analyses were constructed in line with the hierarchical model of Section 5.7. In other words, the manipulation/conditions were entered at the first stage of the model, in the second stage, participants' sensory- and healthiness focus were added and in the last stage, also the expected enjoyment was entered.

**Table 19.** Overview of the four analyses to measure participants' food choice for healthy (over unhealthy) foods.

| | **Manipulation versus no manipulation** | **Verbal versus visual versus control** |
|---|---|---|
| **Average portion sizes of healthy foods** | Table 20 | Table 21 |
| **Total amount of calories** | Table 22 | Table 23 |

The first hierarchical multiple regression that was conducted (see Table 20), revealed that at stage one, the manipulation did not significantly contribute to the portion sizes of healthy foods ($F$ (1, 249) = 1.097, $p$ = .296). Moreover, based on this model, only 0.4% of the variation of participants' choice for the portion sizes of healthy foods could be explained by the difference in manipulation. By introducing the sensory- and healthiness focus, an additional 2% (totally 2.4%) of the portion sizes could be explained by the model ($F$ (3, 247) = 2.023, $p$ = .111). However this percentual change was not found to be significant ($p$ = .086). Adding the factor expected enjoyment in the third model, did not contribute to a change of the total explained variance (2,4%; $F$ (4, 246) = 1.513, $p$ = .199). The second hierarchical multiple regression was conducted to analyze if other conclusions could be drawn in case the conditions were analyzed separately (visual condition, verbal condition and visual control condition, all compared to the verbal control condition). Based on the results (see Table 21) no new significant results could be found. Moreover, comparable to the results of the first regression (see Table 20), none of the models of the second regression were found to be significant (model 1: $F$ (3, 247) = .400, $p$ = .753, model 2: $F$ (5, 245) = .1.218, $p$ = .301, model 3: $F$ (6, 244) = 1.012, $p$ = .418). The three models explained respectively 0.5%, 2.4% and 2.4% of the average portion sizes of the chosen healthy foods. To summarize, based on the results of the first and second analysis, a positive influence of individuals' expected enjoyment on their portion sizes of healthy foods could not be approved (*hypothesis 3j)*. The same conclusion could be applied to the influence of the different conditions the individuals were assigned to on the portion they have chosen (*hypothesis 3k*).

The third and fourth analysis were useful to evaluate the total amount of calories which the participants chose to consume. Compared to the first and second analysis, the dependent variable changed (*total amount of calories* instead of *average portion sizes of healthy foods*), but all independent variables remained the same. The results of the analyses could be found in Table 22 and 23. In both analyses, the first model was not found to be significant (respectively $F$ (1, 249) = .669, $p$ = .404; $F$ (3, 247) = .292, $p$ = .831) and only 3% and respectively 4% of the total amount of calories could be explained by these models. Contradictory, the second and third model did in both analysis show significant results (model 2: $F$ (3, 247) = 7.370, $p$ < .001; $F$ (5, 245) = 4.414, $p$ = .001; model 3: $F$ (4, 246) = 5.522, $p$ < .001; $F$ (6, 244) = 3.675, $p$ = .002). Those models explained respectively 8.2%, 8.3%, 8.2% and 8.3% of the variance of the amount of calories the participants chose. Participants' healthiness- and sensory focus were found to be significant predictors of the models (i.e. healthiness focus, analysis 3, model 2: $\beta$ = -48.025, $p$ < .001 and sensory focus, analysis 3, model 2: $\beta$ = 35.544, $p$ = .024). Moreover, as the healthiness focus has a negative value, the larger participants' healthiness focus, the smaller the amount of total chosen calories there could be expected. Contradictory to the healthiness focus, the sensory focus showed a positive value, which means that the greater participants' sensory focus, the greater their total amount of chosen calories probably

will be. Stated differently, based on the current results, a positive effect of sensory focus and a negative effect of healthiness focus could be expected on consumers' calorie intake.

**Table 20.** Three staged hierarchical multiple regression analysis, with participants' average portion sizes of the four healthy foods as dependent variable and the manipulation (yes versus no), sensory focus, healthiness focus and expected enjoyment as independent variables.

| | **Model 1** | | | **Model 2** | | | **Model 3** | | |
|---|---|---|---|---|---|---|---|---|---|
| | β | SE | p | β | SE | p | β | SE | p |
| **Constant** | 2.904 | .086 | .000 | 2.358 | .275 | .000 | 2.331 | .406 | .000 |
| **Manipulation** | .132 | .126 | .296 | .113 | .126 | .386 | .112 | .126 | .374 |
| **Sensory focus** | | | | .061 | .044 | .163 | .060 | .047 | .205 |
| **Healthiness focus** | | | | .069 | .037 | .062 | .069 | .037 | .066 |
| **Expected enjoyment** | | | | | | | .007 | .072 | .928 |
| **df** | 1, 249 | | | 3, 247 | | | 4, 246 | | |
| **F** | 1.097 | | | 2.023 | | | 1.513 | | |
| **p** | .296 | | | .111 | | | .199 | | |
| **$R^2$** | .004 | | | .024 | | | .024 | | |

**Table 21.** Three staged hierarchical multiple regression analysis, with participants' average portion sizes of the four healthy foods as dependent variable and the condition (verbal, visual, visual control), sensory focus, healthiness focus and expected enjoyment as independent variables.

| | Model 1 | | | Model 2 | | | Model 3 | | |
|---|---|---|---|---|---|---|---|---|---|
| | β | SE | p | β | SE | p | β | SE | p |
| **Constant** | 2.923 | .124 | .000 | 2.369 | .300 | .000 | 2.343 | .425 | .000 |
| **Verbal condition** | .136 | .180 | .758 | .131 | .179 | .466 | .130 | .179 | .470 |
| **Visual condition** | .090 | .180 | .449 | .084 | .179 | .641 | .083 | .180 | .644 |
| **Visual control condition** | -.037 | .173 | .831 | -.012 | .174 | .943 | -.012 | .174 | .944 |
| **Sensory focus** | | | | .060 | .044 | .180 | .058 | .047 | .220 |
| **Healthiness focus** | | | | .070 | .037 | .062 | .069 | .037 | .065 |
| **Expected enjoyment** | | | | | | | .006 | .073 | .933 |
| **df** | 3, 247 | | | 5, 245 | | | 6, 244 | | |
| **F** | .400 | | | 1.218 | | | 1.012 | | |
| **p** | .753 | | | .301 | | | .418 | | |
| **$R^2$** | .005 | | | .024 | | | .024 | | |

**Table 22.** Three staged hierarchical multiple regression analysis, with the total amount of calories the participants chose as dependent factor and the condition (verbal, visual, visual control), sensory focus, healthiness focus and expected enjoyment as independent variables.

| | Model 1 | | | Model 2 | | | Model 3 | | |
|---|---|---|---|---|---|---|---|---|---|
| | β | SE | p | β | SE | p | β | SE | p |
| **Constant** | 681.171 | 30.987 | .000 | 627.798 | 95.722 | .000 | 602.509 | 141.071 | .000 |
| **Manipulation** | 37.795 | 45.193 | .404 | 33.063 | 43.689 | .450 | 32.245 | 43.900 | .463 |
| **Sensory focus** | | | | 34.544 | 15.169 | .024 | 33.124 | 16.270 | .043 |
| **Healthiness focus** | | | | -48.025 | 12.807 | .000 | -48.366 | 12.907 | .000 |
| **Expected enjoyment** | | | | | | | 6.147 | 25.148 | .807 |
| **df** | 1, 249 | | | 3, 247 | | | 4, 246 | | |
| **F** | .669 | | | 7.370 | | | 5.522 | | |
| **p** | .404 | | | .000 | | | .000 | | |
| **$R^2$** | .003 | | | .082 | | | .082 | | |

**Table 23.** Three staged hierarchical multiple regression analysis, with the total amount of calories the participants chose as dependent factor and the condition (verbal, visual, visual control), sensory focus, healthiness focus and expected enjoyment as independent variables.

| | **Model 1** | | | **Model 2** | | | **Model 3** | | |
|---|---|---|---|---|---|---|---|---|---|
| | β | SE | p | β | SE | p | β | SE | p |
| **Constant** | 631.297 | 44.487 | .000 | 628.684 | 104.253 | .000 | 602.591 | 147.859 | .000 |
| **Verbal condition** | 28.373 | 64.494 | .660 | 20.086 | 62.184 | .747 | 19.207 | 62.399 | .758 |
| **Visual condition** | 20.966 | 64.494 | .745 | 42.636 | 62.320 | .495 | 42.081 | 62.479 | .501 |
| **Visual control condition** | -25.672 | 62.217 | .680 | -3.220 | 60.465 | .958 | -2.959 | 60.590 | .951 |
| **Sensory focus** | | | | 34.901 | 15.415 | .024 | 33.462 | 16.488 | .043 |
| **Healthiness focus** | | | | -38.288 | 12.878 | .000 | -48.641 | 12.980 | .000 |
| **Expected enjoyment** | | | | | | | 6.296 | 25.252 | .803 |
| **df** | 3, 247 | | | 5, 245 | | | 6, 244 | | |
| **F** | .292 | | | 4.414 | | | 3.675 | | |
| **p** | .831 | | | .001 | | | .002 | | |
| **$R^2$** | .004 | | | .083 | | | .083 | | |

## 5.9. INDIVIDUAL'S COGNITIVE STYLE

According to the theory, a moderating effect of individuals' cognitive style on the relation between imagery-eliciting stimuli and multi-sensory imagery processing would be expected. Moreover, the more an individual has a visualising cognitive style (compared to a verbalizing cognitive style), the greater the impact of (both verbal and visual) imagery-eliciting stimuli on sensory imagery probably would be (*hypothesis 2a*). However, UNIANOVA shows that both on participants' condition (verbal, visual, verbal control and visual control) as on individuals' cognitive style, no significant main effect has been found ((*F* (3, 1) = 1.964, *p* = .164) and respectively (*F* (3, 1) = .052, *p* = .820)). Next to that, also no significant interaction effect of participants' cognitive style and the condition they were assigned to has been found (*F* (3, 1) = 1.766, *p* = .187). Reworded, a moderating effect of individuals' cognitive style on the relation between imagery-eliciting stimuli and multi-sensory imagery processing could not be proved by the results of the current study (*hypothesis 2a*).

## 5.10. OVERVIEW

To give an overview of the results, the investigated hypotheses are visually displayed on the next page by using the original conceptual framework of the current study. The green lines indicate a significant relation, whereas the red lines represent the non-significant findings. All findings will be further elaborated and evaluated in the conclusion and discussion section of the next chapter.

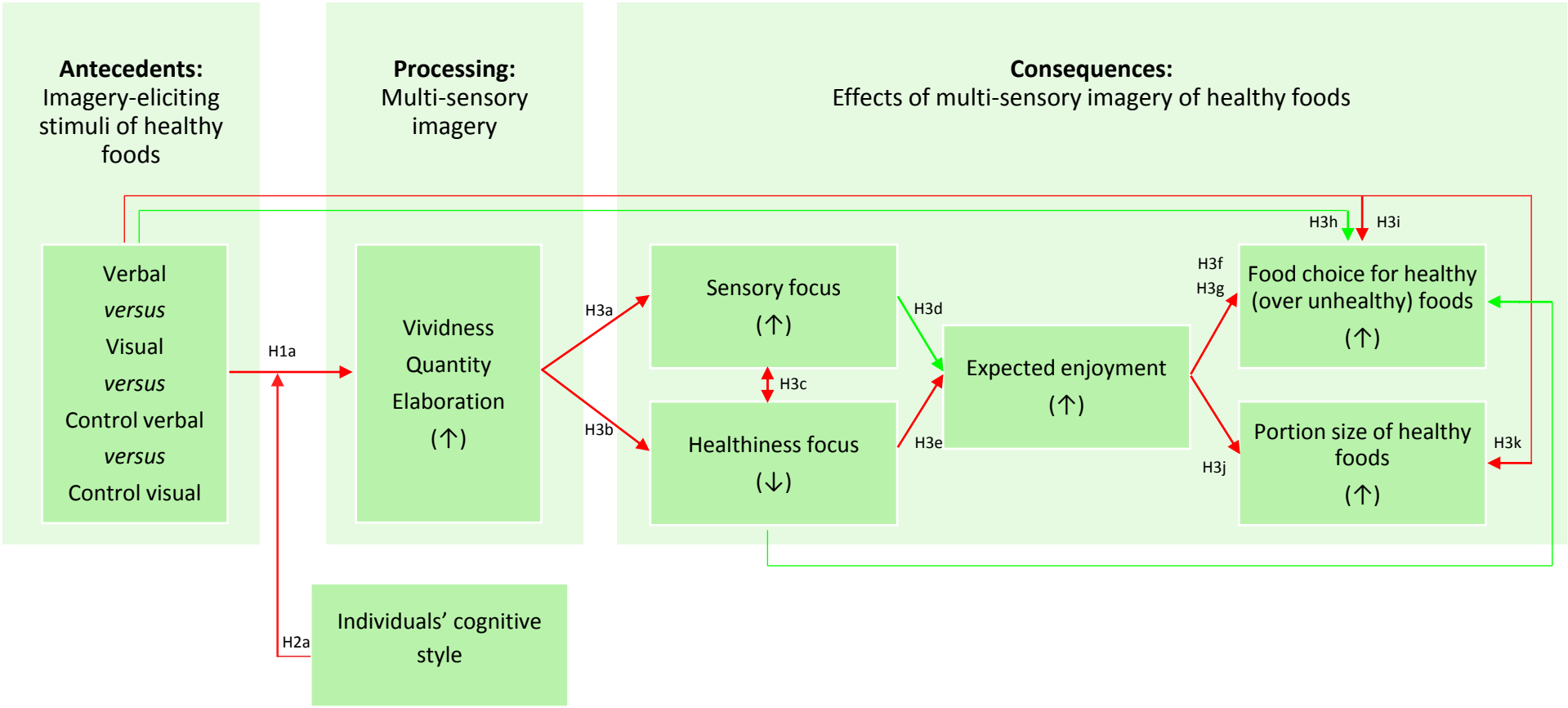


**Figure 7.** Evaluation of the conceptual framework of the impact of (verbal vs. visual vs. control verbal vs. control visual) imagery-eliciting stimuli on the multi-sensory imagery process and its consequences on the consumption of healthy foods.

# 6. DISCUSSION AND CONCLUSION

## 6.1. DISCUSSION

The main aim of the current research was to explore ways in which multi-sensory imagery effectively could be used as marketing technique to help consumers in making more healthy food choices (without either hurting food sales or eating enjoyment). There was particularly focused on verbal and visual stimuli to evoke multi-sensory imagery.

As verbal stimuli are generally expected to have a lower level of concreteness and easiness to imagine than visual stimuli, there was predicted that visual stimuli would presumably elicit multi-sensory imagery to a greater extent than verbal stimuli (MacInnis & Price, 1987; McDaniel & Cornoldi, 1991; Paivio & Marschark, 1991; Stöber, 1998; Kaplan et al., 1968; Lutz & Lutz, 1978). The results of the current study revealed not to be in line with those expectations. This result could probably be explained by the fact that according to the results of the pre-test, the verbal and visual stimuli to use during the main study were chosen based on level of multi-sensory imagery processing (vividness, quantity and elaboration). In this way, the consequences of the verbal and visual stimuli on consumers' food choices could be best measured during the main test. However, an unintended effect of this choice was that the used verbal and visual stimuli were comparable on level multi-sensory imagery (respectively 16.45 versus 15.75; see Table 9). Moreover, the multi-sensory imagery score of the verbal stimuli (*textual instructions to imagine*) was even higher than the score of the visual stimuli (*food pictures with sensory focus*). By taking a deeper look into the results of the pre-test, there can be seen that the three visual stimuli overall reveal to have a higher score on level of multi-sensory imagery than the verbal stimuli (see Table 9). Based on those results there could indeed be stated that visual imagery-eliciting stimuli have a greater impact on eliciting multi-sensory imagery than verbal imagery-eliciting stimuli, but those results could not be statistically proven by the results of the main study.

The more an individual has a visualizing cognitive style (compared to a verbalizing cognitive style), the greater impact was expected of (both verbal and visual) imagery-eliciting stimuli on multi-sensory processing (Clark & Paivio, 1991; Mendelson & Thorson, 2004). Unexpectantly, the impact of participants' cognitive style on multi-sensory imagery could not be proven by the results of the current study. These results could presumably be explained by the fact that the participants' of the current study did not have an outspoken verbal or visual cognitive style. Moreover, their cognitive style did not significantly differed from the middle score ($M$ = 3.49, $SD$ = 1.55), (t (250) = -.143, $p$ = .887). These results are in line with study of Marks (1973), in which he explains that people are generally comparable on level of imagination rating (cognitive style).In other words, as the participants of the current study were not specifically selected on level of cognitive style, no outstanding results were found of the moderating effect of this factor.

During the current study, several predictions have been made regarding the consequences of multi-sensory imagery. Based on study of Xie et al. (2016) and Raghunathan et al., (2006), multi-sensory imagery was among others expected to influence consumers to focus more intensively on sensory attributes, instead of health attributes, when evaluating healthy foods. In this way, the importance of sensory pleasure over other criteria (such as health concerns) could be increased when evaluating foods. Contradictory to those expectations, an influence of multi-sensory imagery processing on both the sensory and healthiness focus could not be confirmed by the results of the current study. These findings could presumably be explained by the fact that the participants were relatively familiar with the chosen food products. Moreover, the participants rated the food products on average ranging from 5.41 (snack

cucumbers) to 6.53 (strawberries) on 1-7 Likert scale. As these scores were relatively high (all significantly higher than 4, the middle score ($p < .001$)), participants were presumably familiar with the attributes (i.e. taste) of the products and therefore they did not have to evaluate the food products on level of missing values. Additionally, as consumers become easily habituated to food products and it is hard to change those habits once they are formed, it is difficult to influence those consumers to focus on other attributes than they normally do (Barnes, Gartland, & Stack, 2004). A solution for this problem might be to apply multi-sensory imagery to more unknown products to have more impact. Those products do not necessarily have to be completely new, they could also be renewed (or framed to be new) by the use of some minor adjustments (i.e. small taste adjustments; Godin, 2018). The most important part is that consumers evaluate those products as new. In those cases, consumers have a *blank mind* which makes it presumably possible to influence their sensory and healthiness focus, as they do not exactly know what they could expect from the products (Raghunathan et al., 2006). From a marketeer perspective, positioning (existing) products as new products could also be an advantage, as the life of any commercial product is not infinite (Midgley, 2014). A product which was once new, soon becomes established, followed by a period of stability, decline and extinction. Consumers may have become bored with the product and are for that reason constantly broaden there horizons to search for new products (Midgley, 2014). The renewal of existing products could therefore be an outcome.

Besides the direct consequences of multi-sensory imagery on consumers' healthiness and sensory focus, based on study of Raghunathan et al. (2006) also an effect of their healthiness and sensory focus on expected enjoyment was predicted. Moreover, by stimulating consumers to focus more on sensory- and less on healthiness attributes, consumers' focus could presumably be an outcome to evade the 'healthy ≠ tasty' intuition. To specify, according to Raghunathan et al. (2006), consumers will expect the same food as more tasty when it is portrayed as less healthy, which could imply that multi-sensory imagery would possibly increase the expected enjoyment of the healthy food product. In line with those predictions, a positive influence of participants' sensory focus on their expected enjoyment was found. However, the positive influence of participants' healthiness focus on their expected enjoyment could not be approved by the findings. Also these findings could probably be explained by the fact that the participants were relatively familiar with the food products used in the current study. Additionally, healthy foods are predominantly chosen for their outcome expectations (such a the level of hunger and health benefits), while hedonic foods are mostly chosen for their process expectations (such as smelling and tasting the foods; Xie et al. (2016)). As the products were (relatively) known, the participants could make a good estimation of the nutritional values of the foods (outcomes), which could explain that the expected enjoyment would not change that much as a results of a change in level of healthiness evaluation. For example, when evaluating familiar healthy foods, such as carrots, the consumer will presumably be aware of the health benefits of this product (i.e. essential for good vision). In case there will be focused on health attributes, the expected health benefits and therewith the expected enjoyment would not change, as the amount of health benefits a consumer has in mind will be stable. To be more concrete, the focus on healthiness attributes will not contribute to the evocation of new nutritional benefits (i.e. reducing the risk of cancer), it just let them focus on the benefits which are already known (in this case, benefits of carrot to be essential for a good vision). Contradictory to the healthiness focus, the findings of the current study supported the positive influence of sensory focus on consumers' expected enjoyment. These contradictory could be seen as logic, as according to Xie et al. (2016), consumers with a sensory focus will be more focused on the process expectations instead of the outcome expectations. As process expectations (i.e. tasteful) are more subjective in nature, focusing on sensory attributes could presumably contribute to the evocation of new sensory benefits (i.e. enjoyment), which could lead to an increase of expected enjoyment.

Next to that, according to Dhar and Simonson (1999) and Tepper and Trail (1998) expected enjoyment is suggested to be one of the most predominant reasons for selecting a food. Therefore, there could be expected that this factor would positively influence both the choice for healthy (over unhealthy) foods and the portion sizes of those foods. Unexpectantly, based on the results of the current study, no significant results of expected enjoyment could be found on participants' choice for healthy foods. However, although unpredictably, participants' choice for healthy products is found to be predictable by their healthiness focus. Stated differently, the more a consumer is evaluating the food on health attributes, the higher his/her choice for healthy (over unhealthy) food products would be. In line with those findings, also no significant influence of individuals' expected enjoyment on the portion sizes of healthy foods could be found, but healthiness (and sensory) attributes seem to be a significant predictor of the total amount of calories the participants chose to consume. Moreover, the larger participants' healthiness focus, the smaller the total amount of calorie intake. The sensory focus works the other way around: the larger participants' sensory focus, the larger their calorie intake was found to be. These findings could possibly be explained by the fact that consumers' mindset of healthy foods has shifted in recent years (Gagliardi, 2015; The Hartman Group, 2015; Raggatt et al., 2018). Consumers are taking more responsibility for their own health, and therefore the interest in fresh, natural and organic products is growing. These effects are probably the result of the current digital world in which knowledge and advices are easily shared and found (The Hartman Group, 2015). Moreover, according to Raghunathan et al. (2006) unhealthy food choices are often the result of a lack of knowledge of the negative consequences, which with the current ease of finding information could be more easily prevented. This could imply that research of Dhar and Simonson (1999) and Tepper and Trail (1998), who suggested that expected enjoyment is suggested to be one of the most predominant reasons for selecting a food, could be outdated. Also the healthiness focus is becoming increasingly important (Gagliardi, 2015) which could explain that consumers who focus more on health benefits choose larger portions of healthy foods but a smaller amount of total calories.

As final prediction of the current study, a positive influence of multi-sensory imagery-eliciting stimuli on both the choice for healthy (over unhealthy) foods and the portions sizes of those foods was expected. Unexpectantly, neither a significant effect was found on participants' food choices, nor on their portion sizes. In line with the explanation of the first discussion point, no difference in influence of verbal and visual multi-sensory imagery-eliciting stimuli on the food choices were probably found as those two stimuli were comparable on level of multi-sensory imagery processing. The difference between the multi-sensory imagery conditions and the (non-manipulated) control conditions could not be measured as the design was not suitable. The latter point will be more detailly explained in Section 6.2.

## 6.2. LIMITATIONS AND FUTURE RESEARCH

This study also encountered some limitations that will be acknowledged in order to possibly apply these during potential future research. Apart from those limitations, also some other possibilities will be given which could be researched in the future.

First of all, during the main test of the current study there is chosen to use verbal and visual multi-sensory imagery-eliciting stimuli which were found to evoke multi-sensory imagery on a certain level. An unintended effect of this choice was that the used verbal and visual stimuli were comparable on level of multi-sensory imagery. For this reason, it was hard to find out which of those two types of stimuli is more powerful individually. During future research it would therefore be recommended to find verbal and visual stimuli that are less comparable on level of multi-sensory imagery, but which still accurately reflect

stimuli that could be used in advertisements. However, finding useful advertisement stimuli that in particular contain either verbal or visual elements could be challenging. Moreover, Xie et al. (2016) and Trout (2008) described that there are a limited amount of advertisement tools in which solely verbal or visual elements are used. According to them, this could be explained by the fact that visual elements without a verbal message make for example almost no sense. To sum up, although it could be challenging it is important to well-consider the verbal and visual stimuli which will be used during possible future research in order to find out which stimuli is more powerful individually.

Next to that, for the conduction of the current study there was chosen to use a cross-sectional design. Moreover, in order to generate the same amount of distraction as in the multi-sensory imagery condition, control stimuli was used for both the visual- as verbal control condition. The choice for this design has been based on study of Robinson et al. (2014), who have shown that eating less 'attentively' could influence consumers to eat larger portion sizes. In other words, in case the participants of the control conditions did not have to perform a task, a smaller amount of food intake could be expected for participants of the control conditions compared to participants of the (verbal and visual) multi-sensory imagery conditions. Besides that, the participants of the control conditions had to fulfil a verbal or visual task which had nothing to do with multi-sensory imagery, instead of for example a non-food related multi-sensory imagery exercise. In this way, the participants were prevented from an influence of multi-sensory imagery, which could influence the manipulation and therefore also the results. However, the choice for the current design, instead of for example a 2x2 between subject design, made it impossible to compare the manipulated- and the control conditions. To be more specific, the extent of multi-sensory imagery processing of both control conditions was not measured, which makes is impossible to analyse the effects of this process. To summarize, although the choice for the current design was well-considered, for future research it could be interested to use for example a 2x2 between subject design in order to make it possible to make better comparisons of the different conditions.

Thirdly, according to Rigney and Lutz (1976) consumers' familiarity and prior experience with the food products could influence the degree of imagery activation. Therefore, based on the findings of the pre-test, there was chosen to use food products which were equally known by the participants. An unintended effect of this choice was the fact that participants' healthiness focus and expected enjoyment could presumably be influenced by the rate of familiarity of the foods (see Section 6.1). Therefore, it would be recommended to use, in line with the current study, foods which are equally known by the participants', but it could be interesting if those products (over all participants) contain a lower score on level of familiarity than they did during the current study.

Besides those limitations, this research also opens new avenues for future research. First of all, in the current research, consumers were not specifically selected on level of cognitive style. As differences in cognitive style could influence the amount of multi-sensory imagery processing (Clark & Paivio, 1991; see Section 6.1), this factor could be elaborated further in future research. Next to that, in most advertising media (TV, radio, internet, etc.) it is impossible to provide haptic and olfactory components (Krishna, Cian, & Sokolova, 2016). However, Peck, Barger and Webb (2013) found ways to address this issue, resulting in interesting findings on level of sensory imagery. Therefore, those factors could also be taking along during future research. Besides that, for the verbal stimuli, not only the effects of reading multi-sensory imagery stimuli, but also the effect when listening to them could be examined. Moreover, Brooks (1967) has found that mental imagery could more readily be elicited during listening than reading. In other words, the results of the current study could be stronger if the subjects had to listen to the verbal information, instead of reading it. Furthermore, in the current study, a subjective way of measuring mental imagery

was used. Future research could also examine the effect of multi-sensory imagery by using more objective methods, such as fMRI patterns in sensory brain area's (Pearson, 2014). Finally, research in other fields indicates that mental imagery experiences (i.e. daydreams and fantasies) could be varying across cultures (Doob, 1972) and age groups (Giambra, 1977). Therefore, future research could also examine the effects of verbal and visual multi-sensory imagery of different age- and cultural groups.

## 6.3. CONCLUSION

In summary, the aim of the current study was to find ways in which multi-sensory imagery could be used as marketing technique to help consumers in making more healthy food choices. By focusing on the differences of verbal and visual imagery-eliciting stimuli, recommendations for food marketers were aimed to find, in order to give them possibilities to use multi-sensory imagery in the most efficient way. In this manner, consumers could be steered towards more healthy food choices, without hurting food sales. However, based on the results of the main study, there could not be found which type of multi-sensory imagery stimuli (verbal versus visual) was most powerful in influencing consumers food choices. Therefore, on this field, no recommendation could be given. On the other hand, surprisingly results were found on level of the influence of consumers' healthiness (and sensory) focus, on the choice for healthy (over unhealthy) foods and the total amount of calorie intake. Contradictory to the hypothesis, the more individuals were focusing on health attributes, the higher their choice for healthy (over unhealthy) food products and the lower their total calorie intake. Based on both those findings and existing literature (i.e. The Hartland Group, 2015; Raggatt et al., 2018; Gagliardi, 2015) there could be argued that a healthy lifestyle is becoming more and more important for consumers. Not for nothing, 'fitspiration' has become an official term (Raggatt et al., 2018) and people make increasingly use of wearable lifestyle technologies, such as step and calorie burning watches (Goodyear, Kerner, & Quennerstedt, 2019). With help of those technologies, having a healthy lifestyle becomes fun, entertaining and useful. Next to that, it becomes more easy to find information and advices, which is an important factor to obtain a better health status. To summarize, although there is still much work to be done in promoting healthy lifestyles, a switch could be found in the consumer market to more healthy preferences. For both consumers as marketers it could therefore be an outcome to take along some healthiness aspects in their advertisements. A combination of multi-sensory imagery with sensory attributes sound interesting, but this is for now not more than an imagery.

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# APPENDIX

## APPENDIX I: QUESTIONNAIRE PRE-TEST

### INFORMED CONSENT

Thank you in advance for participating this survey!

You are invited to participate in a study of Wageningen University about food choices.

During the survey, you will be asked to evaluate six different stimuli and several food products. The entire session will last about 15 minutes.

There are no foreseeable risks, your responses are anonymous and you may refuse to answer particular questions or withdraw from this research study at any time.

If you have any questions concerning the research study, please feel free to e-mail me at heleen.nijland@wur.nl

By clicking 'yes', you are indicating that you have read the description of the study and that you agree to the terms as described above.

Yes, I am willing to participate in this study!

### VERBAL AND VISUAL STIMULI

This is the first part of the survey.

In the upcoming part of the questionnaire, six different texts or pictures will be shown to you. Imagine that these stimuli will be portrayed on for example a product package or in an advertisement. Be aware, some of the stimuli might look similar, but this is not the case, they are all different.

You will be asked to evaluate the (eventual) imagery that will be evoked, by filling out the questions as seriously and honestly as possible.

Example: picture of an apple

Please evaluate the (eventual) imagery that is evoked by the stimuli above (in the delineated box), by rating the following statements.

| Not at all | | | | | | Extreme |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

The imagery that came up in my mind was clear

The imagery that came up in my mind was vivid

I only experienced one image

I imagined a number of things

I fantasized about the product

I imagined what it would be like to use the product

To what extent would you evaluate the stimuli (in the delineated box) as being spontaneous?

(NOTE: spontaneous stimuli can in this case be described as automatic, without being instructed)

| Not at all | | | | | | Extreme |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Below the other five stimuli. All measured with help of the same 16 questions.

Please try to mentally rate how appetizing you find the apple on this picture (not at all appetizing – extremely appetizing)

Apple

Please think about eating a well-known Jonagold apple, by imagining its high odour intensity in peel and flesh, odour of pear. Very Juicy and tender, some mealiness, low chewing toughness. Sweet apple, low acidity, flavour or pear, quite high flavour intensity.

Please cover your eyes and try to imagine the consequences of eating an apple. Try to think about all your five senses.

## SNACK PRODUCTS

You just arrived at the second part of the survey.

In the upcoming part of the questionnaire, 20 ready-to-eat **snack products** (so foods that are consumed between the traditional three meals a day and which don´t have to be prepared) will be shown to you. You will be asked to evaluate those products by filling out the questions as seriously and honestly as possible.

Example: Snack tomato

**Snack tomato**

| Not at all | | | | | | Extreme |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

This snack product is a more healthy option in the snack product category

I consider this snack as appropriate in the healthy snack category

If I would eat this snack regularly, this will not negatively affect my weight and health

I am familiar with the snack product

I have prior experience with the snack product

My prior experience with the food product is positive

Below, the other 19 food products. All measured with help of the same six questions.

Watermelon

Veggie chips

Oat cookie cranberry

Snack a jack crispy cheese

Crespini breadstick rosemary

Lays paprika chips

Sausage roll

Strawberries

Apple pie

Ben & Jerry ice cream cookie dough


Mixed nuts

Banana chips

M&M's peanut

Redband winegums

Apple chips

Cheese cubes

Duyvis cocktail nuts

**Peijnenburg Zero% sugar**

**Snack cucumber**

## GENERAL QUESTIONS

WAGENINGEN UR
For quality of life

You arrived at the last part of the survey. Please fill in the questions as seriously and honestly as possible.

WAGENINGEN UR
For quality of life

What is your gender?

- Male
- Female

What is your age?

0 10 20 30 40 50 60 70 80 90 100

This was the last question of the survey. If you have a question, please feel free to send me an e-mail (heleen.nijland@wur.nl). Thank you for your participation!

## APPENDIX II: QUESTIONNAIRE INVITATION

Beste meneer/mevrouw,

Neem ik voor mijn ontbijt een boterham of een schaaltje yoghurt? Wat zal ik vanavond eten? Kies ik vandaag wel of geen dessert? Dit soort vragen komen u waarschijnlijk bekend voor. De gemiddelde mens maakt per dag namelijk zo'n 200 keuzes over zijn of haar voeding.

Voor het afronden van mijn studie (consumentenwetenschappen) zou ik graag een beter beeld willen krijgen over voedingskeuzes van de consument. U zou mij hierbij kunnen helpen, door het beantwoorden van een aantal korte vragen. Daarnaast maakt u door het invullen van deze vragenlijst ook nog eens kans op het winnen van een bol.com cadeaubon van 25,-.

De totale vragenlijst duurt ongeveer 8 minuten en de gegevens blijven geheel anoniem.

Alvast bedankt voor uw medewerking.

Met vriendelijke groet,

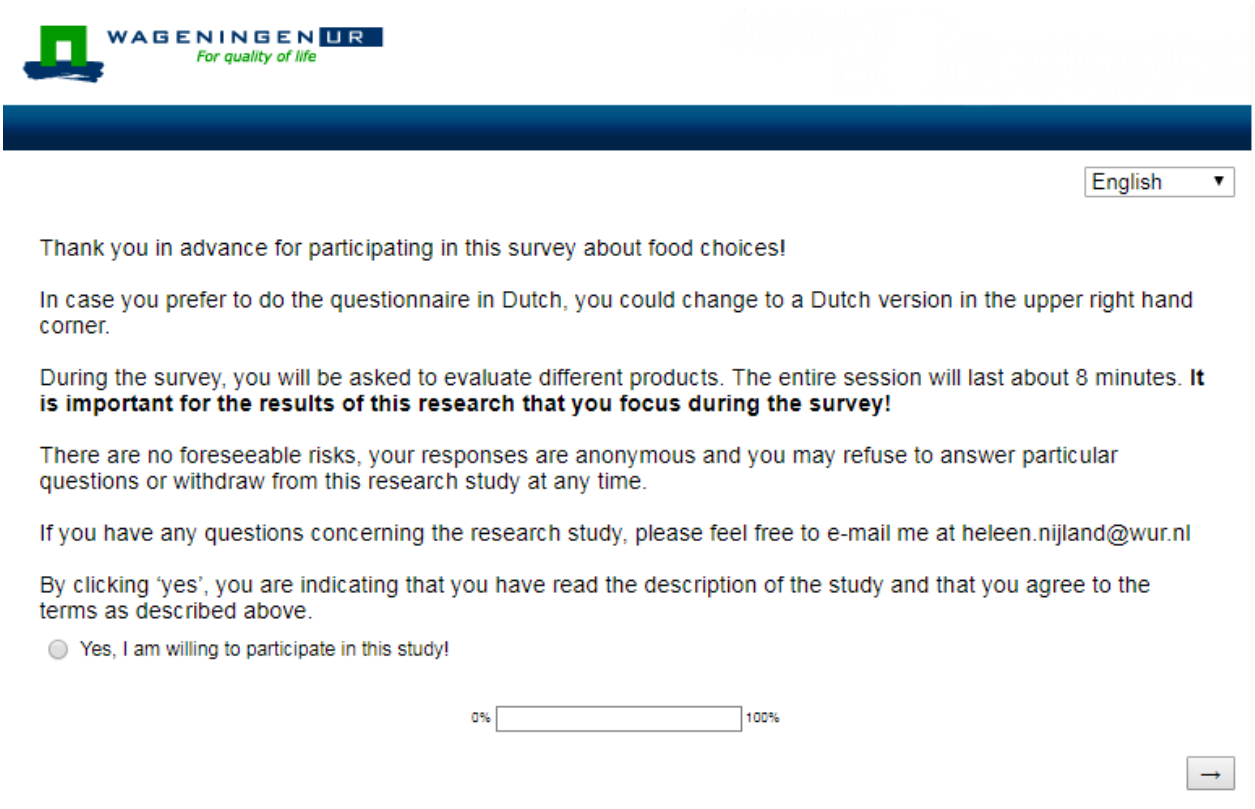
Heleen Nijland

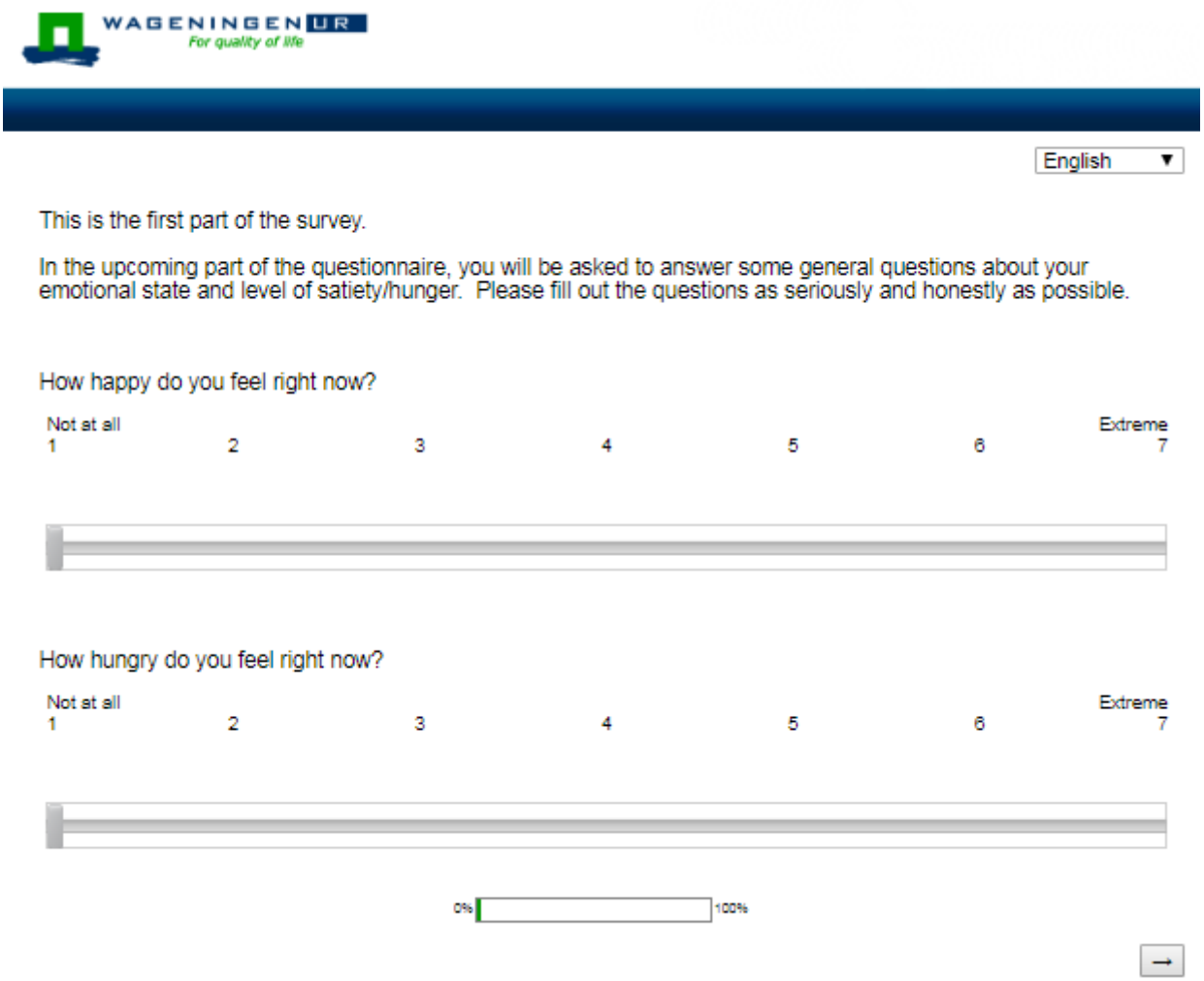
In het geval u vragen heeft kunt u mij bereiken op het volgende mail adres: Heleen.nijland@wur.nl

Hieronder de link naar de Nederlandse
enquête: https://wur.az1.qualtrics.com/jfe/form/SV_eljMOXlJAY8UFql

# APPENDIX III: QUESTIONNAIRE MAIN TEST

## INFORMED CONSENT




WAGENINGEN UR
For quality of life
English
This is the first part of the survey.
In the upcoming part of the questionnaire, you will be asked to answer some general questions about your emotional state and level of satiety/hunger. Please fill out the questions as seriously and honestly as possible.
How happy do you feel right now?
Not at all
1
2
3
4
5
6
Extreme
7
How hungry do you feel right now?
Not at all
1
2
3
4
5
6
Extreme
7
0%
100%
→

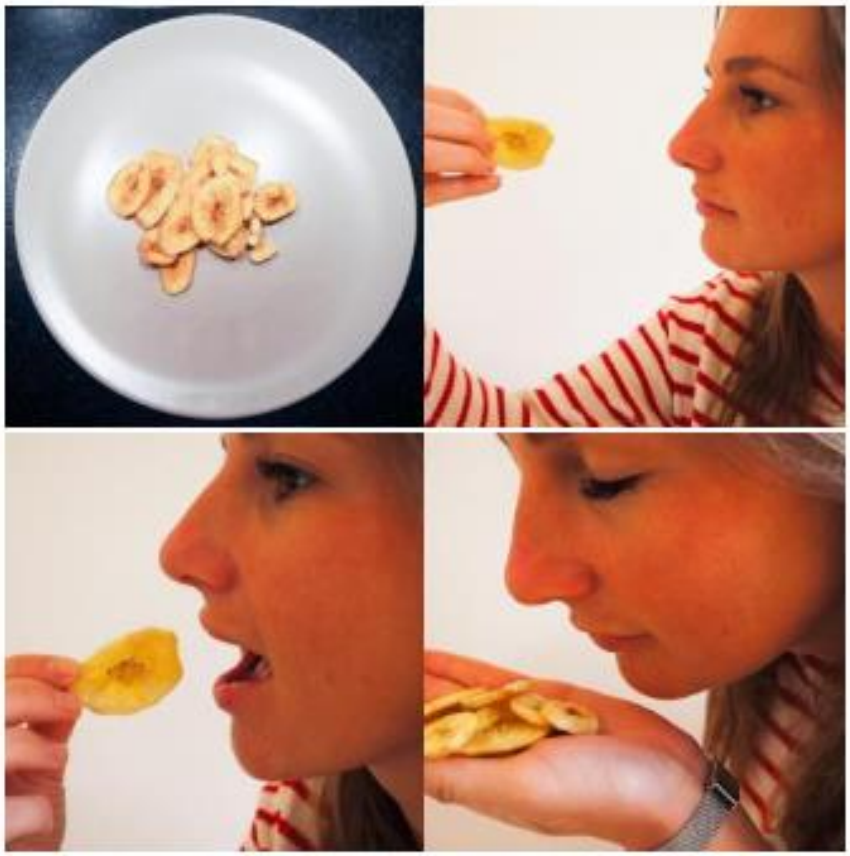
## VISUAL CONDITION

Banana chips

WAGENINGEN UR
For quality of life

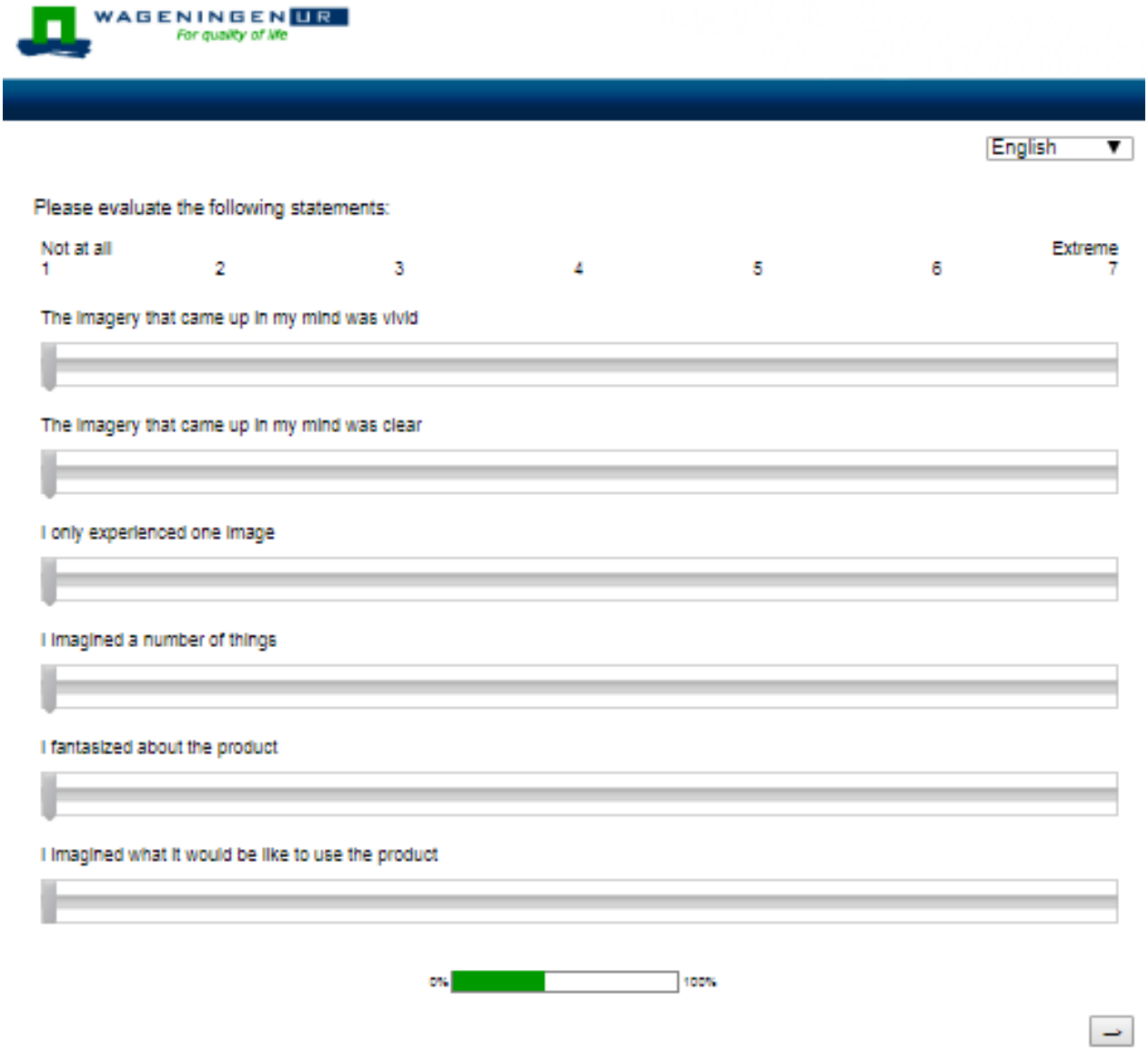
English

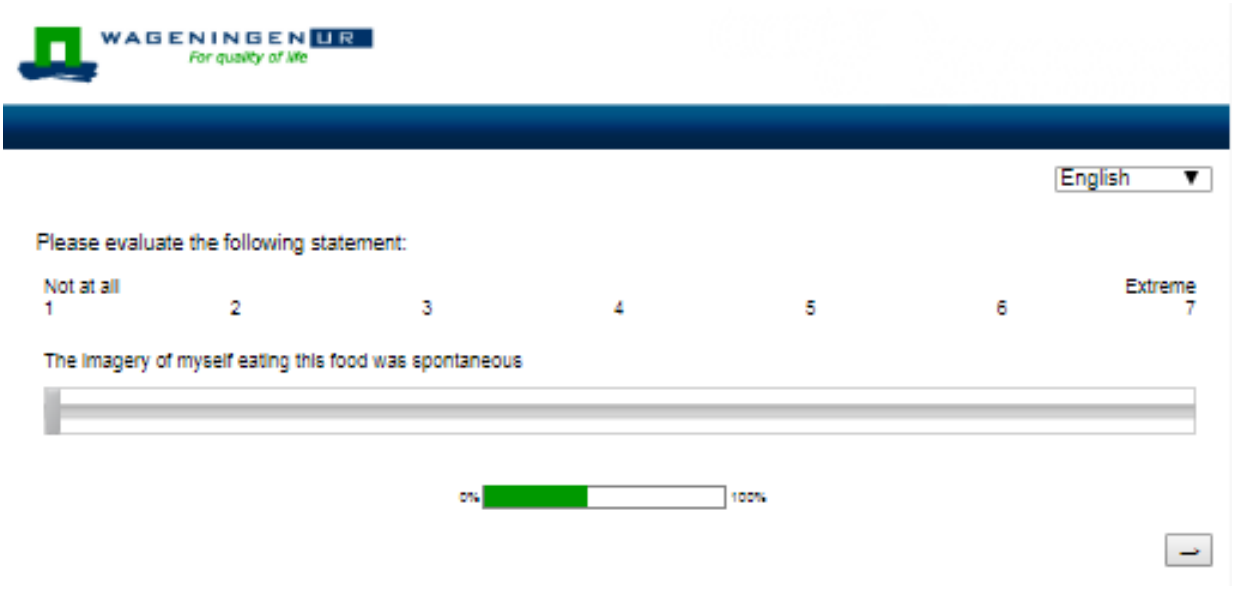
In this part of the questionnaire, you will be asked to evaluate a portion of banana chips. Please fill out the questions as seriously and honestly as possible.



Please take a look at the pictures above on which a portion of banana chips is portrayed. After you have carefully studied the pictures, you could continue to the next page.

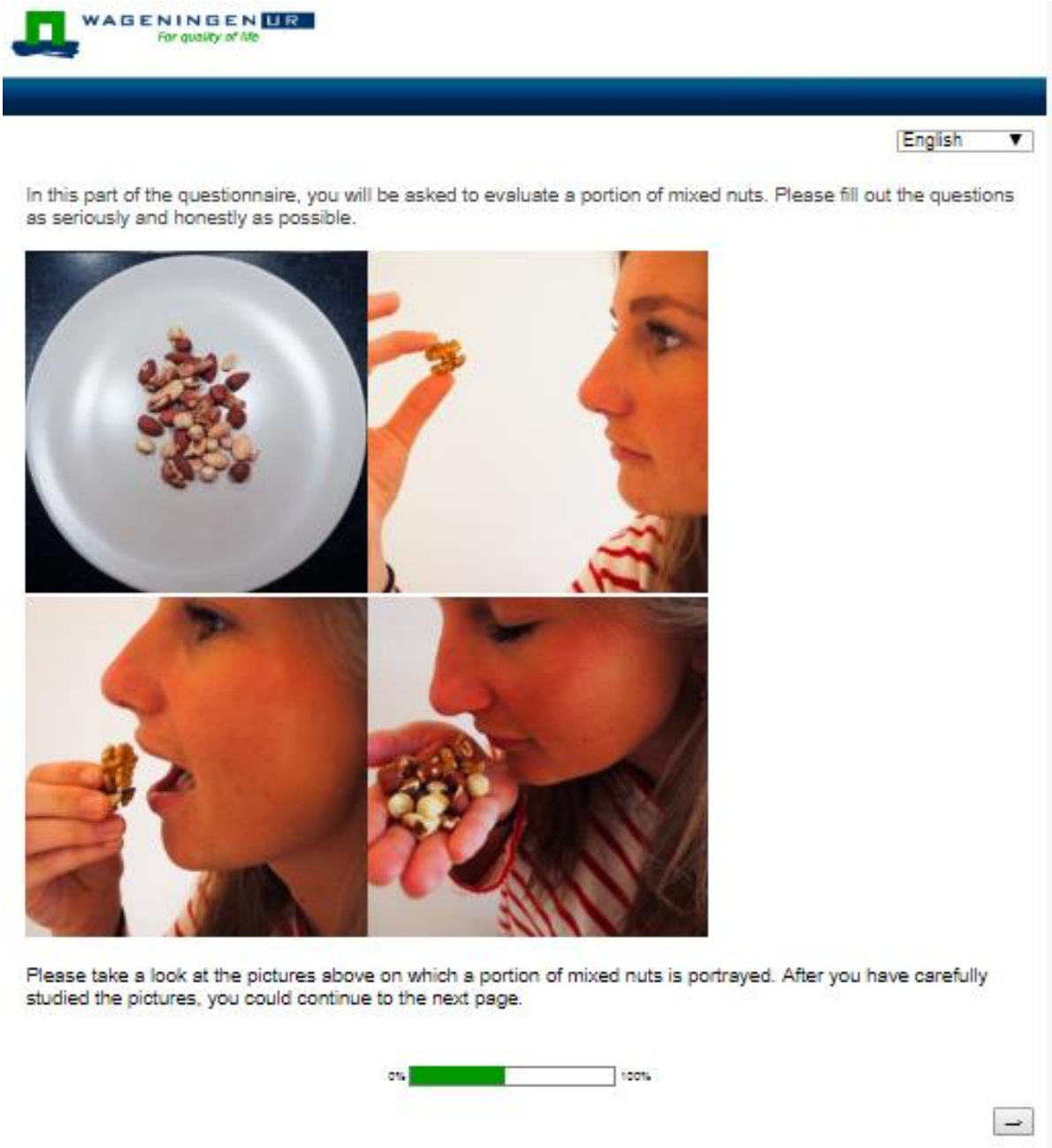
0% 100%


WAGENINGEN UR
For quality of life
English
Please evaluate the following statements:
Not at all
1
2
3
4
5
6
Extreme
7
The imagery that came up in my mind was vivid
The imagery that came up in my mind was clear
I only experienced one image
I imagined a number of things
I fantasized about the product
I imagined what it would be like to use the product
0%
100%


WAGENINGEN UR
For quality of life
English
Please evaluate the following statement:
Not at all
1
2
3
4
5
6
Extreme
7
The imagery of myself eating this food was spontaneous
0%
100%

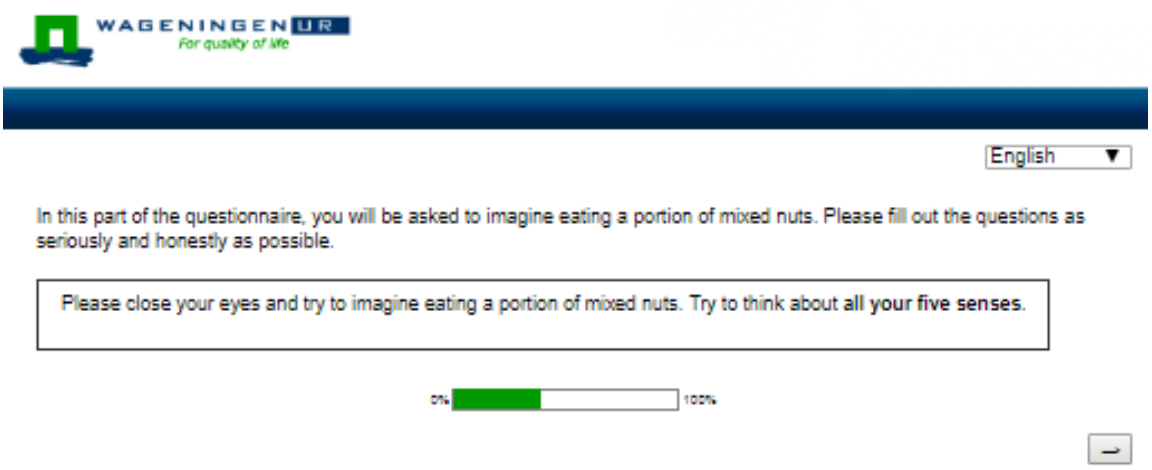
**Mixed nuts.**

For banana chips and mixed nuts, the same seven questions were used to measure multi-sensory imagery.

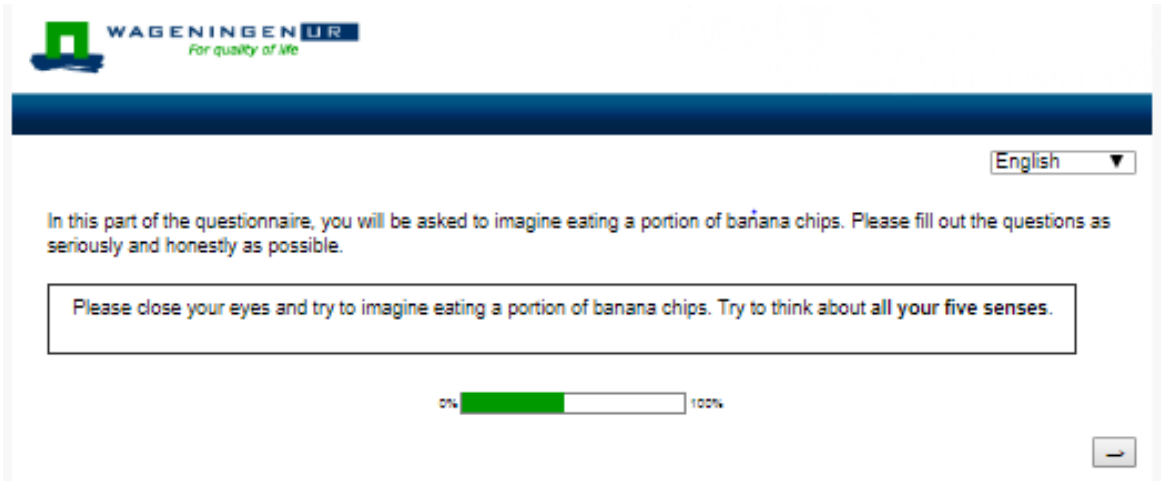


## VERBAL CONDITION

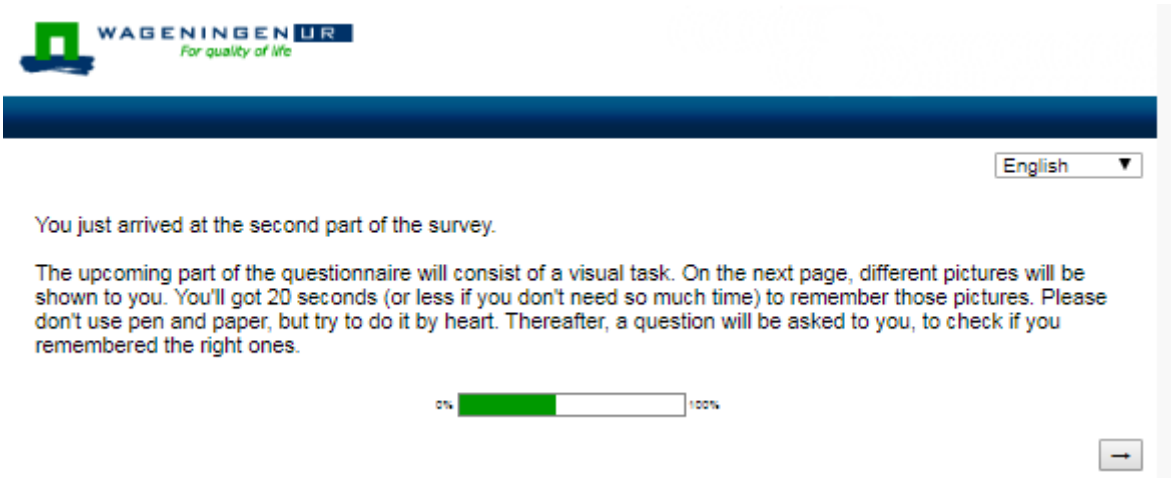
**Mixed nuts.** For banana chips and mixed nuts in the verbal condition, the same seven questions were used to measure multi-sensory imagery as in the visual condition.




**Banana chips**




## VISUAL CONTROL CONDITION



14

0% 100%

→

WAGENINGEN UR
For quality of life

English

One of the following pictures was NOT part of the previous list. Please indicate which one you think that is.

0% 100%

→

## VERBAL CONTROL CONDITION

WAGENINGEN UR
For quality of life

English

You just arrived at the second part of the survey.

The upcoming part of the questionnaire will consist of a verbal task. On the next page, different names will be shown to you. You'll got 20 seconds (or less if you don't need so much time) to remember those names. Please don't use pen and paper, but try to do it by heart. Thereafter, a question will be asked to you, to check if you remembered the right names.

0% 100%

→

GOMO

DILI

GILI

DOLO

DOMO

0% 100%

→

WAGENINGEN UR
For quality of life

English

One of the following names was NOT part of the previous list. Please indicate which one you think that is.

- DOLO
- GOMO
- DIMI
- DOMO

0% 100%

→

## FOOD CHOICES: BUFFET

WAGENINGEN UR
For quality of life

English

You just arrived at the third part of the survey, about food choices.

Imagine that the products which are portrayed below will be available on a buffet. You could choose yourself which product(s) you would like to eat as a snack at a self-chosen moment today. Please indicate if you want to eat the snack product, and if the answer is yes, which portion size you would choose. You do not necessarily have to choose only one product, but you could also mix different products and different product sizes. Be aware: it is mandatory to tick a box for every single product. If you are not choosing the product, please select the picture on which the empty plate is portrayed.

Please fill out the questions as seriously and honestly as possible.

M&M's peanut

Snack cucumbers

Strawberries

Apple pie

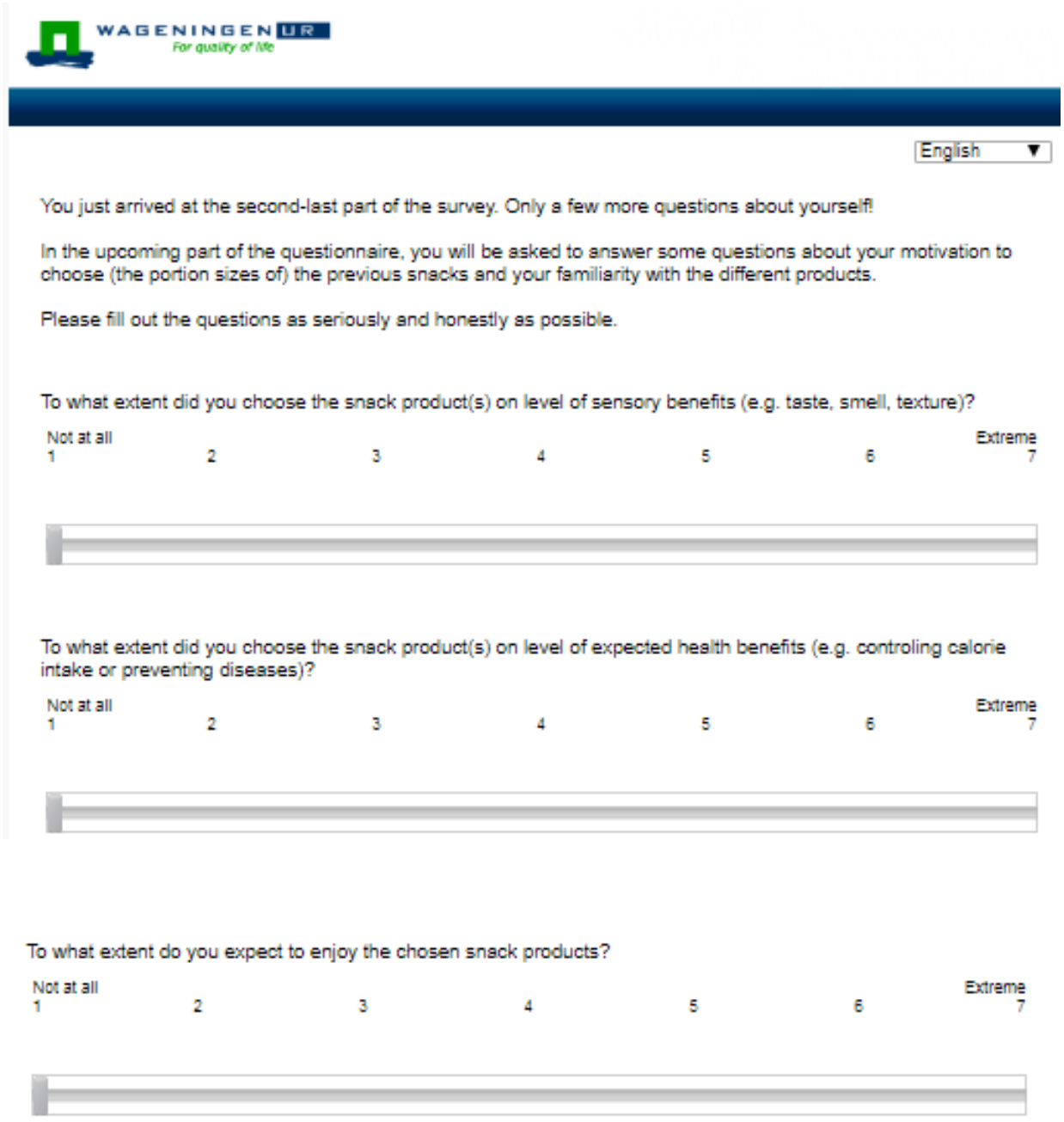
Lay's paprika chips

Snack tomato's

Watermelon

Cheese cubes

## FOOD CHOICES: MOTIVATIONS TO CHOOSE THE FOOD PRODUCTS



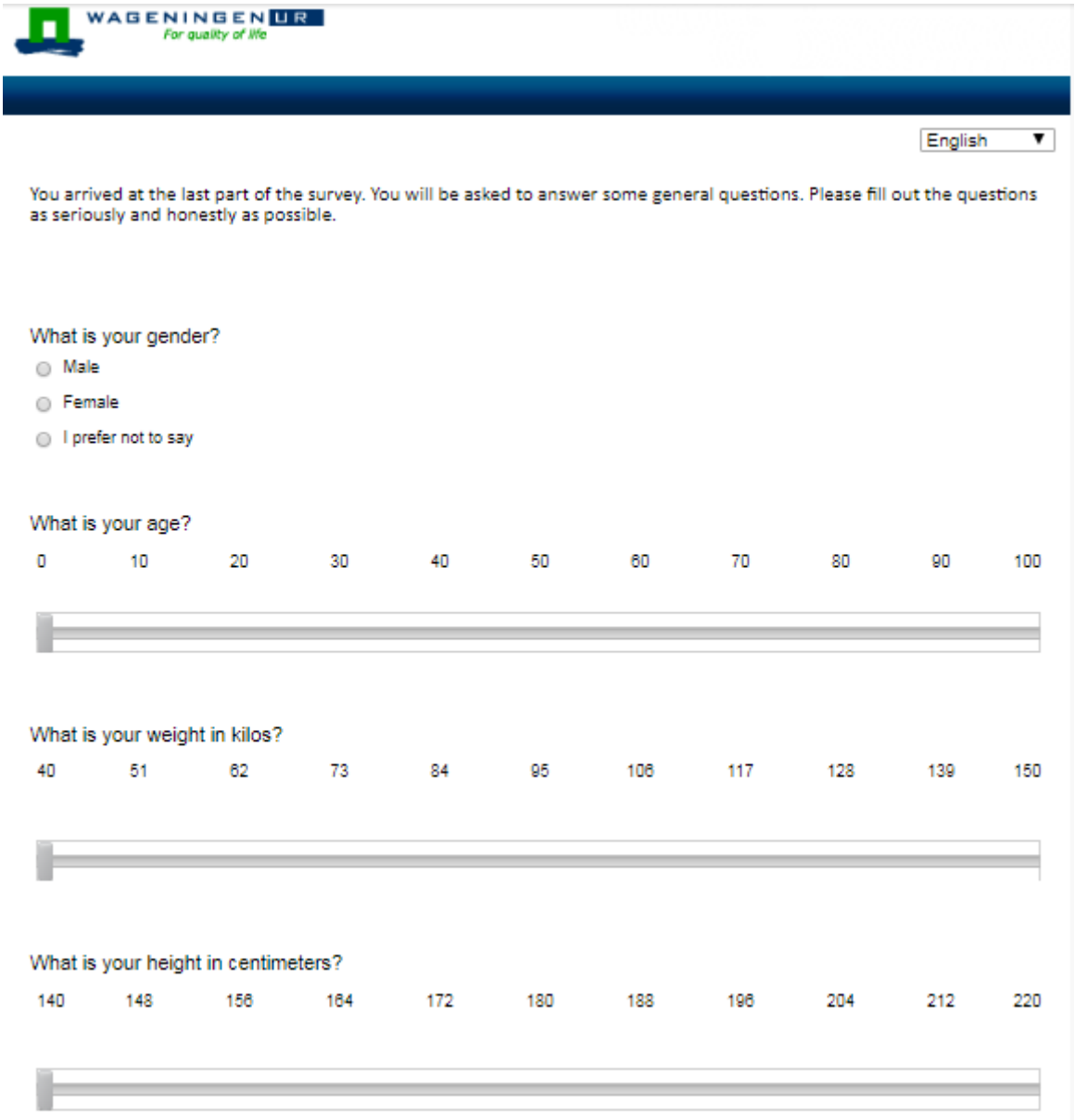
Please evaluate the following products.

| | I am familiar with the product | | | | | | | My prior experience with the product is positive/negative | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Extreme unfamiliar | Unfamiliar | Slightly unfamiliar | Neutral | Slightly familiar | Familiar | Extreme familiar | Extreme negative | Negative | Slightly negative | Neutral | Slightly positive | Positive | Extreme positive |
| Strawberries | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Watermelon | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Snack tomato's | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Snack cucumers | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| M&M's peanut | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Apple pie | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Lay's paprika chips | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Cheese cubes | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

0% 100%

→

## GENERAL QUESTIONS



To what extent is your health important for you?

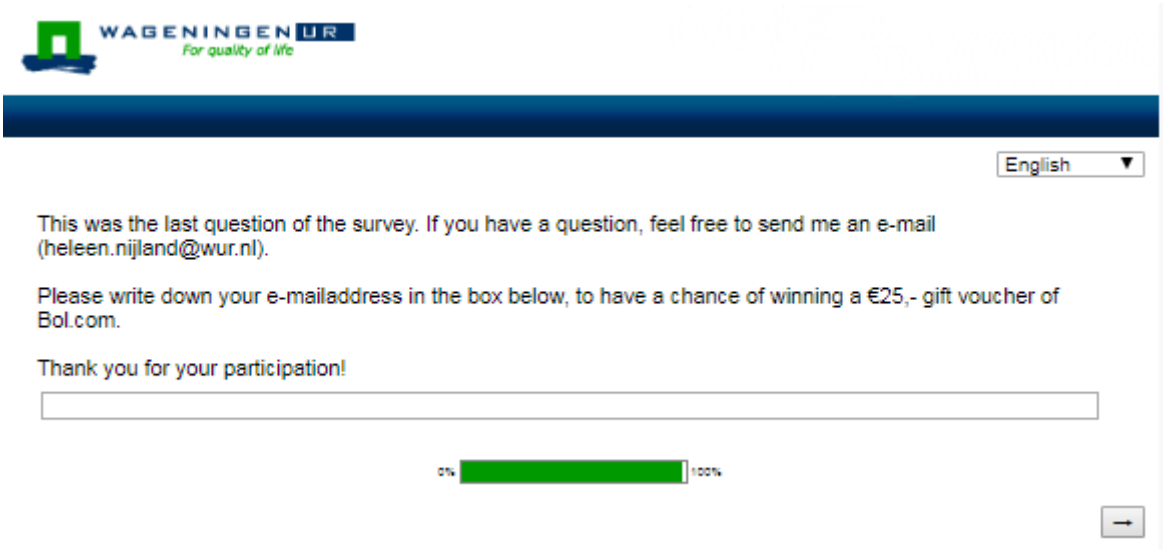
| Not at all | | | | | | Extreme |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

To what extent do you prefer visual over verbal elements when getting information?

| I strongly prefer visual elements | I prefer visual elements | I slightly prefer visual elements | Neutral | I slightly prefer verbal elements | I prefer verbal elements | I strongly prefer verbal elements |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

0% 100%

→



## APPENDIX IV: FACTORANALYSIS MULTI-SENSORY IMAGERY ITEMS

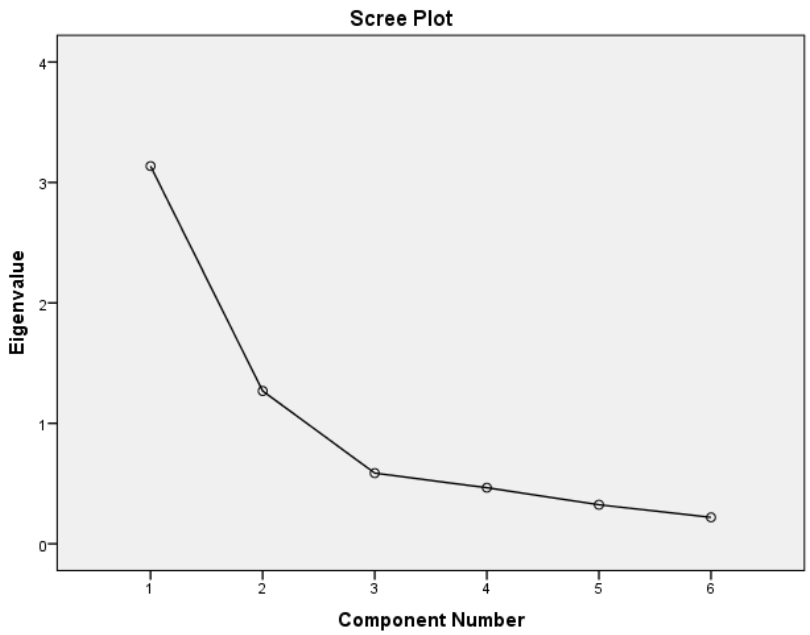



**Figure 8.** Factor analysis: Scree plot of all multi-sensory imagery items; showing two components have an Eigenvalue > 1.

**Table 24.** Factor analysis: Component matrix. Items and factor loadings of the factor analysis for measuring multi-sensory imagery items.

| | Component 1 | Component 2 |
|---|---|---|
| **Vivid image** | .823 | -.202 |
| **Clear image** | .757 | -.410 |
| **One image** | -.130 | .884 |
| **Number of things** | .694 | .442 |
| **Fantasies about the product** | .824 | .281 |
| **Imaginations about using the product** | .842 | .064 |

Extraction method: Principal component analysis.
a. 2 components extracted.

## APPENDIX V: CALCULATION OF GRAMS AND CALORIC DENSITY OF PORTIONS

**Table 25**. Calculation of amount of grams per portion size. P4 is set as the 'standard portion'.

| | P1 | P2 | P3 | P4 | P5 | P6 | P7 |
|---|---|---|---|---|---|---|---|
| **Strawberries** | 0 | 41.7 | 83.3 | 125.0 | 166.7 | 208.3 | 250.0 |
| **Watermelon** | 0 | 50.0 | 100.0 | 150.0 | 200.0 | 250.0 | 300.0 |
| **Snack tomatos** | 0 | 66.7 | 133.3 | 200.0 | 266.7 | 333.3 | 400.0 |
| **Snack cucumbers** | 0 | 66.7 | 133.3 | 200.0 | 266.7 | 333.3 | 400.0 |
| **M&M's peanut** | 0 | 14.7 | 29.3 | 44.0 | 58.7 | 73.3 | 88.0 |
| **Apple pie** | 0 | 41.7 | 83.3 | 125.0 | 166.7 | 208.3 | 250.0 |
| **Lay's paprika chips** | 0 | 10.0 | 20.0 | 30.0 | 40.0 | 50.0 | 60.0 |
| **Cheese cubes** | 0 | 16.7 | 33.0 | 50.0 | 66.7 | 83.3 | 100.0 |

**Table 26**. Amount of calories per portion (Calorielijst, 2019). P100 = amount of calories per 100 grams.

| | P100 | P1 | P2 | P3 | P4 | P5 | P6 | P7 |
|---|---|---|---|---|---|---|---|---|
| **Strawberries** | 32.5 | 0 | 13.5 | 27.1 | 40.6 | 54.2 | 67.7 | 81.2 |
| **Watermelon** | 30.4 | 0 | 15.2 | 30.4 | 45.6 | 60.8 | 76.0 | 91.2 |
| **Snack tomatos** | 17.0 | 0 | 11.3 | 22.7 | 34.0 | 45.4 | 56.7 | 68.0 |
| **Snack cucumbers** | 8.0 | 0 | 5.3 | 10.7 | 16.0 | 21.4 | 26.7 | 32.0 |
| **M&M's peanut** | 514.0 | 0 | 75.4 | 150.8 | 226.2 | 301.5 | 377,0 | 452.4 |
| **Apple pie** | 274.0 | 0 | 114.2 | 228.3 | 342.5 | 456.6 | 570.8 | 684.9 |
| **Lay's paprika chips** | 513.0 | 0 | 51.3 | 102.6 | 153.9 | 205.2 | 256.5 | 307.8 |
| **Cheese cubes** | 377.0 | 0 | 62.8 | 125.6 | 188.5 | 251.3 | 314.1 | 376.9 |

## APPENDIX VI: FAMILIARITY AND PRIOR EXPERIENCE OF THE FOOD PRODUCTS

**Table 27**. Familiarity and prior experience of the eight food products per condition, measured on 7-point Likert scale.

| | **Verbal (*N* = 59)** | **Visual (*N* = 59)** | **Verbal control (*N* = 65)** | **Visual control (*N* = 68)** | ***P* value** |
|---|---|---|---|---|---|
| **Strawberries (M)** | | | | | |
| **Familiarity** | 6.5 (*SD* = 0.6) | 6.5 (*SD* = 0.5) | 6.6 (*SD* = 0.6) | 6.5 (*SD* = 0.5) | .551 |
| **Prior experience** | 6.2 (*SD* = 0.8) | 6.2 (*SD* = 0.9) | 6.3 (*SD* = 0.9) | 6.2 (*SD* = 0.7) | .901 |
| **Watermelon (M)** | | | | | |
| **Familiarity** | 6.2 (*SD* = 0.7) | 6.2 (*SD* = 0.8) | 6.2 (*SD* = 0.8) | 6.2 (*SD* = 0.7) | .927 |
| **Prior experience** | 5.6 (*SD* = 1.4) | 5.8 (*SD* = 1.2) | 5.7 (*SD* = 1.4) | 5.8 (*SD* = 1.0) | .564 |
| **Snack tomato's (M)** | | | | | |
| **Familiarity** | 6.4 (*SD* = 0.7) | 6.2 (*SD* = 1.1) | 6.3 (*SD* = 0.9) | 6.3 (*SD* = 0.7) | .594 |
| **Prior experience** | 5.6 (*SD* = 1.1) | 5.6 (*SD* = 1.3) | 5.5 (*SD* = 1.5) | 5.6 (*SD* = 1.3) | .842 |
| **Snack cucumber (M)** | | | | | |
| **Familiarity** | 5.1 (*SD* = 1.3) | 5.3 (*SD* = 1.4) | 5.4 (*SD* = 1.4) | 5.5 (*SD* = 1.1) | .775 |
| **Prior experience** | 4.9 (*SD* = 1.3) | 5.1 (*SD* = 1.3) | 5.1 (*SD* = 1.3) | 5.3 (*SD* = 1.1) | .267 |
| **M&M's peanut (M)** | | | | | |
| **Familiarity** | 5.4 (*SD* = 1.4) | 5.5 (*SD* = 1.5) | 5.7 (*SD* = 1.6) | 5.6 (*SD* = 1.1) | .586 |
| **Prior experience** | 4.8 (*SD* = 1.7) | 4.8 (*SD* = 1.8) | 4.9 (*SD* = 2.1) | 4.9 (*SD* = 1.5) | .971 |
| **Apple pie (M)** | | | | | |
| **Familiarity** | 6.2 (*SD* = 1.0) | 6.3 (*SD* = 0.8) | 6.4 (*SD* = 0.8) | 6.3 (*SD* = 0.6) | .646 |
| **Prior experience** | 5.9 (*SD* = 1.0 | 5.8 (*SD* = 1.3) | 5.7 (*SD* = 1.3) | 5.8 (*SD* = 0.9) | .697 |
| **Lay's paprika chips (M)** | | | | | |
| **Familiarity** | 5.8 (*SD* = 1.4) | 6.0 (*SD* = 1.2) | 6.1 (*SD* = 1.3) | 5.7 (*SD* = 1.1) | .331 |
| **Prior experience** | 5.0 (*SD* = 1.7) | 5.0 (*SD* = 1.6) | 5.1 (*SD* = 1.7) | 5.3 (*SD* = 1.4) | .794 |
| **Cheese cubes (M)** | | | | | |
| **Familiarity** | 6.2 (*SD* = 1.0) | 6.3 (*SD* = 1.0) | 6.3 (*SD* = 1.0) | 6.2 (*SD* = 0.9) | .889 |
| **Prior experience** | 5.7 (*SD* = 1.2) | 5.6 (*SD* = 1.2) | 5.6 (*SD* = 1.6) | 5.7 (*SD* = 1.3) | .896 |