

PLEASURE AS A SUBSTITUTE FOR HEALTH:

THE EFFECTS OF MULTISENSORY IMAGERY ON THE EVALUATION CONSUMPTION OF
WHOLE WHEAT BREAD



Heleen Nijland, March 2016

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ABSTRACT

Consumers make about two-hundred food decisions a day. Because of this large number, it is important to examine how those decisions can be influenced in order to encourage people to choose the best options for their own health. The objective of this study was to find out to what extent multisensory imagery affects the evaluation and consumption of healthy food products. A between-subjects experiment was conducted among students of Wageningen University. Participants were randomly assigned to one of the three conditions (multisensory imagery condition, health focus condition or control condition). In all three conditions they had to think about several questions, fill in several questions and eat a self-chosen amount of whole wheat bread as part of a supposed taste test. Results had shown that multisensory imagery had a significant effect on healthiness evaluation, eating enjoyment and liking of whole wheat bread. Next to that, participants in the multisensory imagery condition were significantly willing to pay more for the same amount of whole wheat bread than participants in the other two conditions. However, multisensory imagery did not impact intake of this food product. This result could probably be explained by the fact that the research was held in a controlled environment. A more natural setting, with for example real customers, could probably be a solution for this limitation. Overall, the findings of this research suggest that consumers evaluate healthy food products as more tasty when multisensory imagery is applied. This could be a solution to undermine the healthy \neq tasty concept, and as a result stimulate people to like healthy products better.

Keywords: multisensory imagery, food intake, healthiness evaluation, eating enjoyment, whole wheat bread

One of the most alarming statistics of food consumption is the rate of overweight and obesity. In 2014, more than 1.9 billion of the worldwide adults (39% of world's adult population) were overweight. Of these, over 600 million (13% of world's adult population) were obese (WHO/FAO, 2015). In the Netherlands, the prevalence of overweight and obesity is increasing in all population groups, including for instance children, people with a low and high socio-economic status and the elderly people (Schokker, Visscher, Nooyens, van Baak and Seidell, 2006). The prevalence of overweight in adult males in the Netherlands increased from 37% in 1981 to 51% in 2004 and in adult females from 30% in 1981 to 42% in 2004 (Schokker et al., 2006). In boys and girls, obesity prevalence doubled or even tripled from 1980 to 1997, and again from 1997 to 2002–2004 a two- or threefold increase was seen for almost all ages (Schokker et al., 2006).

The raised BMI – which is greater or equal to 25 in case of overweight and greater or equal to 30 in case of obesity – has consequences 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; Hills, Schultz, Soares, Byrne, Hunter, King, and Misra, 2010). The physical effects are the most important. The raised BMI is the major risk factor for chronic NCDs (non-communicable diseases) - including diabetes mellitus, cardiovascular disease (CVD) and some types of cancer – which become increasingly significant causes of disability and premature death (WHO/FAO, 2002).

Research has shown that there are three common factors which can influence obesity: *genetics*, *metabolism* and *lifestyle* (Standford Health Care, 2015; Marti, Moreno-Aliaga, Hebebrand and Martínez, 2004). Although people cannot change their genes or metabolism, consumers lifestyle can be changed by expending more (e.g. more exercising) and consuming less calories (e.g. choosing smaller portion sizes or less calorie-dense foods). At the moment, governments and public health institutions use different strategies to influence people to decrease their excessive calorie intake, including message framing to motivate health behaviour (i.e. Gerend and Maner, 2011), motivating mindfulness (i.e. Godsey, 2013), portion size limits (i.e. Geier, Rozin and Doros, 2015), health appeals (warnings, food labeling) and more. Unfortunately, those strategies have limited success because they undermine eating pleasure and involve an economic cost for food marketers who extract higher profits from larger portions (Cornil, and Chandon, 2015).

According to Cornil and Chandon (2015), focusing on sensory pleasure can be a solution to achieve a better balance between consumer enjoyment, business and health. In their research, they want to challenge the assumption that sensory pleasure is an enemy of healthy eating. Namely, although most people believe that thinking about a desirable food increases their hedonic response to the stimulus (Morewede, Huh and Vosgerau, 2010), Cornil and Chandon (2015) have in contrast shown that focusing on sensory pleasure makes people happier and willing to spend more for less food, which is an advantage for public health, consumer enjoyment and businesses. Indeed, imagining the smell of a freshly baked apple pie elicits an increase in salivation and the desire to eat it (Dadds, Bockjerg, Redd and Cutmore, 1997), but on the other hand the thought of a 10th bite of this pie is desired less than the thought of the first bite. Those examples can be explained by *habituation*: a decrease in responsiveness that develops with later presentations because you become used to it (McSweeney and Swindell, 1999) and *sensory-specific satiation*: sensory pleasure of a certain type of food peaks at the first few mouthfuls and declines with each additional mouthful

(Rolls, Rowe, Rolls, Kingston, Megson and Gunary, 1980; Cornil, and Chandon, 2015). So, the first thought about freshly baked apple pie or the first bites of this pie are enjoyed more than the later ones. Next to that, smaller portions can be more enjoyable than larger ones, because the overall enjoyment is not an accumulation of pleasure from each bite but the average pleasure experience over all bites (van Kleef, Shimizu and Wansink, 2013) or even only the enjoyment of the last bite (Garbinsky, Morewedge and Shiv, 2014). So, however most people believe that sensory pleasure motivates to eat larger portions of enjoyable foods, the opposite is true in many cases.

Cornil and Chandon (2015) focus in their research on hedonic calorie-dense foods (chocolate cake) because of its negative impact on health. However, the effect of multisensory imagery on more healthy- and less calorie-dense foods is not well understood. It could be interesting to examine if multisensory imagery has the dual advantage of decreasing food intake of unhealthy foods but at the other hand increasing food intake of healthy foods. Namely, most people believe that the key to losing weight is eating less, however, this is not always the case. For example, eating more high fiber foods (e.g. vegetables, fruits or bread) can just help to prevent overeating (Alpert, 2013). Research has shown that high fiber consumption equates to lower consumption of high-energy foods and that next to that individuals cannot consume the same quantity of high-energy foods when adding fiber to those foods instead of adding not (Alpert, 2013). Although fiber has the benefit to prevent overeating and so obesity (and other diseases, e.g. heart disease, stroke and diabetes) most individuals do not include foods with adequate amounts of fiber to their diet (Alpert, 2013). Thence, it is useful to examine if multisensory imagery can stimulate people to fill up on high-fiber foods.

An example of a high-fiber food could be whole wheat bread. Whole grains are an excellent source of fiber, and for this reason consuming it has beneficial effects on weight control through promoting satiety (Liu, Willett, Manson, Hu, Rosner and Colditz, 2003). Recommended is to consume three servings of whole grains a day, but the usual intake in Western countries is only about one serving a day (Slavin, 2004). Thence, it could be interesting to examine if multisensory imagery can influence people to eat larger portions of this kind of food.

In sum, consumers make about two-hundred food decisions a day (Wansink and Sobal, 2007). Because of this large number, it is important to examine how those decisions can be influenced in order to encourage people to choose the best options for their own health, without hurting food sales or their own eating enjoyment. Cornil and Chandon (2015) found in their recent research that multisensory imagery made consumers choose smaller portions of hedonic foods and that they, next to that, were willing to pay and expecting at least as much from a smaller portion than the one they would otherwise choose. However, the effect of multisensory imagery on healthier and less-calorie dense foods, like whole wheat bread, is still unknown. Although a positive effect of multisensory imagery on food intake of healthy foods would be expected, research has to prove if this is indeed the case by answering the following general research question (GRQ):

To what extent does multisensory imagery affect the evaluation and consumption of whole wheat bread?

To answer this GRQ, the following specific research questions (SRQs) are formulated:

- *To what extent does multisensory imagery affect consumers' healthiness evaluations of whole wheat bread?*
- *To what extent does multisensory imagery affect consumers' expected eating enjoyment of whole wheat bread?*
- *To what extent does multisensory imagery affect consumers' liking of whole wheat bread?*
- *To what extent does multisensory imagery affect consumers' willingness to pay for whole wheat bread?*
- *To what extent does multisensory imagery affect consumers' food intake of whole wheat bread?*

If there indeed can be found that multisensory imagery has the benefits to decrease food intake of unhealthy foods, but on the other hand increase food intake of healthy foods (i.e. whole wheat bread), this intervention could be used to stimulate people in eating healthier and as a result decrease the rate of overweight and obesity.

CHAPTER 2: THEORETICAL BACKGROUND AND CONCEPTUAL MODEL

2.1 INTRODUCTION

This chapter will describe the expected influence of multisensory imagery on food intake of healthy foods, like whole wheat bread, from a theoretical perspective. The chapter will start with an explanation of mental imagery and multisensory imagery. After that, the effects of sensory-specific satiation on whole wheat bread will be described and finally, the consequences of multisensory will be discussed. At the end of this chapter, you will find the conceptual model, which gives an overview of this chapter.

2.2 MENTAL IMAGERY AS COGNITIVE PROCESS

An exceptional capacity of human experience is the ability to travel back and forth in the time by using mental imagery (Missbach, Florack and Köning, 2015). Humans can relive their past experiences and visualize future actions by imagining for example shapes, forms and scenes. Some people may argue that they rarely, or even never, consciously experience imagery, but for the vast majority of us, it is a familiar feature of our mental lives (Galton, 1880). Mental imagery can be described as the act of creating a mental representation of a person, object or event, that is no longer present, by seeing it with the 'mind's eye' (Blair, Ma and Lenton, 2001). This complex cognitive process has many of the same characteristics as a real experience, including for example concrete details and causal sequences. As a consequence, mental imagery has a powerful impact on learning, decision-making and behaviour (Gregory, Cialdini and Carpenter, 1982).

Mental imagery has a lot to do with our senses. We use our vision to see, our audition to hear, our gustation to taste, our olfaction to smell and our somesthesia to touch/feel (Krishna, 2012). Depending on the sensory nature of the object, mental imagery is characterized by a representation of previously viewed visual material, heard auditory content or perceived other types of sensory information (Zvyagintsev, Clemens, Checkko, Mathiak, Sack and Mathiak, 2013). For example, when we imagine a recent dinner in a restaurant, we re-experience the decor from inside and outside the restaurant, the music or other voices, which can be heard, the taste of the food, and more.

A special form of mental imagery is multisensory imagery. Multisensory imagery can be described as the simultaneous activation of unique sensory imageries, for example the sight, taste and smell of food, together with information about texture and mouth feel (Lacy and Lawson, 2013). Cornil and Chandon (2015), make in their research use of this pleasure-based technique. In their study, they let children and adults vividly imagine pleasant multisensory features (smell, taste and texture) of three hedonic foods, for example chocolate cake. After that, they were showed different sizes of foods and they were instructed to choose their preferred portion of that hedonic food. By focusing on sensory pleasure, multisensory imagery should increase the relative importance of sensory pleasure over other criteria such as hunger or dieting in driving portion sizes. Across five studies, they found that it made consumers choose smaller portions of hedonic foods, independent of their cultural background or age. Next to that they found that it made people willing to pay at least as much and expect as least as much eating enjoyment from a portion smaller than the one that they would otherwise choose.

In sum, multisensory imagery has large effects on hedonic foods. Therefore, it could be interesting to examine if this intervention has the dual advantage of decreasing food intake of unhealthy foods, but at the other hand increase food intake of healthy foods. Current research will try to explore ways to make people actually prefer (not just choose) larger portions of healthy foods, at no hedonic costs to themselves and no economic costs to producers. In this chapter, the expected influence of multisensory imagery on consumption and evaluation of healthy foods, like whole wheat bread, will be described from a theoretical perspective. The focus will be on *sensory-specific satiation*, *healthiness evaluation*, *bread liking*, *expected eating enjoyment*, *willingness to pay* and *food intake*, which are all related to multisensory imagery.

2.3 THE EFFECTS OF SENSORY-SPECIFIC SATIATION ON FOOD CONSUMPTION

Although, existing research has already found how sensory pleasure can influence people in *what* food they choose to eat (i.e. Raghunathan, Walker and Wayne, 2006), additionally, Cornil and Chandon (2015) broke new ground by examining the effects of sensory pleasure on *how much* people choose to eat. Their underlying idea was that multisensory imagery could play a role in portion sizes due to *sensory-specific satiation*. Sensory-specific satiation explains that smaller portions could be more enjoyable than larger ones, because sensory pleasure peaks at the first few mouthfuls and declines with each additional mouthful of a certain kind of food (Rolls et al., 1980). When a food is eaten, it drops in liking relative to foods that have not been eaten. Multisensory imagery and sensory-specific satiation are connected to each other in the sense that you could become saturated (sensory-specific satiation) when you think about a specific kind of food (multisensory imagery), because it already stimulates your senses.

To examine if multisensory imagery indeed influences food intake of hedonic foods (with help of sensory specific satiation), consumers in the research of Cornil and Chandon (2015) had to vividly imagine the multisensory pleasures (smell, taste, texture) they expected to experience from eating hedonic foods. Cornil and Chandon (2015) showed participants - who were in the sensory imagery condition - pictures of hedonic desserts and they asked them to vividly imagine the sensory aspects, like taste, smell and texture of each dessert in their mouth. Participants in the control condition were showed the same pictures of hedonic desserts, but were just asked to take a look at the pictures instead of thinking about sensory aspects of the desserts. In the second task, participants of both conditions were asked to choose a portion of chocolate cake and estimate how much they expect to enjoy it. The results showed that hunger was a predictor of choice in the control condition, but not in the sensory imagery condition and also, sensory imagery made hungry participants choose smaller portions. Next to that, sensory imagery made participants expect at least as much enjoyment from the portion they choose, even when the portion was smaller than the one in the control group. So, the results Cornil and Chandon (2015) expected could be confirmed, which means that sensory-specific satiation presumably plays a role in multisensory imagery and thus helps to decrease the intake of hedonic foods.

However, Johnson and Vickers (1992) have shown that foods can differ in the extent to which they produce sensory-specific satiation. Some foods are more resistant than others to drop in liking and can be eaten in large amounts. Johnson and Vickers (1992) studied eight different kinds of food (peaches, corn, coke, cheese, buttered roll, turkey, potato chips and M&M's) and found that one product (the buttered roll) did not drop in liking when eaten. Next to that, Vandewater and Vickers (1994) found that most of the time more healthy foods produce less sensory-specific satiation than

more unhealthy foods. More specific to whole wheat bread, another study (Rolls, van Duijvenvoorde and Rolls, 1984) found bread to be resistant to sensory-specific satiation. As a result, when stimulating multisensory imagery, a lower or no effect of sensory-specific satiation would be expected on whole wheat bread instead of on hedonic foods, like chocolate cake. So, in this study, sensory-specific satiation will probably not or barely influence participants' food intake. For this reason, the concept *sensory-specific satiation* can be neglected in further research.

2.4 CHANGES IN FOOD INTAKE AS A CONSEQUENCE OF MULTISENSORY IMAGERY

Contemporary, people of all ages are increasingly consuming larger portions of hedonic foods, a factor which strongly influences people's balance. At the moment package sizes of products in supermarkets are growing and mega meals are served in restaurants (Nielsen and Popkin, 2003). Consumers buy and eat those increasing portion sizes because of e.g. *value for money*, *portion distortion* (Steenhuis and Vermeer, 2009) and the *portion-size effect* (Peter, Polivy, Pliner and Vartanian, 2015). Larger portions are made more attractive because they are offering more value for money, a lower price per unit. Next to that, portion distortion refers to the fact that consumers have difficulty selecting amounts of food that are appropriate for them in terms of weight and how much they expend. Also the portion-size effect explains why consumers eat more than necessary: their intake is dependent from the served quantity (Peter et al., 2015). Consumers perceive market place portions as the standard, an anchor, while they are often much larger than the recommended portion sizes (Hogbin and Hess, 1999).

As described above, there are a lot of theories that explain why people choose and eat too large portions, however, consumers still choose and eat too small portions of healthy- and less calorie-dense foods, like whole wheat bread. The excessive intake of hedonic foods is a strong factor which influences people's energy balance, but at the other hand, the undersized intake of healthier and less calorie-dense foods has as well negative effects on this balance. But why are people consuming too small portions of healthy foods? This could be explained by research of Raghunathan, Walker and Wayne (2006). They suppose that people think that there is an inversely relationship between things that are 'healthy', 'wholesome' or 'nutritious' and those that are 'fun', 'satisfying' or 'exciting'. For example, people estimate an attractive car, which is fun to drive as less safe than an unattractive and less enjoyable car (Raghunathan et al., 2006). The same applies to foods: people estimate food products that are healthy as not tasty and products that are not healthy as tasty (Raghunathan et al, 2006).

Figure 1 depicts this influence of the 'unhealthy = tasty' intuition on judgments and decisions. The first stage predicts that the healthier a specific kind of food is perceived to be, the lower its inferred tastiness. The driving factors here are missing attributes. People do not exactly know how a specific food will taste, so they value it on other factors they do know, like healthiness evaluation, although these factors have sometimes nothing to do with it at all (Raghunathan et al., 2006). The second stage predicts that consumers will judge the same product as more tasty when it is portrayed as less healthy. This can be explained with help of the confirmation bias: consumers recall information in a way that confirms one's beliefs while giving less attention to information that contradict to it (Shiv, Carmon and Ariely, 2005). So, because people infer food to be healthy (stage I), their actual enjoyment of that kind of food is less than when people do not value the food to be healthy (stage II).



Figure 1 Model of the influence of the Unhealthy = Tasty Intuition on Judgments and Decisions (Raghunathan et al., 2006)

Figure 1 can also be applied to whole wheat bread. Consumer's quality of bread is mainly determined by sensory and health attributes (Dewettink et al., 2008). Consumers have become aware that all bread, but especially whole meal and dark bread, are an essential part of a healthy diet (Dewettink, Bockstaele, Kühne, van der Walle, Courtens and Gellynk, 2008). For this reason, people might perceive whole wheat bread as healthy, what can have effects on their taste inferences (whole wheat bread = healthy \neq tasty). As a result, their eating enjoyment will be lower than when they would have eaten less healthy food. Added to that, in social marketing most messages are health-focused instead of taste-focused (Pitts, Burke and Adams, 2013), what influences consumers to value functional outcomes over taste and other hedonic outcomes. As a result the healthy \neq tasty concept is even more emphasized.

Using multisensory imagery could probably evade the 'healthy \neq tasty' concept by stimulating consumers to think about the sensory consequences they would experience by eating whole wheat bread instead of the health consequences (see figure 2, stage I). People have automatic and biologically driven responses towards food that is high in fat, sugar and salt (unhealthy foods), but those preferences can be learnt and changed (Castro and Berridge, 2014). Multisensory imagery could presumably influence consumers to value healthy foods in a different, more tasty, way (see figure 2, stage II). It should increase the importance of sensory pleasure and therewith decrease the importance of other attributes, like health attributes (and so influence their expected eating enjoyment and liking of whole wheat bread). And because people feel tendencies if their beliefs and attitudes are not corresponding (cognitive dissonance theory; Foster and Misra, 2013), they will probably actually eat more of the product if they value it more tasty (see figure 2, stage III). Next to that, Freeland-Graves and Nitzke (2012) have found that nutrition messages are more effective when focused on positive attributes to make healthy choices, rather than focusing on negative attributes. So, focusing on the tastiness and enjoyment of healthy foods (when multisensory imagery is used) is more effective than focusing on healthiness and restrictions of those foods. Overall, from a theoretical perspective we could expect that consumers will choose to eat larger portions of whole wheat bread when multisensory imagery is applied, because they will evaluate the bread less on health attributes and, as a consequence, experience more bread liking and eating enjoyment. These predictions can state more formally as follow (see figure 2):

Hypothesis 1: *When consumers imagine whole wheat bread in a multisensory way (versus no multisensory imagery, versus a health focus) they evaluate the;*

- a) healthiness of the food as lower,*
- b) eating enjoyment as higher,*
- c) liking of the whole wheat bread as higher.*

Hypothesis 2: *Multisensory imagery (versus no multisensory imagery, versus health focus) will lead to more food intake of whole wheat bread.*

2.5 CHANGES IN WTP AS A CONSEQUENCE OF MULTISENSORY IMAGERY

Next to the prediction that healthiness evaluation, expected eating enjoyment and liking of the food product could help increase portion sizes of healthy foods, a positive effect on willingness to pay would be expected. When multisensory imagery is applied to whole wheat bread, consumers will presumably anticipate that their portions maximize their pleasure, and so they will probably pay more for it in compare to when they expect to enjoy it less (by using the healthy \neq tasty conception; Raghunathan et al., 2006). Moreover, according to Richardson, Dick and Jain (1994), taste is one of the most important factors in shoppers' evaluation of grocery items. Next to that, another study, which examined the relative contributions of taste and health considerations on consumer liking and purchase, found that taste is a predominant reason (and more important than health or other considerations) for selecting a food (Beverly, Tepper and Trail, 1998). In sum, several studies have found taste to be important in purchase intent. So, from a theoretic perspective, there could be expected that participants in the multisensory imagery condition want to pay more for the whole wheat bread than participants in the other two conditions. This prediction could state more formally as follow (see figure 2):

Hypothesis 3: *When multisensory imagery is applied to whole wheat bread (versus no multisensory imagery versus health focus), consumers are willing to pay more for it.*

2.6 CONCEPTUAL MODEL

In summary, multisensory imagery can presumably influence portions sizes of whole wheat bread and willingness to pay for this food product through different mechanisms: *healthiness evaluation, bread liking* and *expected eating enjoyment*. From a theoretical perspective, when focusing on multisensory imagery, whole wheat bread will be less evaluated on health aspects and more on other aspects like tastiness (stage I, figure 2). As a result, consumers eating enjoyment and liking of whole wheat bread will increase (stage II) which can lead to larger food intake of whole wheat bread and more willingness to pay for the same amounts (stage III).

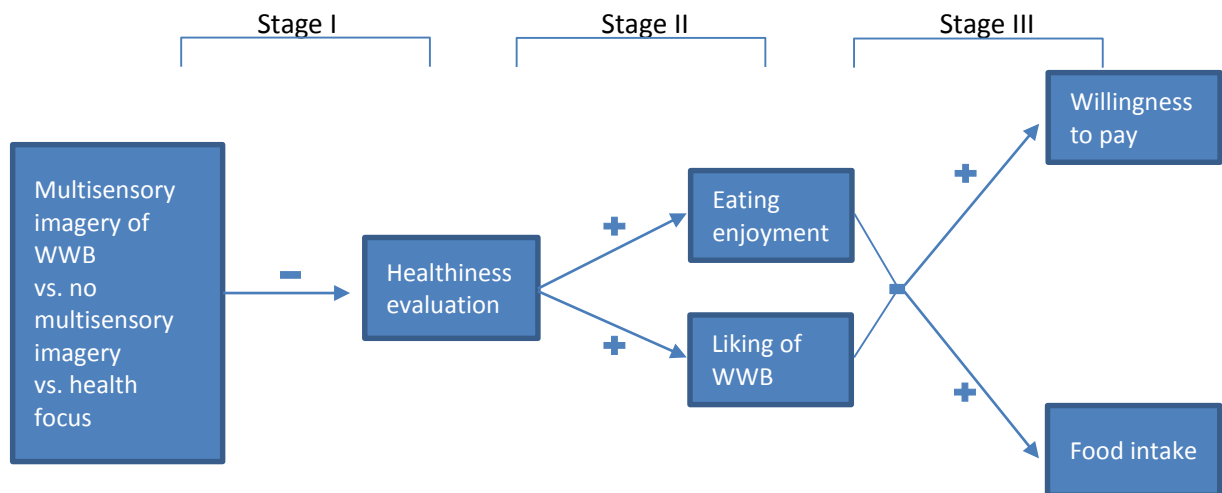


Figure 2 Conceptual model of effect of multisensory imagery of whole wheat bread (WWB) on healthiness evaluation, expected eating enjoyment, liking of whole wheat bread, participants food intake and willingness to pay (overview).

CHAPTER 3: METHODS

3.1 INTRODUCTION

In order to test the predictions and answer the general research question, an experimental study has been done. This chapter will describe the participants, design, procedure, measures and data analysis of this study. The results of the executive research will be described in chapter 4.

3.2 PARTICIPANTS

The final sample consisted of students of the university of Wageningen. A total of 87 participants (28 men, 59 women), with a mean age of 22.8 (SD= 4.7) years participated in the present study. They were recruited through an email invitation and flyers and received a small gift for compensation. No information about the purpose of the study was given. One participant mentioned that she was fasting, so she was excluded from further research.

3.3 DESIGN

This between-subjects experiment was distributed and administrated online using Qualtrics software. The participants were randomly assigned to one of the three conditions (*multisensory imagery condition (MSIC)*, *health focus condition (HFC)* or *control condition (CC)*). In all three conditions the participants had to think about some questions, fill in some questions and eat a self-chosen amount of whole wheat bread as a part of a supposed taste test. The thinking part (imagery) was different for all three conditions (see figure 3 on the next page).

In the multisensory imagery condition, participants had to vividly imagine multisensory features of whole wheat bread. They were instructed to focus on and pay attention to the smell, sound, taste, feelings and sight of the whole wheat bread.

In the health focus condition they had to think about the health benefits they would perceive due eating whole wheat bread. The questions in the health focus- and control condition were based on research of Bilman, van Kleef, Mela, Hulshof and van Trijp (2012). They defined four different levels of inference-making (*product attribute level*, *product benefit level*, *behavioural consequence level* and *goal/outcome related consequence level*), which consist of seven perceived benefits that consumers might extract. In the health focus condition, participants were asked to deeply think about the health benefits they would expect to perceive due to consuming whole wheat bread. In the control condition, participants were asked questions about a neutral object (desk), which could be hardly linked to sensory- or health aspects. There is chosen to ask neutral questions instead of doing nothing in the control condition, because this could influence the portion size participants choose afterwards. Namely, research of Robinson, Kersbergen and Higgs (2014) has shown that eating less 'attentively' can influence consumers to eat larger amounts of food. So, by doing nothing in the control condition, people are less distracted than participants in the other two conditions, which thus can influence the portion sizes they choose and eat.

Multisensory imagery condition	Health focus condition	Control condition
What smell would you expect whole wheat bread to have?	What specific ingredients does whole wheat bread contain?	From what specific materials is a desk usually made?
What taste would you expect whole wheat bread to have?	To what extent does whole wheat bread fill your stomach?	To what extent does a desk have functional benefits?
What texture would you expect whole wheat bread to have?	To what extent does whole wheat bread you feel full for a long time?	To what extent does a desk have emotional benefits?
What sound would you expect whole wheat bread to have?	To what extent does whole wheat bread control appetite?	To what extent does a desk what is has to do?
What appearance would you expect whole wheat bread to have?	To what extent does whole wheat bread control caloric intake (result: impact on your weight)	To what extent can a desk help to reach your personal goals?

Figure 3 Overview of questions asked in the different conditions: multisensory imagery condition (MSIC), health focus condition (HFC) and control condition (CC).

3.4 PROCEDURE

The experimental sessions were organized in the afternoon after lunch break (between 13.00 and 17.15), to ensure that most of the participants did not feel hungry. Participants entered a middle-sized classroom that contained several computer stations and they choose where to sit. Not all participants were run in one session: they could walk in during the session hours, so the number of people participating at one single moment varied from 1 to 8.

The experiment contained of five phases: 1) introduction and instruction, 2) the first part of the questionnaire, 3) thinking part, 4) eating part and 5) the last part of the questionnaire (see figure 4). The questionnaire can be found in Appendix I.

After they started, instructions were presented to them in the informed consent. In this instruction was some information about the duration of the test, the privacy of participants and possible questions. Next to that, participants were asked to complete the questionnaire individually and seriously.

After the instructions, the participants started with the first part of the questionnaire. In this part, they were asked some questions about their mood and level of hunger.

Then participants arrived at the part, which was different for each condition. They were randomly assigned to one of the three conditions (*multisensory imagery condition, health focus condition or control condition*). In all three conditions, participants were asked five questions to think about (see table 3 and Appendix I), they did not have to write something down. To ensure that they deeply thought about the questions, a timer was used. After 30 seconds, participants could go to the next question. Next to that, they were asked to close their eyes or cover them with their hands, to decrease distraction. The duration of this part of the test was for all three conditions the same, about 3 minutes.

The fourth phase of the test was the eating part. This part was for all conditions the same. At the beginning of the test, all participants got a covered dish with small pieces of whole wheat bread (see Appendix II). All participants got (around) the same amount (50 gram), and until this part of the test they did not know what was on the plate. They were instructed to look what was in there, and eat until they had enough. To ensure that they took their time, they had to watch a short commercial about animals. There was not specifically draw attention to the purpose of the commercial. During the next two parts, the participants could continue eating.

In the fifth phase of the experiment, participants were asked some questions about their chosen food intake, willingness to pay and level of hunger. At last they were asked some basic questions, like age, gender, height and weight and subsequently, how serious they fill in the questionnaire. After completing the questionnaire, participants could choose a snack as reward.



Figure 4 Flow chart of the questionnaire/experiment used in this study.

3.5 MEASURES

The independent variable in this study was *multisensory imagery*. The effects of multisensory imagery were measured with help of five key dependent variables: *intake of whole wheat bread*, *willingness to pay*, *liking of whole wheat bread*, *eating enjoyment* and *healthiness evaluation*. Next to that, there were some randomization variables used to check the distribution among the different conditions. The control variables used in this study to check whether randomization was successful were *BMI*, *emotions*, *level of satiation before eating*, *concerns health and weight*, *frequency of eating whole wheat bread*, *gender* and *age*. The other post consumption ratings, which were measured were *reasons of food intake (healthiness reasons or sensory reasons)* and *level of satiation after eating*. Those ratings were not dependent variables, but it could be interesting to test if they influence the independent variable.

3.5.1 DEPENDENT VARIABLES

INTAKE OF WHOLE WHEAT BREAD

One of the key dependent variables was participant's consumption of whole wheat bread in grams (see Appendix III). To measure how much the participants ate, all single plates were numbered beforehand (see Appendix II). At the end of the test, instructions were given to hand in the dish with leftovers. The plates were weighted before and after the questionnaire, in order to calculate how many grams the participant ate. With help of the numbers, the questionnaire and amount of whole wheat bread that was eaten could be linked.

WILLINGNESS TO PAY

There was one item to measure participants' willingness to pay: *'What do you think is a good price for the total portion of whole wheat bread you got (50 grams)?'*. This item was measured with help of a slider from €0,00 to €2,00.

LIKING OF WHOLE WHEAT BREAD

Participants' liking of bread was measured with help of three items. Participants were asked to what extent they like whole wheat bread, brown bread and white bread, on a 7-point Likert scale (don't like it at all – extremely like it). All these questions were asked after the eating part, because they could otherwise influence the thinking and eating part. Only the first question (*'To what extent do you like whole wheat bread?'*) was used in further research, because the other questions were not useful.

EATING ENJOYMENT

Participants' eating enjoyment of whole wheat bread was measured with help of one item in the questionnaire: *'To what extent did you enjoy eating the whole wheat bread?'*. This item was measured with a 7-point Likert scale (not at all – extreme).

HEALTHINESS EVALUATION

Participants' healthiness evaluation of whole wheat bread (the bread they had on the dish before them) was measured with help of two items: *'To what extent do you think whole wheat bread is healthy?'*. This item was measured with a 7-point Likert scale (not at all – extreme).

3.5.2 CONTROL VARIABLES

BMI

Participants' height and weight was asked in order to compute their body mass index. This randomization variable was measured, because consumers' body mass index (BMI) could probably influence the chosen portion sizes. First, recent research of Missbach et al. (2015) supposes that thinking about an object is related to perception and motors behaviour that is related to the stimulus. Moreover, this research has found that people with obesity report that they more vividly imagine both smells and images of foods than people with lower BMIs (Missbach et al., 2015). So, consumers with higher BMIs perceive more stimuli of the food and hence, have stronger behavior related to the stimulus (probably choosing larger portions). Another explanation between the linkage between BMI and chosen portion sizes is that overweight consumers habituate slower than non-overweight consumers to food (Temple, Giacomelli, Roemmich and Epstein, 2007). Two questions were used: *'What is your length in centimetres?'* and *'What is your weight in kg?'*. For both items, a slider was used in order to make people feel a bit more comfortable when giving their answers. With help of participants answers, their body mass index could be calculated.

EMOTIONS

Participants' mood was measured at the first part of the questionnaire (so, before the eating part). This randomization variable was measured, because portion size and willingness to pay can be influenced by consumers' emotions. Especially consumers who report themselves as emotional eaters, eat more in a positive or negative mood compared to a neutral mood (Bongers, Jansen,

Havermans, Roefs and Nederkoorn, 2013). Besides that, individuals with positive emotion (compared to a neutral or negative mood) will evaluate a product more quickly and impulsively than those with a negative emotion (Parboteeah, Valacich and Wells, 2009). The more extreme the positive emotion, the greater the effect. One single item to measure how happy they felt was used: *'To what extent do you have a good mood at the moment?'*. This item was measured with a 7-point Likert scale (not at all – extreme). This question was used to ensure that the results (in portion sizes and willingness to pay) were not driven by differences in emotions.

LEVEL OF SATIATION BEFORE EATING

Based on the study of Cornil and Chandon (2015), participants were on asked how hungry they felt (before and after eating). This variable is used, because hunger obviously leads people to choose larger portion sizes (Herman and Polivy, 1983). When choosing between different portion sizes, consumers ask themselves for example in which extent the chosen portion will satiate their hunger. Next to that, internal cues of hunger can influence consumers' willingness to pay for a certain portion. Ghrelin, a naturally occurring gut hormone that signals hungers by acting on the brain, is instrumental to this process (Skibicka and Dickson, 2011). Five different items to measure participants level of satiation were used: 1) *'How hungry do you feel at the moment?'*, 2) *'How full do you feel at the moment?'*, 3) *'How much do you think you can eat?'*, 4) *'How satiated are you?'* and 5) *'To what extent do you desire to eat at the moment?'*. All the items were measured with 7-point Likert scales (not at all – extreme). After reverse scoring the first, third and fifth item, these items could be combined in a single overall level of satiation scale given high reliability ($\alpha = .925$).

CONCERNS ABOUT HEALTH AND WEIGHT

To find out how important health is for participants, their degree of health importance was asked. This randomization variable was used because consumers, especially chronic dieters, determine their portion sizes with help of the impact on their health and weight (Glanz, Basil, Maibach, Goldberg and Snyder, 1998). Next to that, consumers who value health as an important factor, will presumably pay more for healthy foods than consumers who value health as less important (Batte, Hooker, Haab and Beaverson, 2007). Because of these influences it is important to check if there are any differences in distribution of concerns about health and weight among the three conditions. Two different items to measure concerns about health and weight were used: 1) *'To what extent is health important to you?'* and 2) *'To what extent do you concern about your weight?'*. Both items were measured with a 7-point Likert scale (not at all – extreme). Cronbach's Alpha could measure if the two items can be combined in a single scale. A Cronbach Alpha of .636 was calculated, so the two items could not be combined whereas the threshold value for Cronbach Alpha is 0.7 (Nunnally, Bernstein, 1978).

FREQUENCY OF EATING WHOLE WHEAT BREAD

After the eating part, participants were asked how often they usually eat whole wheat bread, brown bread and white bread (1 = once a month or less, 2 = two to three times a month, 3 = once a week, 4 = two to three times a week, 5 = every day). How often participants eat whole wheat bread could indicate to what extent they like it or are used to it, so there should be no differences among conditions in times eating whole wheat bread.

BACKGROUND CHARACTERISTICS

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

3.5.3 OTHER POST CONSUMPTION RATINGS

SENSORY REASONS

To what extent participants base their chosen amount of whole wheat bread on sensory benefits was measured with one item: *'To what extent did you base the amount of bread you have eaten on expected sensory pleasures (smell, taste, texture)?'*. This item was measured with a 7-point Likert scale (not at all – extreme).

HEALTHINESS REASONS

To what extent participants base their chosen amount of whole wheat bread on healthiness reasons was measured with one item: and *'To what extent did you base the amount of bread eaten on expected health benefits?'*. This item was measured with a 7-point Likert scale (not at all – extreme).

LEVEL OF SATIATION AFTER EATING

As described above (level of satiation before eating) was measure with help of five different items: 1) 'How hungry do you feel at the moment?', 2) 'How full do you feel at the moment?', 3) 'How much do you think you can eat?', 4) 'How satiated are you?' and 5) 'To what extent do you desire to eat at the moment?'. All the items were measured with 7-point Likert scales (not at all – extreme). After reverse scoring the first, third and fifth item, these items could be combined in a single overall level of satiation scale given high reliability ($\alpha = .944$).

3.6 DATA ANALYSIS

Before the key dependent variables were studied, there were some randomization variables used to check the distribution among the different conditions. The randomization variables used in this study were *BMI, emotions, level of satiation before eating, concerns about health and weight, times eating whole wheat bread, gender* and *age*. The differences across the three conditions regarding age, gender, BMI and more were checked using ANOVA and χ^2 analysis.

The independent variable used in this study was *multisensory imagery*. The effects of multisensory imagery were measured with help of five key dependent variables: *food intake of whole wheat bread, willingness to pay, liking of whole wheat bread, eating enjoyment* and *healthiness evaluation*. The food intake of whole wheat bread was checked for normality of distribution (skewness and kurtosis). Statistical analysis of the consumed whole wheat bread was performed using ANOVA with food intake of whole wheat bread as dependent variable and the different conditions as independent variable. The other key dependent variables were measured for equality of distribution using one-way ANOVA and Fisher's least significance difference technique (LSD) to make pairwise comparisons between the conditions.

The data was analysed using the statistical software package IBM SPSS Statistics 22.0. A significance level of $P < 0.05$ was used.

CHAPTER 4: RESULTS

4.1 INTRODUCTION

In this chapter, the outcomes of the executive research (questionnaire and experiment) will be explained. The first part of this chapter contains descriptive information and a randomisation check. In the second part, the key dependent variables will be discussed one by one (i.e. *portion sizes* and *healthiness evaluation*).

4.2 DESCRIPTIVE INFORMATION AND RANDOMISATION CHECK

A total of 38 men and 58 women participated in the experiment (see Table 1). A Chi-square test between 'condition' and 'gender' showed a value of $\chi^2(2) = 6.66$ ($P = .036$), indicated that the distribution of men and women was significantly different between the conditions. The different distribution of men and women could influence the results of this study, so this is taken into account in further study.

Table 1 # men/women within each condition

	Men	Women	Total
Multisensory imagery condition	5 (19.2%)	21 (80.8%)	26
Health focus condition	10 (28.6%)	25 (71.4%)	35
Control condition	13 (52.0%)	12 (48.0%)	25
Total	28 (32.6%)	58 (67.4%)	86

The average age of the sample was 22.8 (SD 4.65) years (range 19 – 51 years). One-way ANOVA with the different conditions as independent variable and age as dependent variable revealed age to be equally balanced across the three conditions ($F(2) = 1.74$, $P = .182$). Next to that BMI ($F(2) = 1.97$, $P = .146$), level of satiation before eating ($F(2) = 0.26$, $P = .774$), concerns about health ($F(2) = 0.33$, $P = .723$), concerns about weight ($F(2) = 0.94$, $P = .396$) and frequency of eating whole wheat bread ($F(2) = 0.97$, $P = .384$) did not differ between participants (see Table 2 on the next page). However, there was a difference across conditions in emotions of participants ($F(2) = 3.13$, $P = .049$). A post hoc test could make pairwise comparisons between the conditions. Fisher's least significance difference technique (LSD) showed that the mean difference was significant between the multisensory imagery condition and the control condition ($P = .014$). No significant difference between the health focus condition and the multisensory imagery condition or the control condition was found ($P = .174$ vs $P = .189$). The differences between conditions in emotions and gender could influence the results of this study. Therefore, all analysis were done twice (one time with emotion and gender included as covariates and one time without emotion and gender as covariates) to control for influence. No significant effects of gender and emotions on any of the dependent variables was found and next to that, gender and emotion did not significantly change the results. Hence, in further study (see Table 2) they were not included as covariates.

Table 2 Differences across multisensory imagery condition (MSIC), health focus condition (HFC) and control condition (CC) regarding randomisation checks, intake and post consumption ratings.

	MSIC Mean (SD)	HFC Mean (SD)	CC Mean (SD)	P value
Randomisation checks*				
• Age	21.8 (1.5)	23.9 (6.9)	22.2 (2.0)	.182
• BMI	22.0 (1.4)	22.9 (2.3)	22.7 (1.4)	.146
• Emotions	5.8 ^a (0.9)	5.4 (1.2)	5.0 ^b (1.3)	.049
• Level of satiation before eating	3.6 (1.1)	3.4 (0.8)	3.6 (1.4)	.774
• Concerns about health	5.5 (1.3)	5.3 (1.5)	5.2 (1.2)	.723
• Concerns about weight	4.5 (1.4)	4.2 (1.7)	3.9 (1.7)	.396
• Frequency of eating WWB	4.2 (0.9)	3.9 (1.0)	3.9 (1.1)	.384
Intake of WWB (dependent variable)				
• Grams of WWB consumed	4.8 (4.8)	4.3 (4.9)	5.4 (6.6)	.748
Post consumption ratings (dependent variables)*				
• Willingness to pay	0.6 ^a (0.1)	0.5 ^b (0.1)	0.6 ^a (0.2)	.002
• Liking of WWB	4.8 ^a (1.2)	4.2 ^b (1.3)	5.0 ^a (1.1)	.034
• Eating enjoyment	4.8 ^a (1.3)	4.2 (1.2)	4.1 ^b (1.4)	.094
• Healthiness evaluation of WWB	4.2 ^b (0.9)	5.1 ^a (0.7)	4.4 ^b (1.0)	.001
Other post consumption ratings*				
• Food intake – healthiness reasons	3.4 (1.3)	3.9 (1.3)	3.5 (1.2)	.224
• Food intake – sensory reasons	5.1 ^a (1.3)	4.2 ^b (1.1)	4.0 ^b (1.1)	.002
• Level of satiation after eating	4.2 (1.1)	3.8 (0.8)	3.9 (1.1)	.243
• Differences in level of satiation before and after eating	0.6 (0.8)	0.3 (1.0)	0.3 (0.8)	.408

* Numbers (except age, BMI, times eating whole wheat bread and WTP) represent mean scores on each of the scales (7-point scales).

a Mean of the variable was found to be significantly higher than b

b Mean of the variable was found to be significantly lower than a

4.3 INTAKE OF WHOLE WHEAT BREAD

On average, participants ate 4.8 grams (SD = 5.4) of whole wheat bread. Values of kurtosis and skewness can check if the distribution of those scores is normal (skewness = 2.1, SE = .260, kurtosis = 7.3, SE = .514). The rough rule-of-thumb for interpreting the skewness and kurtosis statistics is to see if the absolute value of the statistic is smaller than twice the standard error (Bulmer, 1979). For food intake of whole wheat bread, this is not the case, which means that food intake is not normally distributed. The skew and kurtosis values are positive, which indicates a positive pile-up of scores on the left of the distribution, so there are too many low scores. With help of a boxplot and histogram can be indicated if there are any outliers, which influence the distribution. The boxplot showed that there were three outliers. Removing those outliers lead to a more normally distribution of the scores (skewness = .675, SE = .264, kurtosis = -.773, SE = .523). Twenty participants in total did not eat any of the whole wheat bread. These non-eaters were equally distributed across conditions ($F(2) = .506$, $P = .605$). No participant finished the entire portion that was served to them. According to the predictions, multisensory imagery will lead to more food intake of whole wheat bread than no multisensory imagery or a health focus (*hypothesis 2*). The findings not supported these predictions. A one-way ANOVA with the different conditions as independent variable and the amount of food

intake as dependent variable, showed that the amount of whole wheat bread eaten was not significantly different distributed among the three conditions. In other words, multisensory imagery of whole wheat bread will not lead to more food intake of whole wheat bread than the other two conditions.

4.4 WILLINGNESS TO PAY

When multisensory imagery is applied to whole wheat bread, consumers should – from a theoretic perspective - be willing to pay more for the same amount than when there is no multisensory imagery applied (*hypothesis 3*). The findings supported this prediction. After computing a one-way ANOVA with the different conditions (MSIC, HFC and CC) as independent variable and willingness to pay for whole wheat bread as dependent variable, revealed willingness to pay not equally balanced across the three conditions ($F(2) = 6.91, P = .002$). A post hoc test (LSD) showed that the mean difference was significant between the health focus condition and the multisensory imagery condition ($P < .001$) and between the health focus condition and the control condition ($P = .044$). No significance between the multisensory imagery condition and the control condition was found ($P = .142$). So, this means that participants in the multisensory imagery condition or in the control condition significantly want to pay more for the amount of bread they received than participants in the health focus condition.

Table 3 Differences in willingness to pay for 50 grams of whole wheat bread, rounded to cents

	Mean (in €)	SD (in €)
Multisensory imagery condition (MSIC)	0.64	0.13
Health focus condition (HFC)	0.48	0.15
Control condition (CC)	0.57	0.21
Total	0.55	0.18

4.5 LIKING OF WHOLE WHEAT BREAD

According to the predictions, participants who are stimulated to think about multisensory benefits will like whole wheat bread better than participants in the control condition or in the health focus condition (*hypothesis 1c*). This prediction could be partly confirmed by the findings. There was a significant difference between the three conditions in liking of whole wheat bread ($F(2) = 3.54, P = .034$). By computing a post hoc test (LSD), there could be indicated between which conditions the differences were significant. The test showed that there was a significant difference across the health focus condition and the multisensory imagery condition ($P = .043$), but also between the health focus condition and the control condition ($P = .019$). There was no significant difference between the multisensory imagery condition and the control condition ($P = .738$). In other words, participants in the multisensory imagery condition and in the control condition liked whole wheat bread significantly better than participants in the health focus condition. The significant difference between the multisensory imagery condition and the health focus condition was expected, but the difference between the health focus condition and the control condition was unexpected.

4.6 EATING ENJOYMENT

According to the predictions, consumers in the multisensory imagery condition will enjoy eating whole wheat bread more than participants in the health focus condition or in the control condition (*hypothesis 1b*). The findings partly supported these predictions. The differences between the three conditions were marginally significant ($F(2) = 2.43, P = .094$). A post hoc test (LSD) should test if there were significant differences between two conditions. The test showed that there was a significant difference between the multisensory imagery condition and the control condition ($P = .047$), but not between all other conditions. This means that participants in the multisensory imagery condition significantly perceived more eating enjoyment than participants in the control condition. However, in contradiction to the predictions, there cannot be proved that participants in the multisensory imagery condition perceived more eating enjoyment than participants in the health focus condition.

4.7 HEALTHINESS EVALUATION

According to the predictions, participants in the multisensory imagery condition will evaluate whole wheat bread as less healthy than participants in the health focus condition or in the control condition (*hypothesis 1a*). These predictions could be partly supported by the findings. One-way ANOVA showed that the health perception of whole wheat bread was not equally balanced across the three conditions ($F(2) = 7.34, P = .001$). A post hoc test (LSD) showed that the differences were significant across the health focus condition and the multisensory imagery condition ($P = .001$) and between the health focus condition and the control condition ($P = .009$). In other words, participants in the health focus condition perceived whole wheat bread significantly healthier than participants in the multisensory imagery condition or in the control condition. However, no significant difference was shown across the multisensory imagery condition and the control conditions, although a significant difference was expected.

4.8 OTHER POST CONSUMPTION RATINGS

Besides the dependent variables, four other post consumption ratings were measured: *healthiness reasons of food intake*, *sensory reasons of food intake*, *level of satiation after eating* and difference in level of satiation before and after eating. A one-way ANOVA computed the differences between the conditions.

Food intake for sensory reasons revealed not equally balanced across the three conditions ($F(2) = 6.59, P = .002$). A post hoc test (LSD) showed that there was a significant difference between the multisensory imagery condition and the health focus condition ($P = .005$) and between the multisensory imagery condition and the control condition ($P = .001$). There was no significant difference found between the health focus condition and the control condition ($P = .437$). In other words, participants in the multisensory imagery condition base the chosen amount of food intake significantly more on sensory attributes than participants in the health focus condition or in the control condition.

Food intake for healthiness reasons was equally balanced across the different conditions. One-way ANOVA showed that there was no significant difference in eaten portion size for health reasons ($F(2) = 1.52, P = .224$). So, there cannot be proved that participants in the multisensory

imagery condition base the eaten amount of whole wheat bread less on health attributes than participants in the other two conditions.

There was no significant difference between the three conditions in level of satiation after eating ($F(2) = 1.44, P = .243$). In other words, participants in one condition feel just as full as participants in the other conditions. Next to that, the differences in satiation before and after eating were calculated to measure if participants in one condition feel more satiated than participants in another condition despite they had eaten the same amount of whole wheat bread. One-way ANOVA showed that there were no significant differences between the three conditions ($F(2) = 0.91, P = .408$), so participants in one condition did not feel more satiated after eating compared to before eating than participants in the other conditions.

5.1 DISCUSSION

To counteract the current alarming rate of overweight and obesity, this research has focused on how people can be influenced to eat more healthy foods, without hurting either food sales or consumers eating enjoyment. Namely, most people believe that the key to losing weight is eating less, however, this is not always the case. For example, eating more foods high in fiber, like whole wheat bread, can just prevent overeating (Alpert, 2013). Existing research has already focused on how people can choose health over eating enjoyment (Morewedge et al., 2010), but unfortunately this strategy undermines eating pleasure and goes against the economic interest of food marketers because consumers' willingness to pay decreases. For this reason, this study offers suggestive support for an alternative pleasure-based approach, multisensory imagery. Cornil and Chandon (2015) had already found that multisensory imagery made consumers choose smaller portions of hedonic foods and that they, next to that, were willing to pay and expecting at least as much from a portion smaller than the one they would otherwise choose. Current research has examined if multisensory imagery has the dual advantage of stimulating portion sized of healthier foods, like whole wheat bread.

From a theoretic perspective, multisensory imagery should influence portion sizes of whole wheat bread and willingness to pay for this food product. When focusing on multisensory imagery, whole wheat bread will presumably be less evaluated on health aspects and more on other aspects like tastiness. As a result, consumers eating enjoyment and liking of whole wheat bread will increase, which will lead to larger intake of whole wheat bread and more willingness to pay for the same amounts of food.

Corresponding to those expectations, this study indeed found that multisensory imagery had a significant effect on healthiness evaluation of whole wheat bread. The reason for this is presumably that multisensory imagery increases the importance of sensory pleasure, and therewith decreases the importance of other attributes, like health attributes. As a result, an increase in participants' eating enjoyment and liking of whole wheat bread was expected. Indeed, when multisensory imagery is applied, participants' eating enjoyment was significantly higher than the control condition and next to that, participants' liking of whole wheat bread was significantly higher than liking of whole wheat bread of participants in the health focus condition. This corresponds to the 'unhealthy = tasty' intuition (Raghunathan et al., 2006): people estimate food products that are healthy as not tasty and products that are not healthy as tasty.

Because people feel tendencies if their beliefs and attitudes are not corresponding (cognitive dissonance theory; Foster and Misra, 2013), from a theoretic perspective, people will eat more whole wheat bread if they value it as more tasty (when multisensory imagery is applied). In contrast to the expectations, this research did not found that multisensory imagery influenced people to eat more whole wheat bread. Moreover, the average amount of whole wheat bread was only 4.8 grams. This contradiction can possibly be explained by research of Frewer and van Trijp (2006). In their study they argue that especially whenever you seek to measure actual consumption/intake, you have to use a natural setting, otherwise it could influence the results (not externally valid). Such a natural eating setting usually contains of real customers and real food. Current study did not contain a natural setting, because people had to eat behind their computer screen where were no real customers. Hence, intake of whole wheat bread could be influenced by the setting of the

experiment.

The last dependent variable, which was measured was willingness to pay for whole wheat bread. According to Richardson et al. (1994), taste is one of the most important factors in shoppers' evaluation of grocery items. Moreover, Beverly et al. (1998) found that taste is a predominant reason (and more important than health or other considerations for selecting a food. According to those expectations, when multisensory imagery is applied to whole wheat bread consumers are probably willing to pay more for the food product than when multisensory imagery is not applied. This prediction could be confirmed by the findings.

5.2 LIMITATIONS AND FUTURE RESEARCH

Although an increase in food intake of whole wheat bread would be expected when multisensory imagery is applied, current research cannot prove those expectations. It is important to remember that the research was held in a controlled environment. Therefore it is not entirely clear whether the findings are also true in 'the real world', where many factors can affect how much we eat. The experimental sessions took place in a middle-sized classroom that contained several computer stations. In future research, a more natural setting, with for example real customers, could probably be a solution for this limitation (Frewer and Van Trijp, 2006).

Besides that, this research opens more avenues for future research. In current study, participants only had to choose the amount they wanted to eat, instead of when to eat or what to eat. It could be interesting to examine the effects of multisensory imagery on moment to eat and choice of food, from a public health perspective. It is possible that multisensory imagery, by emphasizing sensory pleasure, may lead people to choose taste over health and therefore prefer hedonic food products. At the other hand, consumers could evaluate healthy products as tastier and as a result choose those products. Overall, the effect of sensory imagery on when and what is uncertain and open to further investigation.

Subsequently, it could be interesting to examine if multisensory imagery of healthier food products has the same effects on children and adults. In general, very young children are unlikely to think about their health and weight (Cornil and Chandon, 2015), so the 'healthy ≠ tasty' intuiting is probably not applicable to them.

5.3 IMPLICATIONS

The aim of this study was to find out to what extent multisensory imagery affects the evaluation and consumption of whole wheat bread. As described above, when multisensory imagery is applied to whole wheat bread, consumers evaluate the food product less on health attributes and as a result they evaluate more eating enjoyment and liking of whole wheat bread. This is in line with research of Raghunathan et al. (2006), who examined that people estimate food products that are healthy are not tasty and products that are not healthy as tasty. However, current research has shown that in social marketing, most messages are health-focused instead of taste-focused (Pitts et al., 2013). According to current research it would be better to use taste-focused messages instead of health-focused ones. A taste-focus will emphasize the healthy ≠ tasty concept and therefore consumers will dislike healthier products, like whole wheat bread, more than when taste-focused messages are used.

Additionally, this research has shown that participants in the sensory imagery condition are significantly willing to pay more for the same amount of whole wheat bread. This finding could lead to economic benefits for food marketers. When they stimulate consumers to think about multisensory benefits (in for example advertisements of on the menu in restaurants), consumers would presumably pay more for the same amount of food than consumers who are not stimulated to think about multisensory benefits or consumers who are stimulated to think about health benefits, like in most current social marketing

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APPENDIX I: QUESTIONNAIRE



Fijn dat je mee wilt doen aan dit onderzoek van Wageningen Universiteit! Deze vragenlijst gaat over voedselkeuzes.

Het invullen van de vragenlijst zal ongeveer 15 minuten duren. Als deelnemer aan dit onderzoek blijft u geheel anoniem.

Er zijn geen risico's of voordelen verbonden aan het invullen van de vragenlijst. Je kunt op ieder moment beslissen om te stoppen met invullen. Voor eventuele vragen kunt je contact opnemen met Heleen Nijland (heleen.nijland@wur.nl)

Aan het eind van het onderzoek mag je een beloning uitkiezen, als dank voor het meedoen.

Door op 'ja' te klikken geef je aan dat je bovenstaande hebtgelezen en ermee instemt:

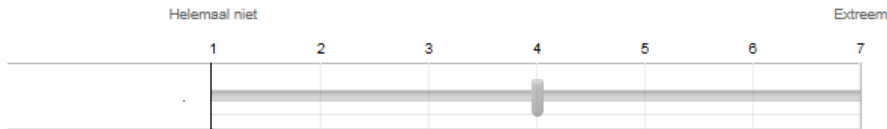
Ja, ik doe mee aan dit onderzoek

0% 100%

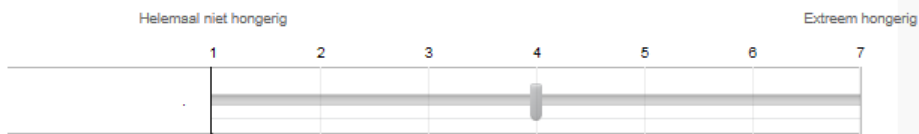
>>

Je bent nu aangekomen bij het eerste onderdeel van de enquête. Vul je antwoorden graag zo eerlijk en serieus mogelijk in.

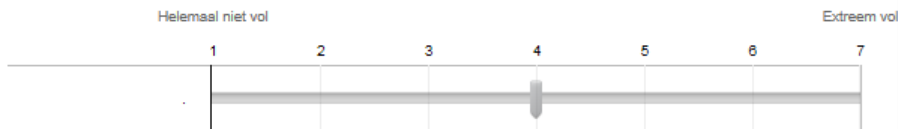
In hoeverre heb je op dit moment een goed humeur?



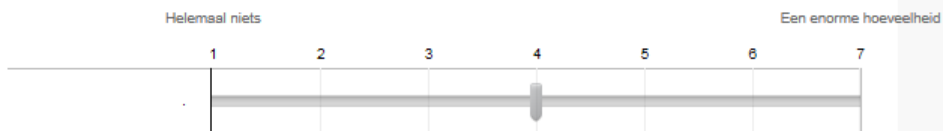
Hoe hongerig voel je je op dit moment?



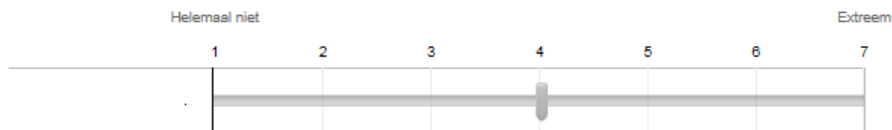
Hoe vol voel je je op dit moment?



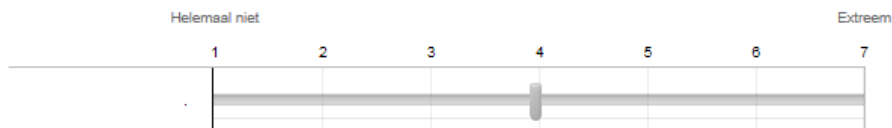
Hoeveel denk je nu te kunnen eten?



Hoe verzadigd voel je je op dit moment?



In hoeverre verlang je nu naar eten?



0% 100%

>>

Nu volgt een belangrijk onderdeel van deze studie.

Bij dit onderdeel is het de bedoeling dat je goed nadenkt over de gestelde vragen, je hoeft dus niets op te schrijven. Je wordt scherm voor scherm geleid door vragen over de sensorische ervaring van het eten van volkorenbrood. Met andere woorden; we willen dat je denkt aan alle zintuigen die worden geprikkeld door het eten van volkorenbrood, zoals je reuk, smaak en gehoor. Doe je handen voor je ogen om enige afleiding te voorkomen.

Hierna volgen 5 afzonderlijke schermen met op ieder scherm één vraag. Na 30 seconde kun je door gaan naar de volgende vraag, maar neem vooral meer tijd als je die nodig hebt.



0% 100%

>>

Hoe verwacht je dat je de geur van volkorenbrood ervaart tijdens het eten?

0% 100%

>>

Hoe verwacht je dat je het geluid van volkorenbrood ervaart tijdens het eten?

0% 100%

>>

Hoe verwacht je dat je de smaak van volkorenbrood ervaart tijdens het eten?

0% 100%

>>

Hoe verwacht je dat je de textuur van volkorenbrood ervaart tijdens het eten?

0% 100%

>>

Hoe verwacht je dat je het uiterlijk van volkorenbrood ervaart tijdens het eten?

0% 100%

>>

Nu volgt een belangrijk onderdeel van deze studie.

Bij dit onderdeel is het de bedoeling dat je goed nadenkt over de gestelde vragen, je hoeft dus niets op te schrijven. Je wordt scherm voor scherm geleid door vragen over de gezondheidservaring van het eten van volkorenbrood. Oftewel; denk diep na over de voordelen van volkorenbrood voor je gezondheid. Doe je handen voor je ogen om enige afleiding te voorkomen.

Hierna volgen 5 afzonderlijke schermen met op ieder scherm één vraag. Na 30 seconde kun je door gaan naar de volgende vraag, maar neem vooral meer tijd als je die nodig hebt.



Uit welke specifieke ingrediënten denk je dat volkorenbrood bestaat?



In welke mate denk je dat volkorenbrood zorgt voor een volle maag?



In welke mate denk je dat volkorenbrood ervoor zorgt dat je lang vol zit?



In welke mate denk je dat volkorenbrood zorgt voor een gecontroleerde eetlust?



In welke mate denk je dat volkorenbrood zorgt voor een gecontroleerde calorie-inname (gevolg: invloed op gewicht)?



Nu volgt een belangrijk onderdeel van deze studie.

Bij dit onderdeel is het de bedoeling dat je goed nadenkt over de gestelde vragen, je hoeft dus niets op te schrijven. Je wordt scherm voor scherm geleid door vragen over de de ervaring van het gebruiken van bureau. Oftewel; denk diep na over de voordelen van het hebben van een bureau. Doe je handen voor je ogen om enige afleiding te voorkomen.

Hierna volgen 5 afzonderlijke schermen met op ieder scherm één vraag. Na 30 seconde kun je door gaan naar de volgende vraag, maar neem vooral meer tijd als je die nodig hebt.



. Van welk specifiek materiaal denk je dat een bureau meestal is gemaakt?



. In welke mate denk je dat het gebruiken van een bureau functionele voordelen heeft?



. In welke mate denk je dat het gebruiken van een bureau emotionele voordelen heeft?



. In welke mate denk je dat een bureau over het algemeen werkt zoals het hoort te werken?



. In welke mate denk je dat een bureau bij kan dragen aan het bereiken van je eigen gestelde doelen?



Je bent nu aangekomen bij het derde deel van het onderzoek. Voor je staat een afgedekt bord met daaronder stukjes volkorenbrood. Tijdens het kijken van de commercial van Android en de twee laatste onderdelen van de enquête (en eventueel daarna) mag je zoveel brood eten als je maar wilt. Gebruik de tijd die je nodig hebt.

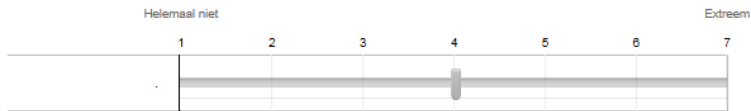


0%  100%

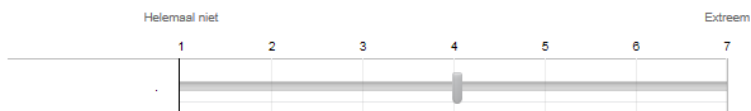


Het vierde onderdeel van de enquête begint nu. Vul je antwoorden graag zo eerlijk en serieus mogelijk in.

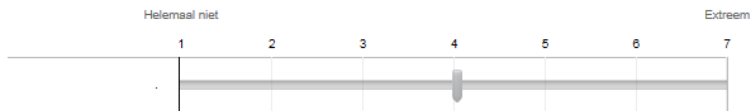
In hoeverre geniet je/heb je genoten van het eten van het volkorenbrood?



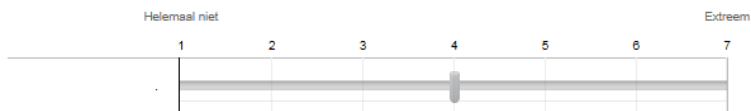
In hoeverre denk je dat volkorenbrood dat je voor je hebt gezond (voor je) is?



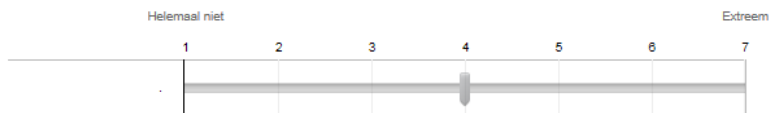
In hoeverre heb je de gekozen hoeveelheid gegeten volkorenbrood gebaseerd op verwachte zintuiglijke voordelen (bijv. geur, smaak, textuur)?



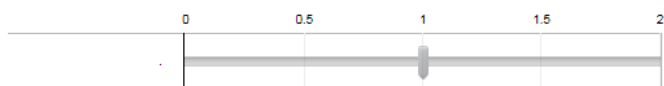
In hoeverre heb je de gekozen hoeveelheid gegeten volkorenbrood gebaseerd op verwachte gezondheidsvoordelen (bijv. controleert calorie-inname, bevat gezonde voedingsstoffen)?



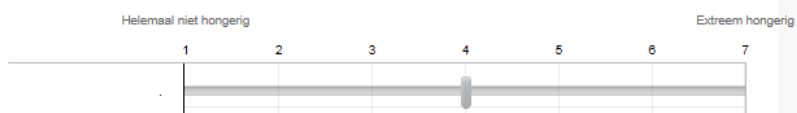
In hoeverre heb je de gekozen hoeveelheid gegeten volkorenbrood gebaseerd op verwachte verzadiging van honger?



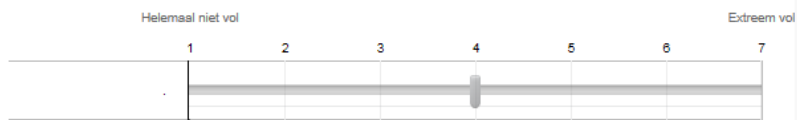
Wat is volgens jou een goede prijs voor de totale portie brood die je hebt gekregen tijdens deze test?



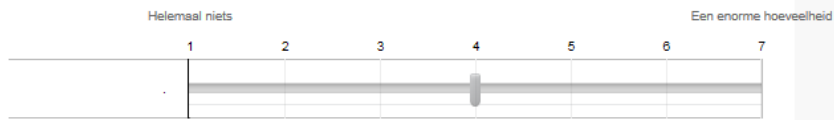
Hoe hongerig voel je je op dit moment?



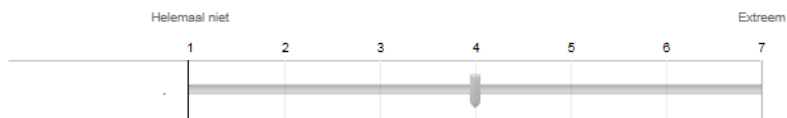
Hoe vol voel je je op dit moment?



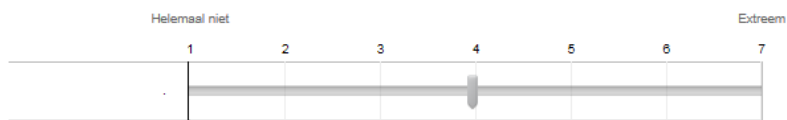
Hoeveel denk je nu te kunnen eten?



Hoe verzadigd voel je je op dit moment?



In hoeverre verlang je nu naar eten?



0%  100%

>>

. Dit is het laatste onderdeel van deze enquête. Vul je antwoorden graag zo eerlijk en serieus mogelijk in.

. Wat is je geslacht?

- Man
 Vrouw

. Wat is je leeftijd?

16 24 33 41 50 58 66 75 83 92 100

Leeftijd



. Wat is je lengte in centimeters?

140 150 160 170 180 190 200 210 220



. Wat is je gewicht in kilo's?

40 51 62 73 84 95 106 117 128 139 150



. In welke mate is je gezondheid belangrijk voor je?

Helemaal niet 2 3 4 5 6 Extreem
1 7



. In welke mate ben je bezig met je gewicht?

Helemaal niet 2 3 4 5 6 Extreem
1 7



0%  100%

>>

Geef aan in hoeverre je het eens bent met de volgende beweringen.

	Helemaal niet mee eens			Helemaal mee eens			
	1	2	3	4	5	6	7
Volkorenbrood vind ik erg lekker	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bruinbrood vind ik erg lekker	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Witbrood vind ik erg lekker	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Klik aan hoe vaak je de volgende voedingsmiddelen eet.

	1 keer per maand of minder	2 tot 3 keer per maand	1 keer per week	2 tot 3 keer per week	elke dag
Volkorenbrood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bruinbrood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Witbrood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

In welke mate heb je deze enquête serieus ingevuld?

Niet	2	3	4	5	6	Extreem
1						7
<input type="checkbox"/>						

Op het bord met brood dat je hebt gekregen staat een nummer vermeld. Schrijf dit nummer op in de balk hieronder.

Als je per e-mail uitgenodigd wilt worden voor toekomstige onderzoeken van de MCB groep, zoals deze, vul dan hieronder je e-mail adres in. Dit zal losgekoppeld worden van je antwoorden.

Bij voorbaat dank!

Als u nog opmerkingen hebt voor de onderzoekers, schrijf deze dan hieronder:

Dit was de laatste vraag van de test. Hierbij verzoek ik je om na op volgende de hebben gedrukt, je bordje met overgebleven brood bij mij in te leveren en je bedankje op te halen.

Bedankt voor het meedoen aan de enquête!

0% 100%

>>

APPENDIX II: STIMULI

Dish with whole wheat bread before the eating part (left) and after they were instructed to open the dish (right). The numbers on the dishes could indicate to which participant the dish belonged.



APPENDIX III: FOOD INTAKE OF WHOLE WHEAT BREAD

Participant	Grams WWB before eating	Grams WWB after eating	Grams eaten
1	46	46	0
2	46	40	6
3	47	41	6
4	50	47	3
5	52	40	12
6	48	40	8
7	50	42	8
8	54	53	1
9	53	51	2
10	46	14	32
11	49	38	11
12	50	42	8
13	50	45	5
14	51	40	11
15	48	48	0
16	52	47	5
17	48	44	4
18	48	48	0
19	49	49	0
20	50	42	8
21	49	47	2
22	50	44	6
23	49	49	0
24	49	43	6
25	48	47	1
26	46	46	0
27	48	41	7
28	48	46	2
29	51	50	1
30	49	28	21
31	49	44	5
32	47	47	0
33	50	49	1
34	48	36	12
35	52	50	2
36	52	52	0
37	48	40	8
38	49	46	3
39	53	53	0
40	46	45	1
41	47	47	0
42	47	36	11
43	48	46	2
44	47	35	12
45	50	43	7
46	51	41	10
47	50	42	8
48	51	51	0

49	50	40	10
50	53	41	12
51	52	47	5
52	51	51	0
53	48	45	3
54	58	51	7
55	51	41	10
56	52	33	19
57	55	49	6
58	50	49	1
59	53	53	0
60	48	44	4
62	50	48	2
63	46	44	2
64	51	49	2
65	47	44	3
66	50	40	10
67	53	49	4
68	49	49	0
69	54	54	0
70	51	39	12
71	52	50	2
72	50	46	4
73	49	43	6
74	47	45	2
75	57	54	3
76	48	41	7
77	54	53	1
78	51	51	0
79	46	46	0
80	48	48	0
81	46	46	0
82	48	44	4
83	49	49	0
84	48	46	2
85	51	49	2
86	51	51	0
87	47	46	1
88	52	45	7