The Effect of Sound Nudging on Customer Behavior and Vegetable Sales in a Supermarket

A case- and intervention study in REMA 1000

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Abstract

Setting: The Danish population does not meet the official vegetable consumption requirements. Different health promoting initiatives have been made, including campaigns to increase the knowledge in the general public. As separate initiatives, these have proven insufficient though the consumers have gained knowledge on health. Thus this study uses their knowledge as a foundation for using nudging. By a change in governance, the public and private have become equally responsible in affecting the Danish population towards being healthier. Supermarkets have become increasingly interested in the welfare of the customers, including making the healthy choice the obvious choice. In corporation with a supermarket chain, this study aims at increasing the sales of vegetables by affecting the customers' shopping behavior, by using a 'sound nudge'.

Methods: A sound nudge was developed for an intervention, conducted in five phases: *pre*, *primo*, *medio*, *ultimo*, and *post*.

Two concurrent studies were made in a supermarket after the development of the sound nudge. A case study, investigating the customers behavior, and an intervention study, investigating the sales changes.

Findings: The sound of peeling, cutting and eating a carrot was considered the most suitable to use as a sound nudge in a supermarket. After implementation, it was found that the most effective part of the intervention was during the phase *ultimo*, due to statistically significance in the vegetables sales between *pre* and *ultimo*.

Conclusion: The most effective sound nudge in both changing customer behavior and increasing the sales of vegetables in a statistically significant way, was the sound of a carrot being eaten. The customer group being most affected by the sound nudge was primarily customers with a university or a college university degree. This indicates that a sound nudge can affect the customers and increase the sales of vegetables after considerations of factors such as spotlight effect, staff and sales offers. Thus, further research is needed to fully understand the significance in using sound nudges.

Resumé

Baggrund: Den danske befolkning lever ikke op til det anbefalede indtag af grønt. Der er blevet foretaget forskellige sundhedsfremmende initiativer, deriblandt informationskampagner. Som særskilte initiativer har de vist sig ikke at være effektive selvom forbrugerne har fået viden om sundhed. Således vil dette studie bruge denne viden som grundlag til at bruge nudging. Ansvarsfordelingen har ændret sig og det offentlige og det private har fået et ligeligt ansvar for at påvirke den danske befolkning i en sundere retning. Supermarkederne er ligeledes blevet mere interesseret i kundernes trivsel, heriblandt at gøre det sunde valg det nemme valg. Dette studie har i samarbejde med en supermarkedskæde, som mål, at øge salget af grøntsager, ved at påvirke kundernes indkøbsvaner, ved at bruge et 'lyd nudge'

Metoder: Et lyd nudge blev udviklet til en intervention, der blev foretaget i fem faser: *pre, primo, medio, ultimo* og *post.* Efter udviklingen af lyden, blev to studier udført samtidigt i et supermarked. Et casestudie, der undersøgte kundernes adfærd, og et interventionsstudie der undersøgte salgsændringer.

Resultater: Lyden af en gulerod der blevet skrællet, skåret og spist blev betragtet som den mest passende lyd at bruge som lyd nudge i et supermarked. Efter implementeringen viste det sig at den mest effektive del af interventionen skete i *ultimo* fasen, på grund af en statistisk signifikant stigning i salget af grønt mellem *pre* og *ultimo.*

Konklusion: Den mest effektive lyd for både at ændre kundeadfærd og øge salget af grøntsager statistisk signifikant, var lyden af en gulerod der blev spist. Kundegruppen der blev påvirket mest af 'lyd nudget', var hovedsageligt kunder med et universitets- eller professionshøjskoleuddannelse. Dette indikerer at et 'lyd nudge' kan påvirke kunder og øge salget af grøntsager med hensyn til faktorer som spotlight effect, ansatte og tilbud. Dermed er der dog stadig brug for yderligere forskning til kunne forstå potentialet ved brugen af 'lyd nudges'.

Acknowledgements

Bent Egberg Mikkelsen for being our supervisor, Michal Dobroczynski for developing the sound nudge devices, Max Skov Hansen the grocer at REMA 1000 Carlsbergbyen for letting us do the intervention at REMA 1000, Martin from the fruit and vegetables department of REMA 1000 for helping with sales figures, Helene Christine Reinbach for statistical expertise, Rikke Gade for helping with the thermal camera and Thomas Moeslund for borrowing the thermal camera.

Sales figures

No sales figures will be presented due to confidentiality, they will instead be presented by index-100 bar charts.

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1. Introduction

The Danish adult population is not meeting the official requirements of fruit and vegetable intake. Therefore there is a need for making a change towards getting the Danish population to consume more of such. According to the report Dietary habits in Denmark 2011-2013 (Pedersen et al. 2015), the Danish adult population on average consumes 199g of vegetables per day. The Danish dietary intake recommendations suggest the population to consume 600g of fruit and vegetables in total, where at least half of the consumption should be vegetables and preferably coarse (Fødevarestyrelsen 2013). Since the vegetable intake needs to contribute with at least half of the consumed fruit and vegetables combined (Fødevarestyrelsen 2013), and the adult population in Denmark is not meeting the requirements, the primary focus in this study lies on the vegetable intake. A limited or no access to fruit and vegetables has been reported to be an obstacle to consumption of those (EUFIC 2012). Therefore, if it is possible to sell more vegetables in the supermarket to the consumers, the vegetables might be more available to the consumer and then it might prompt them to eat more vegetables. A possible way to sell more vegetables could be by making shopping habits more mindlessly healthy, making it more convenient, attractive, and normal to grab and buy healthier food (Wansink 2014). This mindset has been the basis of this study, by making the healthier choice the obvious choice.

Previously, the government had the primary responsibility of ensuring the health of the population, but it was proposed by WHO, that the health could not be ensured by the government alone (World Health Organisation 1986). When looking at the governmental changes, there has, within the last decades, been made a shift towards being more heterarchical (Jørgensen et al. 2012), making it attractive for private companies to do governmental initiatives beyond legislation, as for example making a healthy strategy. Globally the consumers have become more environmentally aware and socially oriented in their products consumed, which is why corporate social responsibility (CSR) among supermarkets can appeal to those customers (Wang & Anderson 2011). In connection to that there has within the last few years been a greater focus on the supermarket's responsibility in doing what is best for the customers in Denmark as well. It is in the interest of the supermarkets to show that they are willing to focus on groceries that contribute to the health of the customers, which can be communicated through a CSR strategy.

This study revolves around the CSR strategy called “the healthy family” from a supermarket chain in Denmark.

Supermarkets can be seen as both *servicescapes* and *foodscapes* (Hynes & Manson 2016; Wansink & Sobal 2007; Winson 2004; Dolphijn 2004; Bitner 1992), since supermarkets are a place customers are being serviced by staff and where customers can purchase food. There are often planned music in the supermarkets to affect the customer’s shopping behavior in any intentional direction. Muzak is commonly known in shopping centers such as supermarkets, but there are no scientific proof that it affects the customer’s shopping behavior (Solomon et al. 2006). Most often there are also other sounds than just the music in the supermarkets, e.g. the sound of other customers shopping and the till making noises, which also can affect the customer’s shopping behavior (Hynes & Manson 2016). Beyond the sound in the supermarkets there has over the last decade been an explosive growth of interest in sensory marketing and sensory branding (Spence & Wang 2015). Some supermarkets have a slogan “walk towards the smell”, where they have bakeoff at the store to both offer fresh bread and create a nice smell of bread to affect the customers into buying it (Lidl n.d.). Some companies brand themselves on the specific sound the product makes during consumption. For example Coca Cola has made an advertisement that focused on the sound of the drink being poured over ice (Spence & Wang 2015). In these cases, the companies are effectively using the customer’s emotions and memory to affect them into buying more of their product. According to T. A. Ryan (1940, p.659) “*it is a commonly observed fact that most objects of our everyday lives are perceived by means of two or more sensory modalities working in cooperation*”. As the customers can be influenced by the use of senses and experiences and the Danish population not meeting the recommendations of vegetable consumption, this study will investigate whether sound can be used to increase the sales of vegetables. More specifically, the sound of vegetables could be perceived as more meaningful, due to vegetables being available at the supermarket. Objects are perceived by more than one sense as hearing, seeing and touching. The sound of vegetables in the supermarket could be triggering the memory of preparing and eating vegetables, which might lead to an increased sale of vegetables.

1.1 Research question

Primary research question:

- To what extent can the sound of peeling, cutting and eating carrots increase the sale of vegetables in supermarkets?

Secondary research questions:

- In what way can the sound of peeling, cutting and eating carrots be altered to affect the customer's buying behavior in supermarkets?
- Which customer groups can be affected by the sound of carrots in supermarkets?
- How can a thermal camera be used to track customer behavior in supermarkets?

1.2 Different health initiatives in Denmark

Ongoing research at Harvard Medical School shows that sensory cues and choice architecture can be used to decrease consumption of unhealthy food. Usually unhealthy eating is addressed with knowledge-raising campaigns, which is insufficient viewed in isolation (Nielsen et al. 2016). Different initiatives have been made in order to influence the Danish population to consume more vegetables. One of the most well known campaigns have been the "6 á day"-campaign that visually informs the population about the recommendations regarding fruit and vegetable intake. (Fødevaredirektoratet 2003). According to an investigation from 2007 84% of the Danish population is familiar with the campaign "6 á day" (Asbjørn 2009). Those being most affected by health campaigns are according to research mostly well educated and female, and they tends to focus more on health (Christensen et al. 2010; Groth & Fagt 2003). Not much has been done since this campaign was implemented more than a decade ago. In 2011 the campaign 6 á day stopped because the authority believed that there should be a different perspective than only focusing on fruit and vegetables (Dahlager 2015). Instead of campaigns, different projects have been established, where most have been targeted as projects at schools and workplaces (Landbrug og Fødevarer, Pers. Comm.). "Landbrug og Fødevarer" is a part of the public-/private partnership "Måltidspartnerskabet"(Måltidspartnerskabet n.d.a). Måltidspartnerskabet has in 2015 developed a technical tool focusing on sustainable seasonal food in what is called "Kampagne Årshjul" in Danish. This tool has been produced for interactive usage in the supermarkets. The

wheel is turned every month showing monthly seasonal fruit and vegetables (Måltidspartnerskabet n.d.b).

Another initiative at supermarkets is about the Nordic nutrition label 'the keyhole'. It means that the healthier groceries in the supermarkets can get the label "*Healthy choices made easy*". The keyhole nutrition label is familiar to most of the Danish population, as guidance to choose a healthier alternative when grocery shopping (YouGov 2014). The label indicates that the products are healthier due to restricted requirements for salt, sugar, fat and fiber content (Nordic Council of Ministers 2010). Currently there is no research, which correlates the keyhole label with an increase in the public health, though it has been estimated that it potentially could, if the Danish population replaced their normal intake with keyhole labeled products (Biltoft-Jensen et al. 2015).

A larger project has been made at Bornholm in a project called SoL, which is an abbreviation in Danish for 'Health and Local Community'. In this project different health initiatives were implemented in schools, the community and supermarket chains and focused on improving behavior towards healthier grocery shopping, diet and physical activity. One of the strategies in the supermarket was structural changes, e.g. increasing supply, price, and choice architecture. This lead to an increased sale in the fruit and vegetable section. (Forskningscenter for Forebyggelse og Sundhed et al. 2016). In Bornholm it was furthermore concluded that the longer you spend at the aisles in the supermarket, the more you buy. A green zigzagged line was put on the floor to influence customers to wander in the specific section for longer. (Wansink 2014). This way of using cues to improve customers' behavior is defined as nudging. According to Thaler and Sunstein (2009, p.6) nudging means altering people's behavior in a predictable way without forbidding any options. Since 2013 a supermarket chain in Denmark has moved healthier snacks to the checkout aisles, which resulted in a 50% increase in sales of items at the checkout aisles (Thorbeck 2014).

In this study, these initiatives were used as an inspiration for investigating the use of nudging initiatives, in this case a specific sound nudge in a supermarket.

The previous health initiatives of healthy food consumption has been promoted visually and physically by, for example knowledge raising campaigns about health recommendation, interactive information tools, labels, choice architecture and nudging. As mentioned previously

these knowledge-raising campaigns were insufficient viewed in isolation, whereas the nudging initiatives have turned out to improve the healthy shopping behavior. Therefore this study is building on people's knowledge from the previous campaigns by using a sound nudge to promote healthier shopping behavior based on the customer's knowledge of healthy eating, and memories and experiences with healthy food. Hereby using nudging as a non-reflective environmental strategy.

2. Social constructivism and pragmatism

The notion of research paradigm refers to a particular style in research, in which there is a set of beliefs and practices associated. Research is generally conducted according to a certain philosophy or worldview and there is a general view about reality (ontology) within each paradigm, as well as on the best methods used in social research (epistemology) (Denscombe 2010b).

The ontological perspective in this study was social constructivism, which refers to the world-view that individuals seek understanding in their surroundings, and develop subjective meanings of their experiences towards certain things, based on their personal, cultural and historical experiences. These subjective meanings vary and is formed through interaction with others (Creswell 2007). This philosophy was used in this study as guidance to interpret the participants and customers' answers. One of the goals in using this approach was to rely, as much as possible, on the customers' views on the situation. Moreover, it is important to recognize that the interpretation could be influenced by the researcher's own personal, cultural and historical experience (Creswell 2007).

The epistemology of this study was pragmatism which refers to an approach and philosophy, that assesses the value of strategies and methods in terms of how well they contribute to answer the research question (Denscombe 2010a; Bjørner 2015c). So the methodological tools chosen for this study, was a mixed method of both approaches, which will be elaborated on further in the following section.

3. Methods

The following chapter introduces the methods used in this study. In order to investigate "*To what extent can the sound of peeling, cutting and eating carrots increase the sale of vegetables in supermarkets*", the split design was used to study the changes during the intervention and furthermore get an understanding of the customer's behavior and potential changes in a supermarket.

As this study was based on a sound nudge, a sound was developed, and subsequently used in an intervention at the supermarket. After the development of the sound the study was split into two concurrent studies; a case study and an intervention study. The case study was used to investigate which customer groups potentially could be affected by the sound nudge and in what way the sound nudge could be altered in order to affect customers the most, whereas the intervention study was used to investigate the measurable effect on sales that the sound nudge had. Thus, the study both investigates the measureable outcome in terms of sales, as well as behavior, which could strengthen and provide a deeper understanding of the findings in this study through triangulation; using more than one method. The flow of the study is illustrated in figure 1.

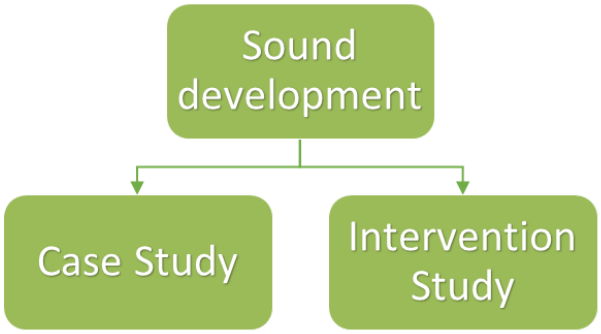


Figure 1. **Flowchart of the thesis**. The figure illustrates the chronological order of the organization of the study.

As seen in figure 1, the sound was developed before the case study and intervention study. Figure 1 furthermore illustrates that the case study and the intervention study runs simultaneously.

The following will introduce an overview of all the collected data within this study. The data from the sound nudge development consisted of two questionnaires. The data from the case study consisted of three observations with a thermal camera as well as structured interviews conducted over four days. The data from the intervention study consisted of both a sound trigger log and sales figures collected before, during and after the intervention.

3.1 Action research cycle

The action research cycle was used in this study as inspiration to the framework, as the cyclical approach provides the flexibility needed to evaluate the ongoing process (Bjørner 2015c), in order to answer the research question. This model with a multi-phased mixed method approach (Bjørner 2015c), will be described further in the forthcoming section. The action research cycle has been used to both develop the sound nudge intervention as well as collecting data and reflecting on those.

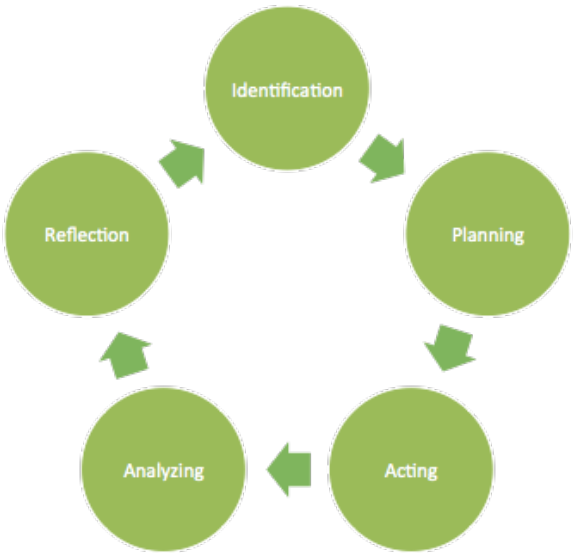


Figure 2. **Action research cycle** (Bjørner 2015c). This figure illustrates the five steps in the study, both when developing the sound and evaluating on the intervention.

The cycle consists of five steps, as illustrated in figure 2, and has been used as the methodological framework throughout the whole study, both in the sound nudge development and in each phase of the intervention study and the case study. All steps will be reviewed chronologically as seen in figure 2.

The first procedure in each phase was the *identification* of the issue that needs to be solved. Secondly comes the planning of the *action*, which requires thorough consideration, since this stage might be revised several times due to the cyclical framework. Therefore a flexible design was important to consider, in order adapting changing. However, planning a second *action* will not take place before an evaluation of the first has ended. *Acting* was the third step that in all its simplicity was data collection, which will be presented in the method section. The fourth step was *analyzing* the interpretation of the data that has been collected and the extraction of some of the findings. *Reflection* was the final step and a crucial part of the action research cycle. At this step, general evaluation takes place, and the generation of new ideas and strategies, which need to be implemented in the design, will be discussed. Even though general evaluation takes place at the last stage, it should be emphasized that sessions of reflection takes place in each steps throughout the cycle.

3.1.1 Action research cycle in this study

Using the Action research cycle as inspiration for this study, had several advantages as the changes for the development of the sound nudge demanded continuous evaluation and changes. The action research cycle was used as an overall frame in the study and in sound nudge development as well as the different phases during the sound nudge intervention at REMA 1000.

The overall study was constructed by using the action research cycle, and each step will be explained. The first step of *identification* was the fact that the Danish population is not consuming enough vegetables. After investigating what has been done to meet the requirements previously, it was *planned* to create a sound nudge with the intention of making the Danish population buy more vegetables. The *action* was the sound nudge through all the phases of the intervention and afterwards the findings were *analyzed*. The final step includes reflections of what was found, and if the Danish population bought more vegetables in order to meet the requirements of vegetables consumption.

Within the study, the sound development was constructed by using the action research cycle, and started by *identifying* which sounds people associated with the word 'health'. This was used for inspiration to *plan* which sounds to use for the sound nudge intervention, as an *action,* the sound

was exposed to potential customers. After *analyzing* the answers given after the exposure, *reflections* on the sound, and its potential effect on the customers in the supermarket, were made and it was concluded to use the *identified* sound as a sound nudge in the intervention at REMA 1000.

After developing the sound, another action research cycle went on during the phase *primo*, which was the first part of the active intervention with the sound nudge. The first sound was *identified* through the sound nudge development and was *planned* to be played in the fruit and vegetable scape. The *action* of the sound nudge took place and the data collection of sales figures, observations and structured interviews were *analyzed*. After *reflecting* on the data the next action research cycle in the phase *medio* began. Adjustments were *identified*, concerning both the sound and the thermal camera for observations. The adjustments were *planned* and got implemented. The data of sales figures, observations and structured interviews were moreover analyzed. After *reflecting* on the data the next action research cycle began. Adjustments for the next phase *ultimo* were *identified*, and changes on the sound were *acted* out. After *analyzing* the data of sales figures and structured interview, *reflections* of the collected data were done in order to investigate whether the sound had fulfilled its purpose.

3.2 Mixed methods

In each of the phases, both qualitative and quantitative were used in order to conduct the findings. The reason for this was, that each method provides diverse advantages, which are also used to corroborate each other and give both breadth, by using quantitative methods, and depth, by using qualitative methods, in the analysis and interpretation of data (Bjørner 2015c). Cited by Flyvbjerg (2006) *"More often than not, a combination of quantitative and qualitative will do the task best."* (Flyvbjerg 2006, p.242). The mixed methods used in this study were short questionnaires, structured interviews with open-ended questions, video observations and sales figures.

3.3 Sound nudge development

This part of the study was used to develop the sound nudge for usage in the supermarket in order to investigate to what extent the sound nudge could increase the sales of vegetables in the supermarket. The flow of the sound nudge development can be seen in figure 3.

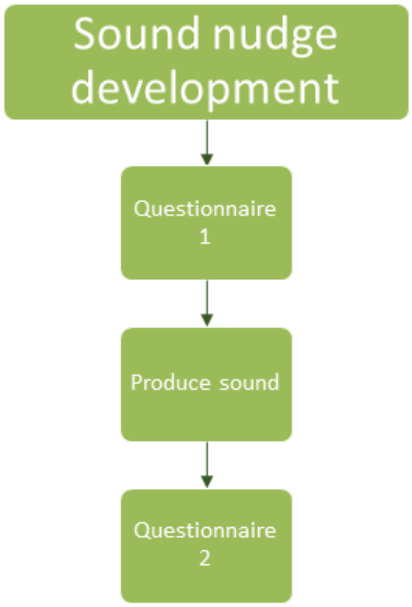


Figure 3. **Flowchart over the sound nudge development**. The figure illustrates the procedure of the sound nudge development. The exact dates of collecting data in *questionnaire 1 and 2* can be found in appendix 1.

For development of the sound for the intervention two questionnaires were developed. Questionnaire 1 was used to get an insight of people's perception of the connection between sound and health. Questionnaire 2 was used for investigating if people heard the sound as intended.

3.3.1 Questionnaire 1

In order to investigate and be inspired of which sounds people connect to health, a short questionnaire was developed from the basis of the primary research question. This questionnaire will be referred to as *questionnaire 1*. In either English or Danish, depending on the respondent's ethnicity, two questions were asked;

1. "When I mention health, what sound do you think of?"

2. Can you elaborate on your answer?

The responses were used to give an impression of what people were considering healthy. The first question asked was generating the idea of a sound nudge and the second question were used to understand the first answer. The answers provided were written as notes on paper by the interviewers during the questioning.

The inclusion criteria for *questionnaire 1*, was all available individuals over 18 years of age, due to the focus in this study was regarding the adults lack of vegetable consumption. No further exclusions were made.

3.3.2 Producing the sound

With results from *questionnaire 1* different sounds were created in a home studio. In order to produce the sound, a *Macbook Pro 2011* computer was used. A sound card *EMU 0202* was connected to the computer in order to control the clearness of the sound including noise. The sound card was connected to an external microphone *Golden Age Project FC 1 MK II F.E.T. Condenser Microphone*. The standard software *Garageband* from a *Macbook Pro* computer was used to record the sound, which afterwards was edited and refined, e.g. removing superfluous recorded sections and additional noise.

In order to find the best sound, seven types of a mix of vegetables and fruits were used in trial. Sounds of the fruit or vegetable being cut, peeled, rinsed, teared or eaten were recorded. All recorded sounds were evaluated and a sequence of sounds of one of the vegetables was chosen. When producing the sound it was considered that sequence matter, which relates to the *halo effect* (Kahneman 2013a). According to Kahneman (2013) the first impression you get is the one that matters. What is presented afterwards does not matter as much. The reflections of the development of the sound will be elaborated on in the discussion of the findings.

3.3.3 Questionnaire 2

The intention of *questionnaire 2* was, after having developed the sound, in short to investigate whether or not the respondents, being potential customers, could identify the chosen sound and

if the sound gave them an urge to buy vegetables. The sound was of peeling, cutting and eating a carrot. The questions asked were:

1. General descriptives (gender, age)
2. What did you think of when you heard the sound?
3. What do you think of the sound (likert scale 1-6)
    a. Elaborate, what do you think of the sound? (written text)
4. Does the sound give you any specific grocery shopping ideas?
    a. Elaborate, what specific shopping ideas? (written text)
5. General comments

Question 3 investigated the likeability of the sound by using a likert scale with the interval from 1-6, where 1 was described as 'very unpleasant' and 6 was described as 'very pleasant'. A likert scale is used to measure feelings about an area (Bryman 2012e).
The success criterion was that the respondents were able to identify either the peeling, cutting and eating of a carrot or all three parts of the sound.

The inclusion criteria in questionnaire 2, was all available individuals over 18 years of age. In this questionnaire the respondents needed to provide feedback to the sound nudge, therefore the respondents with the no ability to hear the sound on their device could not participate.

3.3.4 Sound equipment and software

In order to play the sound in the supermarket, a special sound system was developed for the sound nudge intervention at REMA 1000. The sound system was a prototype based on the single-chip-computer; model Raspberry Pi 2 B+, which is a full computer in credit card size running the operating system Linux. The computer was equipped with a real time clock module to track time in a log file used to investigate how many customers have been exposed to the sound. To detect motion a Passive InfraRed (PIR) sensor was connected directly to the Raspberry Pi 2 B+ computer, covered in a custom made box. Most importantly two speakers were connected to the computer in order for the sound to be played at the supermarket. Pictures of the sound equipment can be seen in figure 4. Input- and output management was configured by a Python

2.7 script. The sound file was accessed and configured through an ftp-server. For further information on the content descriptions from the ftp-server see appendix 2a and 2b.
The computer could be used for detecting motion, uploading and changing a sound file, it could be programmed to play a sound in a certain time frame, it had a volume variation and lastly it could log every time the sound was played out. Basically it detects motion and act upon that.

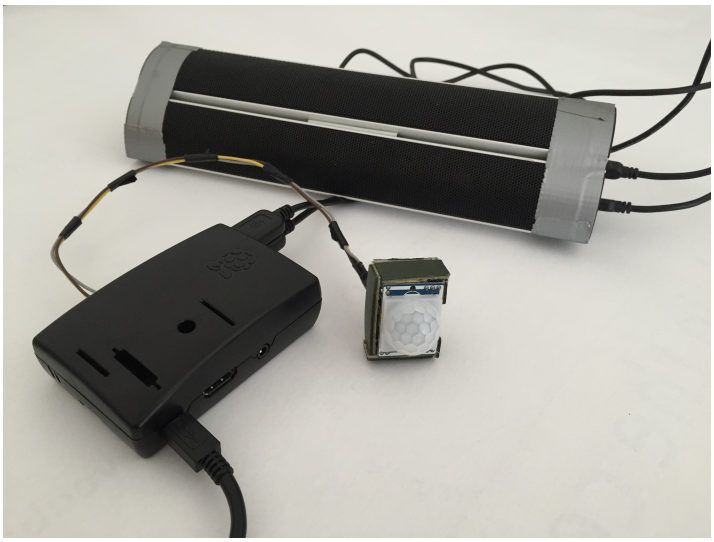


Figure 4. **Equipment used for the sound nudge.** In the picture the single chip computer is connected to; two loudspeakers put together as they were used in the sound nudge intervention and the motion sensor in the custom made box.

3.4 Case study

The strength of a case study was that it could provide a deeper understanding of human behavior (Flyvbjerg 2006). In this case the vegetable shopping behavior in the supermarket. The case study design was chosen, as this study seeked to elucidate the unique features of the chosen case of a supermarket. Case studies is conducted in natural conditions, in comparison to controlled conditions, as experimental studies (Bryman 2012a; David & Sutton 2004b). Another reason behind using a case study is the provision of a more nuanced view of the natural context of a shopping situation and it also gives an insight and deeper understanding of the reasons behind the customer's actions, but also their perception of the sound. It was a necessity to understand the reality of the customers' in order to enhance the possibility of a behavioral change.

Lastly, the aim of this study was to test the sound nudge in this particular context being the supermarket. Furthermore, findings from a case study can be used to generate theory (Bryman 2012a; Lindahl & Juhl 2007). This case study was used in relation to the secondary research question meaning to investigate "*In what way can the sound of peeling, cutting and eating carrots be altered to affect the customer's buying behavior in supermarkets?*" and furthermore investigate "*Which customer groups can be affected by the sound of carrots in supermarkets?*".

The structure of the case study can be seen in figure 5. This case study was using two types of methods; video observations and structured interviews. Which were executed in REMA 1000.

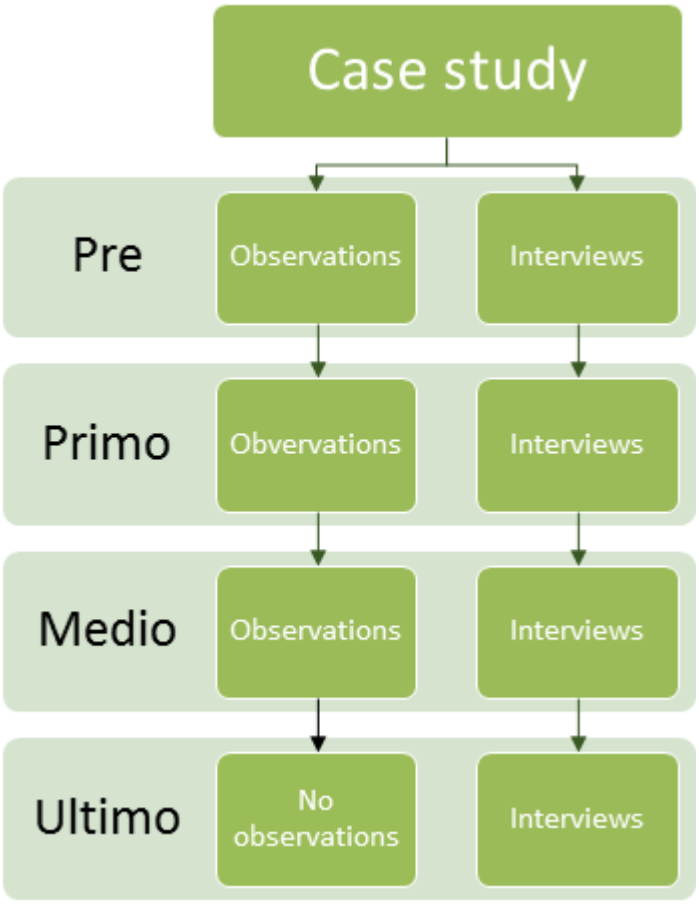


Figure 5. **Flowchart over the case study**. The figure illustrates an overview of the case study with both observations and structured interviews. The exact dates can be found in appendix 3a and 3b.

As seen in figure 5 the observations and the interviews were running simultaneously with the exception of the phase *medio* and *ultimo*. Due to technical and practical issues the observations in

medio were made one week after the interviews in *medio*, and the observation in *ultimo* could not be executed. The practical and technical issues with the thermal camera used for observations will be elaborated on in the discussion of the methods.

3.4.1 The supermarket REMA 1000

The supermarket in this case was REMA1000 located in Carlsbergbyen in Copenhagen, Denmark. REMA 1000 is well known and acknowledged all over Scandinavia and the supermarket is more than just groceries according to themselves. REMA 1000 focuses on the people both customers and employees, where "the customer is the boss". REMA 1000 wants to be the symbol of common sense, folksiness and competence. REMA 1000 is constantly working on their business idea and creating an environment where the customer is in the centre. The working environment is characterized by teamwork, respect and a joint desire for success. (REMA 1000 n.d.). REMA 1000 wants to make the healthy choice the obvious choice for the customers, which is in relation to their CSR strategy.

The sound nudge was implemented in REMA 1000 in Carlsbergbyen, and an interior map of this particular REMA 1000 can be seen in figure 6, illustrating the placement of the different groceries.

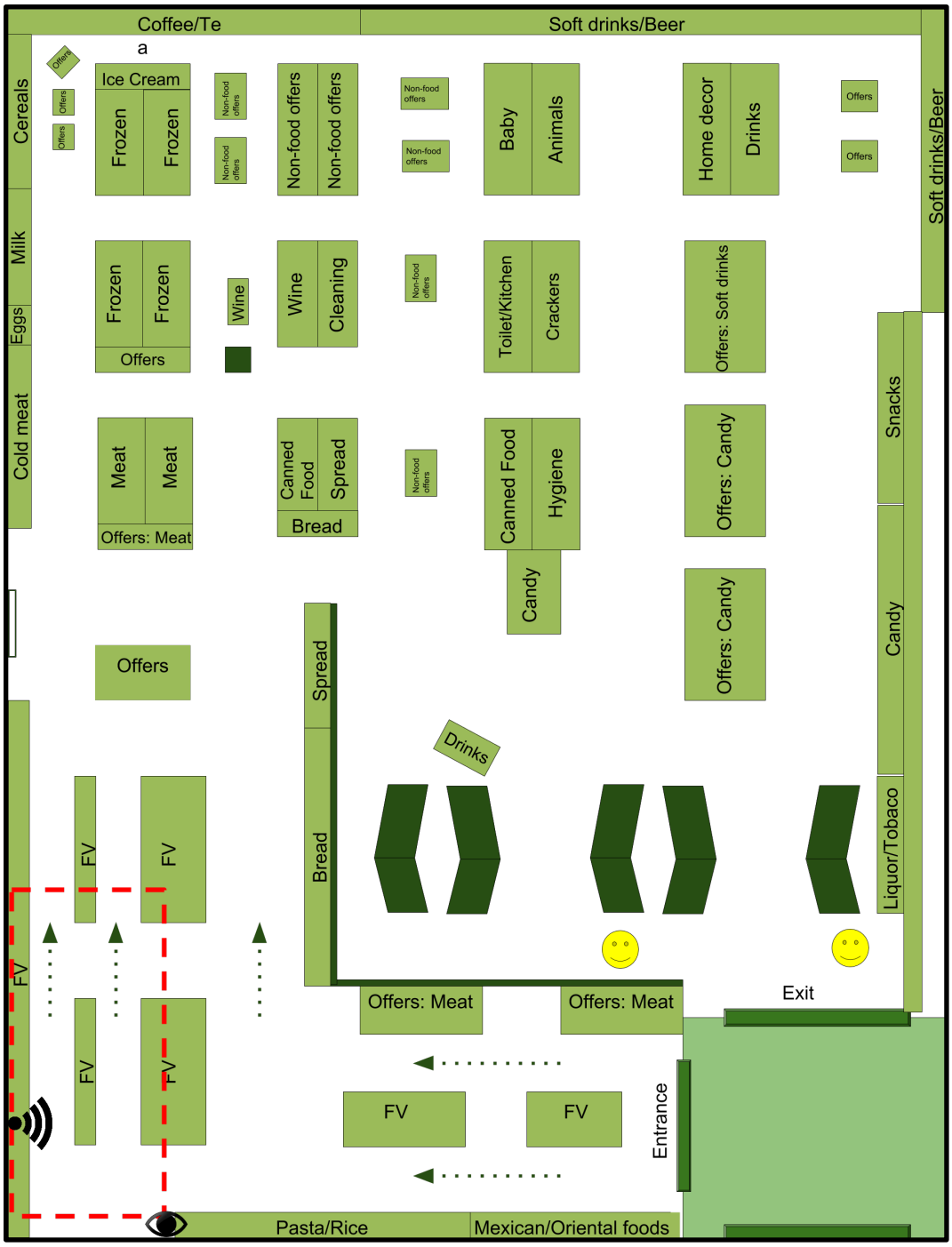


Figure 6. **Map of REMA 1000**. The map illustrates an overview of REMA 1000, the red stippled area illustrates the area of where the observations were made, the eye illustrates the camera placement, the arrows illustrate the customer flow, and the two smileys indicate where the structured interviews were conducted. Furthermore the map illustrates the entrance and the exit of the supermarket. In the map FV is an abbreviation for fruit and vegetables.

As seen in figure 6 the placement of the camera was illustrated with an eye. The red stippled marking illustrates approximately where the video observations with the thermal camera took place, which does not cover the entire fruit and vegetables area, due to the camera's limited angle of view. The two smiley faces illustrates where the two researchers conducting this study were standing during the structured interviews. The green arrows in the map illustrates how the customers entered the supermarket and also shows that the customers could enter REMA 1000 without entering the fruit and vegetable scape.

3.4.1.1 Population around Carlsbergbyen

The area surrounding REMA 1000 contains a variety of private households and companies, as well as a public school and two University Colleges (UCC), which indicate that both students and workers use the supermarket. During the intervention, several construction sites, due to the reconstruction of Carlsbergbyen, occupied the area around REMA 1000.

3.4.2 Observations

Observations are a fundamental form of qualitative data collection and can illustrate the larger picture or context by revealing more than what interviews can alone (Bjørner 2015a). This study was using video observations recorded with a thermal camera placed in the *fruits- and vegetables-scape* at REMA 1000. Using observation as a method could reveal the customer's use of the scape and furthermore give an understanding of what was revealed through the structured interviews. According to Bryman (2012b) non-participant observation means observing but not participating in the social setting. Using video observations therefore made the observer non-participating.

3.4.2.1 Observations at REMA 1000

The observations in this study were made with an Axis Q1922 Thermal Network Camera. Due to ethical considerations and privacy issues from previous research of human behavior on video (Gade 2014), the thermal camera was chosen for data collection on the observation. The camera was placed on a tripod being fastened on a shelving unit in the *fruits- and vegetables-scape* in the supermarket REMA 1000. The observations were made on Mondays in the time period between 2 pm and 5 pm. Information regarding the observation dates can be found in figure 5.

The inclusion criteria in the observations at the supermarket was all customers over 18 years of age, however staff was excluded in the observations due to the focus on the *customer's* shopping behavior. The staff was identified by their working clothes and actions. The actions included; adding lots of groceries to the shelves, helping other customers, or cleaning the area. Customers' actions, that were not visible in the video records, were excluded in the analysis. E.g. if only the customer's legs were visible in the frame it was not possible to see whether they grabbed any groceries or just looked at the groceries, therefore they were excluded.

3.4.3 Structured interviews

The interview was structured and scheduled, which requires the interviewer to ask the questions the same way and in the same order (Bjørner 2015a). Being two researchers asking question at REMA 1000 made structured interviews an advantage. The advantage of having a structured interview were therefore by standardizing the questions asked (Bryman 2012c). This standardization, and the lengths of the questions had been taken into consideration due to an introductory conversation with the retail manager of REMA 1000 mentioning from previous experiences in the supermarket the customers not wanting to be interviewed for a longer period of time. So it was important not to ask too many questions keeping the customers interrupted, since not everybody was willing to participate when being interrupted during their day. The shorter the interview and the more interested the participants are in the topic, the easier they are to recruit (Parastatis 2015). The interviews had furthermore the purpose to supplement the observations and getting a deeper understanding of the customers' behavior at REMA 1000.

3.4.3.1 Interviews at REMA 1000

There were two different sets of questions asked in REMA 1000. The first set was only asked during *pre* and was only about getting an understanding of the customers' vegetable shopping behavior. In the remaining phases *primo*, *medio* and *ultimo* a few extra questions were added in relation to the sound being played out in the *fruits- and vegetables-scapes* in order to gain an understanding of the sound perception. The added questions will be marked with bold letters in table 1.

The questions were primarily asked in Danish, and if necessary in English depending on the customer's ethnicity. The questions asked depended on the customer's answers. E.g. there are different subsequent answers to whether the customer answers yes or no. The interview questions are shown in table 1.

Table 1. **Structured interviews**. The table shows the questions asked in REMA 1000. The last three questions are marked in bold, due to those questions only being asked in the phases *primo*, *medio*, and *ultimo* where the sound nudge intervention took place in REMA 1000.

Structured interviews	
Gender (M / F)	
Age	
Occupation	
Did you plan to buy vegetables? (yes / no)	
If yes, did you follow your plans?	If no, why not?
-	Did you buy vegetables anyways? (yes / no)
Did you notice the sound being played at the fruits- and vegetables-section? (yes / no)	
If yes, What did the sound make you think of?	
Do you have any comments to the sound?	

The customers were approached at the checkout aisles, as seen in figure 6. According to Thaler and Sunstein (2009a) if customers are interviewed before doing what they intended to do it can affect their actions which is referred to as the *mere-measurement effect*. In order not to interfere too much with their answers they were approached after they had purchased their groceries. The answers of the customers were written down on paper as notes during the interview.

The inclusion criteria for the structured interviews were all customers over 18 years of age. However in the phases *primo*, *medio*, and *ultimo* an exclusion criteria was needed. The customers with absent hearing abilities such as headphones in the ears, were excluded as the interview featured questions regarding the sound nudge at the *fruits- and vegetables-scape*, therefore the customers needed to be able to hear the sound.

3.5 Intervention study

Quasi experimental studies are often used when it is not possible to randomly assign subjects due to the intervention taking place in a natural setting (Bryman 2012a). This type of study is often called the pre-post intervention (Harris et al. 2006), which was the case in this study. The intervention had five phases; *pre*, *primo*, *medio*, *ultimo*, and *post*. The *pre* functioned as the baseline of the intervention, the middle phases *primo*, *medio*, and *ultimo* were the active intervention of the sound nudge, and the *post* was used to see the post effect of the intervention. The strength in doing a quasi experimental study is the use of a natural setting, and the validity of such could therefore be very strong (Bryman 2012a).

3.5.1 Intervention in REMA 1000

As seen in figure 7 the intervention had a *pre* phase where everything was as usual and no sound was playing. In *primo* the sound played consisted of peeling, cutting and eating of a carrot with a narrow sound trigger area. In *medio* the volume of the played sound of peeling, cutting and eating of a carrot was increased with a narrow sound trigger area. In *ultimo* the sound of eating of a carrot played at the same volume as in *medio* and the sound trigger area was wider. The last phase went back to normal as in *pre*. Further descriptions of the phases will be presented in the following sections.

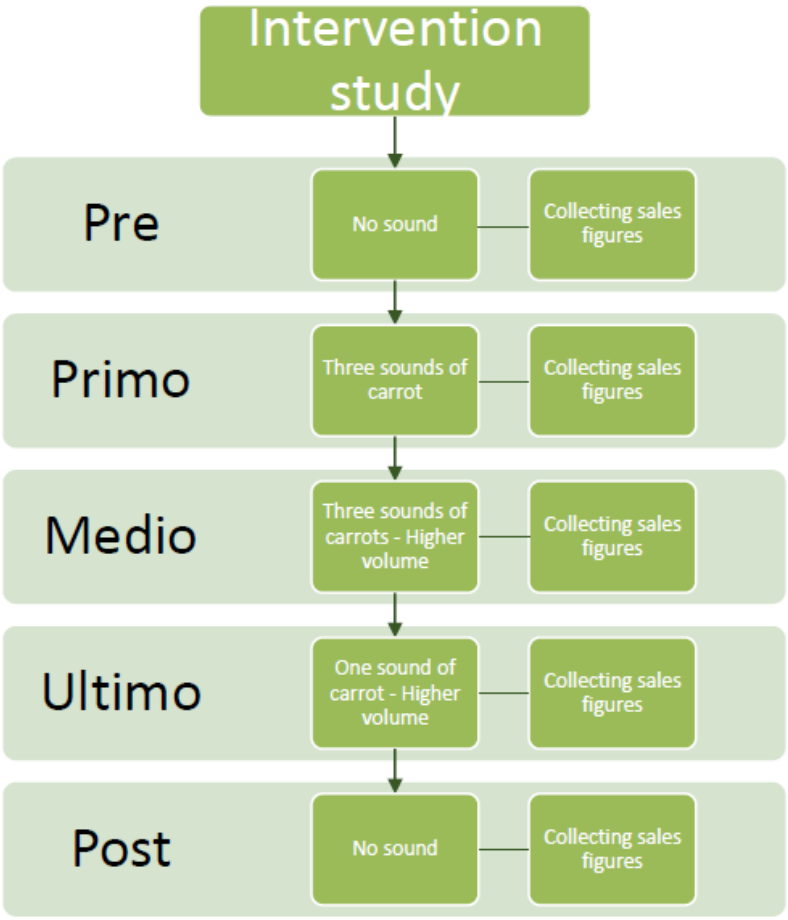


Figure 7. **Flowchart over the intervention study**. This figure illustrates the chronological content of the intervention study. *Three sounds of carrots* indicate the sound of peeling, cutting and eating a carrot, and *one sound of carrot* indicates the sound of eating a carrot. The exact dates can be found in appendix 4.

The phases *pre* and *post* were each over one week due to practicalities of collecting sales figures. The phases *primo*, *medio*, and *ultimo* were lasting two weeks each.

3.5.1.1 Pre phase

This was the *pre* measurement in REMA 1000, where everything was as usual and functioned as a baseline. The sales data was collected in this time period.

During this phase, the observations using a thermal camera was set up and made. The camera pointed at the *fruits- and vegetables-scape* in the supermarket. Structured interviews were conducted after the customer's had done their grocery shopping.

3.5.1.2 Primo phase

This phase consisted of a sound nudge at the *fruits- and vegetables-scape* played through the customized set of loudspeakers connected to a motion sensor both placed next to each other. The sensor was directed in a narrow area at the *fruits- and vegetable-scape* and triggered the sound whenever the customer's were crossing the sensor. The exact point where the motion sensor could trigger the sound can be found in appendix 5a. The sound consisted of the sound of peeling, cutting, and eating of a carrot as seen in figure 7. The sound was referred to as "Three sounds of carrot". Before implementing the sound at the supermarket, an average decibel measurement was made to match the sound to the same noise level with the intention of the customers hearing the sound subconsciously. As the previous phase the sales figures and a sound trigger count was collected, a video observation with the thermal camera was made, and structured interviews were conducted.

3.5.1.3 Medio phase

This phase of the intervention was almost similar to *primo*, the only difference was the sound nudge. After reflecting on the outcome of the previous phase the volume had been turned up, and was higher than the average decibel measurement in order for the customer's to hear the sound consciously. The sound was referred to as "Three sounds of carrot - higher volume" as seen in figure 7. As the previous phase the sales figures and a sound trigger count were collected, a video observation with the thermal camera was made, and structured interviews were conducted.

3.5.1.4 Ultimo phase

In this phase of the intervention was significantly different from the previous phases. After reflecting on the outcome from the previous phases the sound was changed by removing parts of the sound and broadening the area of where the motion sensor was triggered. The exact point where the motion sensor activates the sound nudge can be found in appendix 5b. The sound was referred to as "One sound of carrot - higher volume" as seen in figure 7, and it only consists of the last part of the sound, namely the sound of eating a carrot and the sound was played out louder than the previous parts of the intervention in order to get more feedback of the sound from the customers and in order to investigate whether this change could have a greater impact on the

customers purchasing vegetables. In this phase the sales figures and a sound trigger count were collected and structured interviews were conducted.

3.5.1.5 Post phase

The last part of the intervention had no sound. This part functioned as a post measurement in order to see if there was any changes in the sales after the sound nudge intervention. In this phase only sales figures were collected.

3.6 Sampling methods

According to Bjørner (2015a) there are two kinds of sampling techniques; probability sampling and non-probability sampling. Non-probability sampling is used where it is not possible to rely on randomization due to e.g. practical issues (Bjørner 2015a; Bryman 2012b). Therefore due to practical issues on reaching participants for the *sound nudge development* and customers at REMA 1000 non-probability sampling was used. Two different kinds of probability sampling were used in this study; *convenience sampling* and *snowball sampling*. *Convenience sampling* includes participants that are readily available and easy to contact. This method provides many participants fast and thus, lots of data. As the name suggests *snowball sampling* is characterized by participants leading to other potential participants and is often used through social networks. (Bjørner 2015a).

3.6.1 Sampling in this study

Two different questionnaires were made in the *Sound nudge development* phase, the questionnaires were called *questionnaire 1* and *questionnaire 2*. The recruitment of respondents for *questionnaire 1* took place at Aalborg University Copenhagen for two hours during lunch break using the *convenience sampling* technique, since people at the university were readily available and easy to contact. *Questionnaire 2* was conducted online and forwarded to participants through the social media Facebook by using the sampling technique *snowball sample*. The questionnaire was spread online with a sound file being attached. The participants needed to be able to hear the sound on an electronic device in order to participate. *Snowball sampling* lead to the participants providing more participants from their network. The structured

interviews at REMA 1000 were conducted by using the sample technique *convenience sampling*, due to the customers shopping at REMA 1000 were available and easy to contact at the location. Furthermore this sample technique provided many participants during a short period of time due to the availability of customers.

3.7 Validity and reliability

According to Bjørner (2015b) finding out if the study represents reality means finding good arguments in terms of both validity and reliability of the study. Validity means that this study checks for accuracy of the findings by employing certain procedures, and reliability means the consistency or dependability - in this case meaning the schemes for observation, structured interviews and the treatment of sales figures - ensuring that the study can be repeated and to accurately measure the same things again (Savin-Baden & Major 2013b). Reliability is a prerequisite for validity. (Bjørner 2015b).

To ensure and investigate the validity of this study, triangulation has been used. According to Bjørner (2015b) it means to examine the evidence from different converging sources of data. In this study the findings were backed up by data from interviews, observation and sales figures. This can add to the validity to this study. Furthermore clarifying bias within this study can add to the validity (Bjørner 2015b).

3.8 Coding and analysis

The following sections will present the coding and analysis of all conducted data in this report. The data consisted of questionnaires from the *sound nudge development*. The data from the case study consisted of observations and structured interviews. The data from the intervention study consisted of a sound log and sales figures. How the data was coded and analyzed will be presented below.

3.8.1 Coding

The coding of the data consists of three different types of coding. Coding for nominal variables, coding for ordinal variables, and coding for open-ended questions.

Firstly, the nominal variables were coded numerically as for example male = 1 and female = 2 (David & Sutton 2004a). This type of coding was used in the case study and the intervention study. Secondly, the coding for ordinal variables were used when using a likert scale and ranking the answers numerically by starting with the number 1 and increase the count of 1 by each category (David & Sutton 2004a). Ordinal variables were used in the sound nudge development. The last coding type was for open-ended questions and observations. This type of coding is also called post-coding (and 'post-observation-coding'), where the answers given are categorized with answers that are alike and afterwards coded nominally (David & Sutton 2004a). This type of coding was used in the sound nudge development and the case study.
The coding procedures for this study are presented in forthcoming sections.

3.8.1.1 Sound nudge development

The answers from *questionnaire 1* regarding what sound the participants connect to health was categorized using post-coding. The themes were found continuously while analyzing the answers. The themes found for *questionnaire 1* were: (1) 'crunchy vegetables', (2) 'nature/silence', (3) 'sport', (4), 'hospital', (5) 'music', and (6) 'other'.

The answers from *questionnaire 2* regarding what sound they heard was categorized by using post-coding into 'healthy food' and 'other'. The category 'healthy food' was furthermore divided into the sub-categories 'carrots', 'vegetables' (all other vegetables than carrots), 'fruit', and 'other' by using post coding. The perception of the sound was categorized by an ordinal variable going from (1) 'very unpleasant' to (6) 'very pleasant'. The question regarding whether the sound give any shopping ideas was categorized by using post-coding into (1) 'carrots', (2) 'vegetables' (all other vegetables than carrots), (3) 'fruit', (4) 'other', and (5) 'no' (represents that the sound does not give any grocery shopping ideas).

3.8.1.2 Case study

The case study was divided into observations and structured interviews, starting with observations.

After collecting the video recorded at REMA 1000 it was analyzed by assessing the customers into age range, gender, activity, and activity level. The age range and gender were divided by looking at the posture, height, hair and clothes.
The gender was coded nominally (1) 'male', (2) 'female', and (3) 'unknown' (if it was not possible to identify the gender). The accuracy of identification of the gender and age could be uncertain according to the above mentioned parameters due to the thermal camera hiding information of the customers. The distribution of the time spent in the fruits- and vegetables-section of REMA 1000 was distributed by using post coding; (1) 'X < 10 sec.' (customers mostly passing through), (2) '10 sec. < X > 30 sec.' (customers mostly determined of what to buy), and (3) 'X > 30 sec.' (customers mostly wondering and deciding what to buy). The distribution of activities made in the *fruits- and vegetables-scape*, were categorized by using post-coding: 'passing' (walking through the fruit and vegetable section), 'looking/wondering' (standing in the fruit and vegetable section and looking/wondering), 'returning' (returning items in the *fruits- and vegetables- scape*), and 'grabbing' (grabbing items at the fruit and vegetable section). The data from the observations were quantified and analyzed through SPSS and excel.

Moving on to the structured interviews, the gender was coded nominally similar to what has been done in the observations, (1) 'male' and (2) 'female', however no unknown gender, as in the observation. The distribution of the customer's occupation was categorized by using post-coding. The occupations found were: 'craftsmen' (e.g. carpenters, electricians, plumbers), 'students/apprentices', 'retired', 'unemployed' (incl. 'stay-at-home', maternity leave, and 'off-work-sick'), 'unskilled' (e.g. sales assistant and cab driver), 'skilled' (having a university degree or a university college degree, e.g. journalist or psychiatrist), 'other' (incl. all occupations not categorized elsewhere), and 'self-supporting'. The customers plan to buy vegetables, whether they stuck to their plans, and whether the customer's not sticking to their plan bought vegetables anyway, were coded nominally with 'yes' (1) and 'no' (2) answers. The reasons for the customer's who did not stick to their plans of buying vegetables, were categorized using post-coding; 'unanswered', 'have it at home/have bought it', 'buy it later/elsewhere', 'don't eat it/don't eat it that much', 'at work/school', 'spontaneous' (e.g. did not plan any grocery shopping before entering the supermarket), 'specific purchase' (e.g. other groceries than vegetables, should not have it), and 'don't know/other' (incl. do not need any vegetables, live with parents, no room for

vegetables, too early to buy vegetables). The perceived sound at REMA 1000 was categorized by using post-coding; 'craftsmen', 'vegetables/carrots', 'farm' (e.g. sound of pigs), 'don't know', 'other'. However not all categories were present in all the phases (*primo*, *medio* and *ultimo*). The present categories in each phase will be shown in the findings.

3.8.1.3 Intervention study

The intervention study consisted of a sound log and sales figures from 2015 and 2016 in order to investigate the changes over the phases in both years.
No initial coding was done with the sound log, due to the sound log basically was counted as 1 for each trigger of the sound at REMA 1000 and was used to investigate the amount of customer's triggering the sound.

The sales figures had to undergo initial adjustments before the actual coding.
In order to compare sales figures, to see the general changes in sales from the same phases in 2016 and 2015, you need to compare the weekdays to the same weekdays the previous years, e.g. Monday's needs to be compared to Monday's from the year before, and the days during the holidays need to be compared to the same days the year before. The complexity lies within the changes of the holidays and due to leap year. The intervention occurred during Easter and this holiday falls in different weeks each year. The dates of the collected sales figures can be found in appendix 6.

General sales figures were collected of all the sold fresh vegetables in the *fruits- and vegetables-scape* of the supermarket looking at both 2016 and 2015 in the different phases of the intervention. With the sound of carrots in mind, the sales figures of carrots were additionally collected, which consisted of Lammefjord carrots, Danish carrots and organic carrots. Carrots are furthermore being sold by the piece, however due to practicalities at the supermarket all root crop sold by the piece was in practice sold as carrots, therefore they were not included when only looking at the carrots due to uncertainty in the sale. From 2016 organic snack carrots was also being sold, they are however not included when only looking at carrots, due to the organic snack carrots not being sold in 2015, making it infeasible to compare carrots sold in 2016 compared to carrots sold in 2015.

The vegetables and carrots were not coded but instead counted in total. The sales figures was modified, due to confidentiality, into index-100 numbers, in which the sales figures from *pre* 2015 was set at the value: 100. If the sales were higher or lower in comparison to *pre* 2015, the value would be higher or lower compared to 100.

3.8.2 Keyword analysis

The analytical approach of searching out the words that have some meaning in the larger context, is defined as 'keyword analysis' (Savin-Baden & Major 2013a).
The coded data from the questionnaires and interviews, was analyzed by looking at the frequency of terms used by the participants, however the statements from questionnaire 2: "*How did you like the sound*", was both used to ensure the sound was perceived as intended, and by evaluating the sound throughout the intervention at REMA 1000.

3.8.3 Statistical analysis in SPSS

The statistical analysis of the sales figures was processed through SPSS.
By using a histogram, QQ-plot and Shapiro-Wilk, the normal distribution of the datasets including the sales of all vegetables in 2016 and 2015, respectively, were tested, and no normal distribution was found. The same procedure to test the normal distribution was executed for the datasets of all the carrot sales in REMA 1000's fruits- and vegetables-department in 2016 and 2015.
As there were no normal distribution, several transformation-methods were tested (Kirkwood & Sterne 2003). The Log10-transformation was found to contribute to a normal distribution in all the datasets, when looking at the histograms and QQ-plots.
A One-way Independent ANOVA-test was used, as the datasets had five experimental groups (the five intervention phases), and additionally a Tukey post hoc test was used in order to locate if there should be any significant differences between any of the phases.

4. Theoretical and conceptual foundation

The following chapter elaborates on three themes already presented in the introduction; Corporate Social Responsibility (CSR), scapes, and nudging. These three themes will be the conceptual foundation for the discussion in this study. CSR is used for explaining the justification for doing the intervention, *foodscapes* are explaining the environmental influences for the customers, and nudging are explaining the sound and how it affects the customers.

4.1 New governance and Corporate Social Responsibility

During the last decades there has been a change in governance, which has given rise to the term *new governance*. *New governance* is characterized by creating heterarchy among both public and private actors (Jørgensen et al. 2012). Heterarchical governance can be incorporating networks dominated by private actors, whereas hierarchical governance has clear lines of control and the responsibility comes from governmental authorities (Boch n.d.). *New governance* can be described as a "*..new political, ideological and administrative movement capturing new ways of organizing the public-private relationship… based on cooperation between public and private sector.*" (Jørgensen et al. 2012).

New governance makes it attractive for private companies, such as supermarkets, to make an impact in for example having a health strategy and personalize the supermarkets for consumers such as being aware of sustainable fishing, environmental packaging and healthy living. According to Besley and Ghatak (2007) "*a company which cares as much about how it makes money, as how much money it makes, will make money*". This quote leads on to Corporate Social Responsibility (CSR), which is a voluntary initiative beyond legislation and economic responsibilities. Meaning that acting with legal, moral and social concerns and the company is risking exposure to potential criticism that can not be foreseen how it will be absorbed. (Piacentini et al. 2000). Companies have been found to engage themselves in socially responsible behavior, not only due to stakeholder demands, but also due to self-interest in for example increased competitiveness (Klein & Dawar 2004). Research shows that CSR activities are connected to competitive advantages, such as attracting qualified employees as well as enhancing the company's image and reputation (Filho et al. 2010). Existing supermarket CSR initiatives

includes among others, reduced fatty foods, less use of GMO and more organic foods, and it includes employee welfare and job creation in deprived areas (Shaw 2006). Companies, including supermarkets, are eager to follow up with CSR due to good publicity (Doane & Abasta-Vilaplana 2005). The supermarket chain REMA 1000 has developed a policy report explaining their CSR initiative. The report has five focus areas in their CSR policy; (1) 'the healthy family, (2) 'the happy nature', (3) 'the good supplier', (4) 'REMA 1000's donations to welfare', and (5) 'the motivational workplace' (REMA 1000 2015). Policy (1) 'the healthy family', was the one being elaborated and explored in this thesis. REMA 1000 (2015) wants to make the healthy choice the obvious choice for the customers. This was furthermore the aim of the sound nudge intervention in this thesis.

A key point for companies using CSR strategies, is communicating it to the consumers (Du et al. 2007; Piacentini et al. 2000). Furthermore, the communication needs to be regarding intrinsic motivations, such as genuine concern, rather than extrinsic motivation, such as profit. (Du et al. 2007). This means that when talking CSR, the customers are important for supermarkets. People are no longer defined by their job or what they produce, but instead by what they buy and consume (Shaw 2006), they furthermore can identify with the companies (Du et al. 2007). In REMA 1000's CSR report, the themes that customers can identify themselves with are for example the previously mentioned 'the healthy family'. Research suggests that customers are more likely to buy from companies that engage in CSR actions (Du et al. 2007), and are even willing to pay more for products if they consider it ethically correct (Besley & Ghatak 2007). So customers having a positive belief in a company's CSR is not only creating a positive effect on the financial performance, but it is also connected to customer's *long-term loyalty* (Du et al. 2007; Becker-Olsen et al. 2006). Customers' long term loyalty can be affected by wanting quality products (Mollah 2014). Quality can be seen as socially or environmentally produced products. This means that it is important for REMA 1000 to promote themselves in a way that the customers can identify themselves with and thus ensure their *long-term loyalty*. Research on the other hand also suggests that the consumers will punish companies that do not follow their CSR involvement (Becker-Olsen et al. 2006).

4.2 Scapes

This intervention requires a thorough understanding of the context in which it has to take place, in order to be successful, which leads this study to take departure in the term 'scape' which is defined as referring to a wide view of a place (Cambridge University Press n.d.). The term has been used widely and commonly to define a spatial view, such as landscape, seascape and cityscape, but can also be used as tool to encompass both the physical environment but also the social and cultural context (Olsen 2010). The flexibility in the use of the term 'scape', to define a certain subject of interest is ongoing.

The intervention is taking place at a supermarket, which, in this study, will be defined as a *foodscape*. A *foodscape* has been defined differently by several scientists, as; *"the appearance of an edible item that will be consumed"* (Wansink & Sobal 2007), *"institutional sites for the merchandising and consumption of food"* (Winson 2004) and *"how we live our lives with food, according to food and through food"* (Dolphijn 2004).

However, it can be argued which one encapsulates the term most fulfilling (Wansink & Sobal 2007), it seems trivial to do so, as each definition has different points of departures of how foodscapes are perceived and each approach seeks to explain different questions. With departure in the definitions of Sobal and Wansink (2007), Winston (2004) and Dolphijn (2004), a *foodscape* in this study are "*the scape in which food is purchased*" as for example the supermarket REMA 1000.

As inspiration and with clarifying purposes, a categorization made by Lake et al. (2010) has been included, to distinguish between the different levels of *foodscape*: 'macro' at a national level, and two 'micro'-levels, which is categorized at an institutional level, and at a domestic level, respectively. In which this study acts, would according to this scaling, be identified as a micro *foodscape* as it takes place within a supermarket. As this intervention's main focus was the fruits- and vegetables-department, it can be added into a sub-area of the micro-level – that will in this study be defined as a *fruits- and vegetables-scape*.

Though it is informative to frame REMA 1000 as a *foodscape* and the fruit and vegetable area as *fruits- and vegetables-scape*, in which the customers enter an environment surrounded by foods, it should not be neglected that REMA 1000 is an institution providing a service to the customers

as a merchant who seeks revenue as well. This environment in which the customers are present to receive services and goods is entitled by Bitner (1992) as a service environment or a *servicescape*. In relation to the case, the terms *servicescape* and *foodscape* are naturally intertwined. Therefore, in this study it will be referred to as a *foodscape*, with in mind that service is also included.

Inspired by Bitner (1992)'s framework for understanding environment-user relationships in *servicescapes*, the framework was used as a conceptual foundation to understand the complexity of what influenced the behavior of the customers and the employees in a *foodscape*, which use will be elaborated according to the context of REMA 1000.

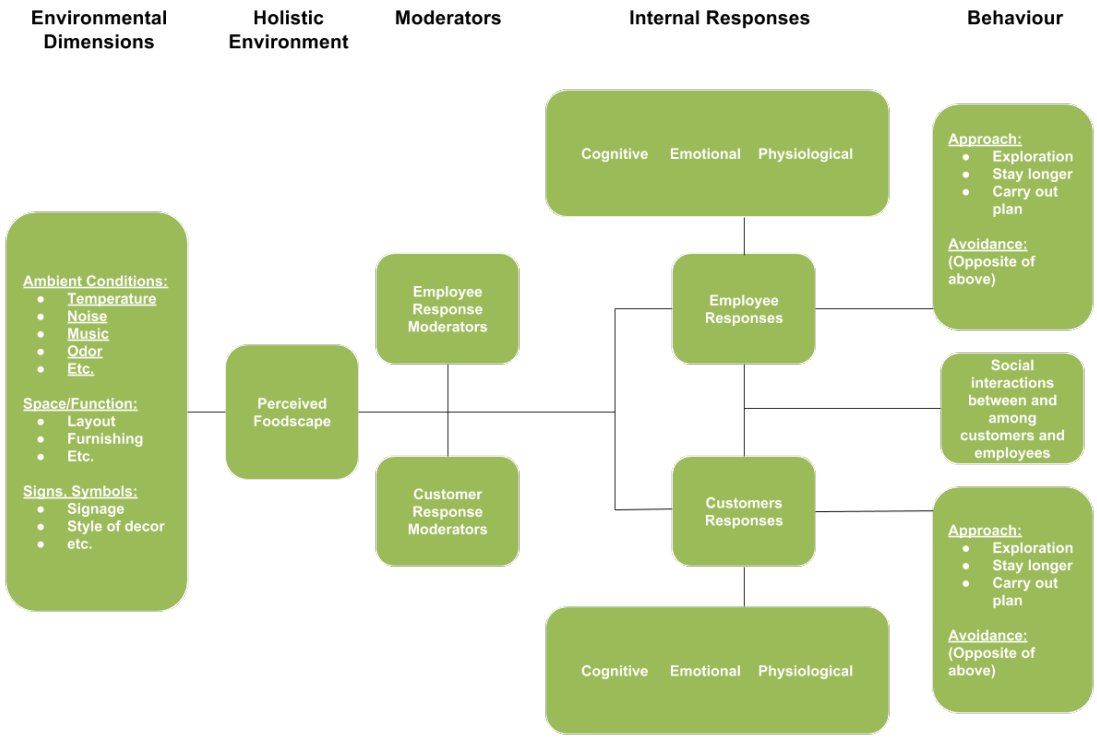


Figure 8. **Framework for understanding environment-user relationships in foodscapes**. The model illustrates the steps for understanding environment-user relationships

Figure 8 shows several steps towards a certain behavior, which Bitner (1992) categorizes as either positive or negative actions; *approach* or *avoidance*, respectively. It is divided into several actions such as the attraction, whether it be the attraction to a certain product, a certain area or even the attraction to REMA 1000 itself. And additional action will be the desire to stay and/or

explore. Does it seem like the customers are in a hurry to get out of the store or the *fruits- and vegetables-scape*, or does their behavior simulate a more relaxed, thoughtful and exploring *approach*. Another, and arguably vital action for any *foodscape*, is that customers will spend money. If the *foodscape* stimulates a behavior that does not encourage its customers to spend money, the customers' perception of the store ought to be evaluated. Furthermore, does the *foodscape* promote such a great experience that the customers willingly want to return and encourage them to make a purchase there again, or does it create an act of *avoidance*, so they will not return? This will be elaborated on in the discussion of the findings.

The *Customers Response Moderators* could be situational factors, such as the purpose and plan for being there, that moderates the relationship between *foodscape* and customer (Bitner 1992). If the expectations of a shopping experience did not go according to plan, whether it was the lack of fresh vegetables or a long queue at the checkout aisle, customers may reconsider the choice of supermarket, and therefore, it is crucial for a retail store to fulfill the expectations and let them carry out their plans. This may seem to contradict the whole purpose of the intervention, as the intention was to affect the customers' plans into buying more vegetables, maybe more than they planned. However, the intervention intentionally should act as an unconscious guidance (priming), which would give them the impression that vegetables were meant to be on their shopping-list in the first place, which will be elaborated on in the next section about nudging. The abovementioned behaviors have also had an inspirational feature towards the decision of which 'measureable outcomes' that should be considered in the evaluation.

The environmental cues/'environmental dimensions' that causes these actions is divided into three sub-categories; 'Ambient Conditions', 'Space/Function' and 'Sign & Symbols', as seen in figure 8. These are the physical parameters that can have an effect on the customer's behavior (Bitner 1992). Even though the focus of this study will be on how a specific chosen *sound* can affect the customers at REMA 1000 into buying more vegetables, it should be considered that there can be more ambient conditions such as temperature and air quality that influence the results, or spatial architecture and signs with offers (offer leaflets). If the environment is too hot, it may influence the customers into buying something refreshing rather than vegetables or if there is any stench in the fruit and vegetable area it may cause them to pass through rather than browse. In addition to this, broader aisles make people stay there longer than in narrower aisles

(Wansink 2014), therefore narrow aisles at the fruit and vegetable scape might result in the customer's short stay and possibly purchasing less in this particular scape.
All of the dimensions mentioned in figure 8, combined, hereby merge into the 'holistic environment', which can affect the customer's perception, and will act as the full experience of the *foodscape*. Lam (2001) further mentions that the congruence between the environmental conditions may greatly promote the customers' categorization of the retail store, as the ambience and design may project a certain image, in which shapes the customer's assumptions and expectations. As REMA 1000 does promote itself as being a discount supermarket, yet socially responsible, they may reflect that image through their store-environment. REMA 1000 is able to use the physical environment in its favor to influence customers, with an expectation of how the they are going to respond. It is, however, uncertain if every customer will respond in the same way. This is due to the internal responses, which are categorized as 'cognitive', 'emotional' and 'physiological' (Bitner 1992). These internal responses, concerning the customers, will be explained by use of 'dual process theory' in the upcoming section.
In addition, when explaining the customers behavior, an interesting aspect of the model was the consideration of how the environment could affect the behavior of the employees as well, namely the social interaction between them. Though the intervention's aim was to not affect the employees at work to buy more vegetables, it should be considered that it potentially could affect the behavior in other ways, either positive or negative. If the sounds tend to be too loud or too annoying for the employee, causing a bad working environment, it may be a catalyst to frustration that could lead to bad service.

4.3 Nudging

As the intervention was inspired by elements from the concept of nudging, this section will define and elaborate on nudging and the concept itself, as well as the theoretical foundation of using nudging in supermarkets.

The concept 'nudging' was developed by Richard H. Thaler and Cass R. Sunstein which they defined as "*A nudge, as we will use the term, is any aspect of choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing their*

economic incentives" (Thaler & Sunstein 2009b, p.6). Some of the best and the worst eating habits start in the supermarkets, where the food gets bought and later eaten at home (Wansink 2014). The supermarket's staff can be defined as choice architects, as they are the ones organizing the environment in which customers make decisions. Designing the environment appropriately for the purpose can improve the lives of others. (Thaler & Sunstein 2009d).

4.3.1 Libertarian Paternalism

Nudging builds upon the free choice, as Thaler and Sunstein's (2009b) definition of nudging indicates, by not forbidding any options. Libertarian paternalism means 'liberty-preserving' according to Thaler and Sunstein (2009b), which refers to a legit reason for why choice architects are trying to influence and improve people's behavior in a better and healthier direction. Research in social science shows that individuals make bad decisions they would not have made if they had complete self control, unlimited cognitive abilities and possessed complete information (Thaler & Sunstein 2009d). Looking at libertarian paternalism by separating the two definitions; paternalism is according to Vallgårda (2012) about knowing what is best for the people, whereas liberalism is about freedom of choice and avoidance of taking responsibility. With the mindset of libertarian paternalists, nudging is self-consciously moving people in a direction that will make their lives better and the better choice should be the easiest possible (Thaler & Sunstein 2009d). The intervention in this study, took place in a supermarket, attempting to change people's behavior towards the healthier choice. This intervention seeked to change bad decisions by using sound as a nudge attempting to make customers buy more vegetables at the supermarket and in the end consume more of those.

4.3.2 Dual process theory

According to the dual process theory, the human way of thinking can be divided into two systems. Thaler and Sunstein (2009a) are referring to these systems as *the automatic system* and *the reflective system*, but in this study it will be referred to as *system 1* and *system 2* which is what Daniel Kahneman (2013b) refers it as. The two systems are active when we are awake, *system 1* runs automatically and *system 2* runs in low-effort mode (Kahneman 2013d). In the following section the dual system are explained somewhat separately.

When looking at *system 1* separately it functions automatically with little or no effort (Kahneman 2013d). This system can be trained by repetition, using the reflective and slower *system 2*, by programming the automatic functions of attention and memory (Thaler & Sunstein 2009a; Kahneman 2013d). The memory of an experience makes you better at recognizing it later, as it gives an impression of familiarity (Kahneman 2013b). In this study it was presumed for most customers at REMA 1000 that the sounds of cooking and eating vegetables were well-known and familiar. Leading to when the customer's hear the sound of crunchy vegetables it triggered their memory. When the mind is busy *system 1* has more influence on behavior than *system 2* (Kahneman 2013e). Shopping in supermarkets leaves many impressions on the surroundings including lighting, layout, directional signage and human elements (Lam 2001). These complex surroundings can contribute to keeping *system 1* busy and making customers choose poorly. Relying on *system 1* people's lives should be easier, better and longer (Thaler & Sunstein 2009a). So when using nudging and choice architecture, make sure not to overload *system 1* due to people being confronted with many choices everyday (Thaler & Sunstein 2009b). According to Kahneman (2013c, p.21-22) examples of *system 1* actions can be to orient the source of a sudden sound, distinguish surprising from normal, creating a coherent pattern of activated ideas in associative memory, and be programmed by *system 2* to mobilize attention when a particular pattern is detected.

System 2 operates with complex computations, which are often including choice and concentration. Normally *system 2* runs in a low effort mode. Surprise activates your attention and will make you wonder and search your memory for at story that can make sense of the surprise. Examples of *system 2* actions can be to search the memory to identify a surprising sound and to monitor appropriateness of behavior in a social situation. (Kahneman 2013d). *System 1* are constantly suggesting impressions, intuitions, intentions and feelings for *system 2*, these can be adopted by *system 2* with little or no modification (Kahneman 2013d). Usually *system 1* is in charge, but when things get difficult and requires attention and effort, *system 2* takes over by controlling thoughts and behavior (Kahneman 2013d; Kahneman 2013e). When the customer's start noticing the sound from the intervention being played at REMA 1000, they might stop and

wonder trying to find a memory where the sound could make sense. Finding this story in their memory could program the memory to a *system 1* function.

4.3.3 Types of nudges and choice architecture

Within the two system's Thaler and Sunstein present different types of nudges and choice architecture. *Availability* relates to previous experiences that affects the current choices (Thaler & Sunstein 2009a). E.g. if people had recent memories of eating vegetables they might buy them when being presented to them. *Mindless choosing* is regarding people eating simply what is presented for them (Thaler & Sunstein 2009e). This can be related to the sound of vegetables, and hearing the sound of vegetables while seeing them, might get them to buy more. Shopping in supermarkets, and in other places, the *spotlight effect* exists, meaning that people are self-conscious about what they believe others may think of them. This *spotlight effect* can have an impact on customers, as humans like to conform. (Thaler & Sunstein 2009c). If others are buying lots of healthy food one might feel compelled to do the same due to what they think others expect them to, and therefore not buying the unhealthy food they wanted in the first place. Having groceries at *eye-level* can also increase the sales because it is easier to spot (Wansink 2014). Having narrow aisles can decrease the sight of what is in *eye-level* and therefore decrease the sale, and furthermore narrow aisles can make customers bump into each other, which rushes the customers to move on and spend less time in the aisles and in the end spend less money (Wansink 2014). *Priming* can be a mere hint of an idea of a concept that can trigger an association that in the end can lead to action. It has its basis from *system 1*. These *primes* occur in social situations and the effect can be surprisingly powerful (Thaler & Sunstein 2009c; Kahneman 2013c). *System 2* does not believe that it can be affected by *priming*, due to *system 2* believing it is in total control (Kahneman 2013c), but the mind can easily be tricked, because effect of *priming* occurs in *system 1* which is an unconscious phenomenon (Kahneman 2013c). The *primes* being presented in this study were sounds of vegetables hopefully leading to increasing the sales of vegetables. Of all the nudges presented *priming* was in this thesis the most in focus.

5. Findings

This section presents the findings of the *sound nudge development* and explains the basis of the choice of sound used for the intervention at REMA 1000. Afterwards the findings of the study are split in two sections, namely findings from the case study, and findings from the intervention study. Firstly the findings from the case study will be presented, giving an insight into the customers vegetable buying behavior in REMA 1000, and secondly the findings from the intervention study will be presented showing the changes in the sales of vegetables and carrots and to which degree the sound has been exposed to the customers in REMA 1000.

5.1 Sound nudge development

This section of the findings presents the basis for the intervention at REMA 1000, namely the two questionnaires being the foundation for the development of the sound nudge used in REMA 1000, in order to investigate if it can increase the vegetable sale. The findings are based on *questionnaire 1* and *questionnaire 2*.

5.1.1 Questionnaire 1

This was the output from questionnaire 1, regarding the connection of health and sound. It included 45 respondents in the ages of 18-47 years. The responses to the question "*When I mention health, what sound do you think of?*" were categorized by using post-coding into the six themes; (1) Crunchy vegetables, (2) Nature/silence, (3) sports, (4) hospital, (5) music, and (6) other.

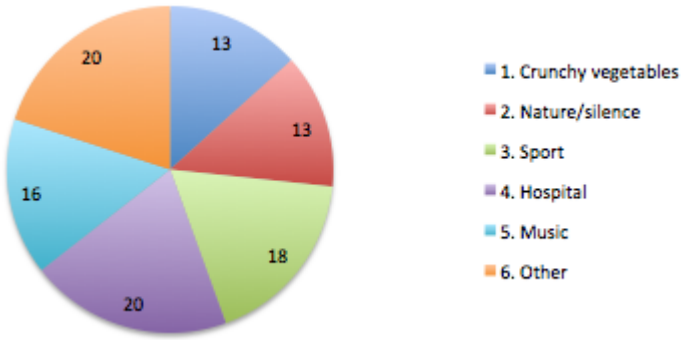


Figure 9. **When I mention health, what sound do you think of?** The figure shows the distribution of answers to the question in percentages using post-coding.

The distribution of the frequencies of the themes is presented in figure 9. The participants' elaborations on their answers were taken into considerations as well when categorizing the themes. For further information on all responses, see appendix 7.

Out of the six different themes, the sound of crunchy vegetables was selected in the intervention at REMA 1000, more specifically the sound of a carrot being peeled, cut and eaten. Further elaboration on the choice of sound will be presented in the discussion.

5.1.2 Questionnaire 2

In order to investigate whether the potential customers at REMA 1000 could identify the produced sound "three sounds of a carrot"; a carrot being peeled, cut and eaten, the online questionnaire were made. The exact questions asked can be found in the method section under section regarding *questionnaire 2*, of the *sound nudge development*.

The outcome of *questionnaire 2* included 59 respondents in the age group between 20-59 years with 27% male and 73% female. The first question asked in *questionnaire 2* was regarding whether the respondents were able to hear sounds of a carrot. The success criteria were that the respondent was able to identify either the peeling, cutting and eating of a carrot or all three parts of the sound. The answers were coded into themes by using post-coding. The answers to the first question are illustrated through two figures (figure 10a and figure 10b).

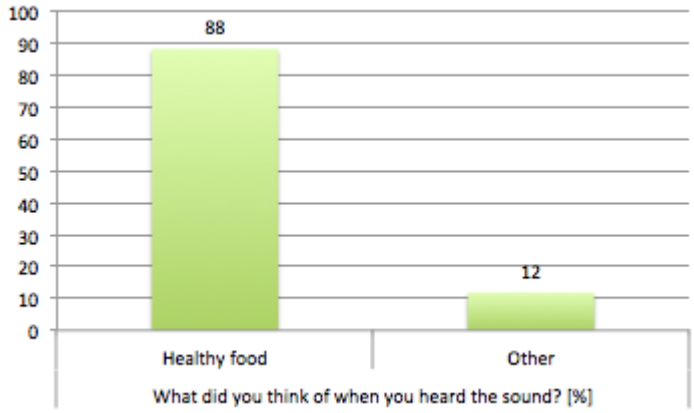


Figure 10a. **What did you think of when you heard the sound?** The figures shows the answers distributed between 'healthy food' and 'other' of what sound is heard. The numbers are presented in percentages.

As it appears from figure 10a, 88% of the participants heard the sound as being made from healthy food whereas only 12% heard the sound as being something different than food.

The theme "healthy food" from figure 10a was further divided and the total responses are illustrated in figure 10b. As seen in figure 10b the themes were divided by using post-coding into (1) carrots, (2) vegetables, (3) fruit, and (4) other.

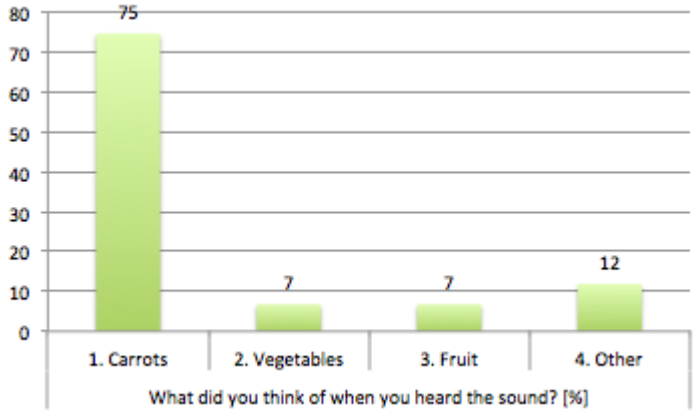


Figure 10b. **What did you think of when you heard the sound?** The figure illustrates the answers distributed between carrots, vegetables, fruit, and other. The numbers are presented in percentages.

As seen in figure 10b, the response suggested that 75% of the participants in the online questionnaire heard the sound as either a carrot being peeled, cut, or eaten, or all the sounds, while 7% heard the sound as being made with vegetables and 7% of the participants heard the sound as being made with fruit. These results from figure 10a and figure 10b indicated that most of the respondents could hear what the sound was, which was the success criteria of using this sound for the intervention in REMA 1000.

In order to answer the question of how the sound was perceived the respondents were asked to choose from 1-6 on a likert scale, where (1) was being very unpleasant and (6) was being very pleasant. The responses are shown in figure 11.

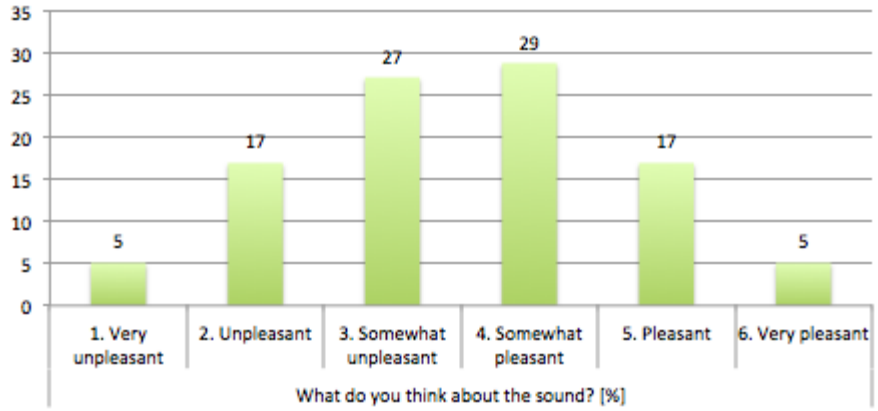


Figure 11. **What do you think of the sound?** The answers are distributed from 1. Very unpleasant to 6. Very pleasant and shows the respondents perception of the sound. The numbers are presented in percentages.

The findings suggests that the perception of the sound was normally distributed, however the curve leans slightly towards the respondents perceiving the sound as being pleasant, Indicating that the respondents found the sound as equally pleasant and unpleasant. The respondents had the possibility to elaborate their answers and a few positive and negative responses are shown in table 2 translated from Danish. The original answers can be found in appendix 8.

Table 2. **Elaborate, what do you think of the sound**. The table is showing the respondents both positive and negative comments to the sound.

Likert scale	Positive comments	Likert scale	Negative comments
4	The first part of the sound was not as nice to listen to, as the last part. I guess it is always nice to eat a carrot :)	2	I thought there was a difference between the 3 sounds, so it is difficult to explain. E.g. I think the first part of the sound was unpleasant, but not the following two parts.
5	The sound is from the kitchen, and sounds are connected to memories. This sound makes me think about my mother, when I was living at home with my parents making good homemade food. She gave me a carrot in the hand before we were having dinner so I could handle my hunger before dinner time. The sound reminds me of comfort. Additionally it makes me want to eat fresh vegetables such as carrots, cabbage, salad, apples, pepper - everything	2	The first 'peeling sound' was really unpleasant. The first sound reminded me about something scratching against a surface that should not be scratched! The following two sounds were fine.

	that is crunchy (just like with the Coca Cola commercial, where the sound of the fizz makes you want to drink it).		
5	You are associating to different foods and to cooking - for my part apples and vegetables. It can very well be a little unpleasant to listen to somebody chew, but really not in this case. It is not like "champing sounds".	3	I actually think it is a bit annoying. It reminds me that carrots are boring and a little troublesome, because you have to peel them.

The positive comments were in general related to association to positive experiences of eating vegetables. Whereas the negative comments mostly were related to the first parts of the sound being unpleasant to listen to. These comments were furthermore used in the process of evaluating on the sound during the intervention at REMA 1000 which will be elaborated in the discussion of the findings.

After getting the responses of the perception of the sound "three sounds of carrots", it was interesting to ask whether the sound gave any specific grocery shopping ideas, in order to investigate if the sound possibly could affect potential customers into getting specific a shopping idea. The answers to that question are illustrated in figure 12. The answers were divided into themes by using post-coding. The themes were (1) carrots, (2) vegetables, (3) fruit, (4) other, and (5) no.

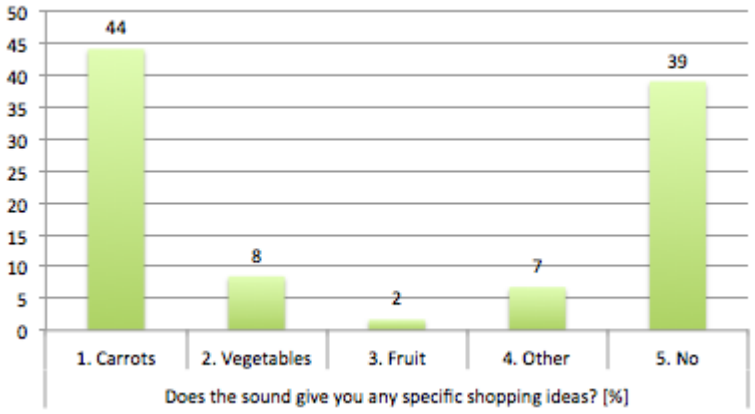


Figure 12. **Does the sound give you any specific grocery shopping ideas?** The answers are distributing the frequency between carrots, vegetables, fruit, other and no. The numbers are presented in percentages.

As illustrated in figure 12, 44% of the participants in the online questionnaire got the shopping idea of carrots after hearing the sound. When combining carrots, vegetables and fruit, the data suggests that 54% got the shopping idea of healthy food, while 46% answered they either got the shopping idea of something else or did not get any grocery shopping ideas. These findings indicate that the sound had a 54% chance of possibly having an effect on carrots/vegetables when being played at a supermarket, which was worth investigating. This was furthermore what this study seeked to investigate, in relation to the primary research question, "*to what extent can the sound of peeling, cutting and eating carrots increase the sale of vegetables in supermarkets*".

Table 3. **Elaborate, what specific shopping ideas?** The table is showing both positive and negative comments on what shopping ideas the respondents could have.

Positive comments	Negative comments
Yes, fresh vegetables and fruit! - Carrots, pepper, chili, cabbage, salad, apples, radishes, cucumber… Everything crispy, fresh, raw, healthy, colorful with antioxidants and vitamins. Now I want to eat more raw food.	The last part, where it sounds like a carrot being eaten, can lead the thoughts to how such looks and it made me wonder if I had any in the refrigerator. I will evidently say that the last sound could affect me more than the first.
Yes, carrots. Which already are already written on the shopping list ;)	Food, carrots, felt (in order to muffle the sounds from the first sound).
Carrots and vegetables/fruit in general. Candy, cake and meat cannot sound like that.	I do NOT get any need to buy apples or carrots or anything else crispy.

The positive comments from table 3 suggested that there were participants having their thoughts lead onto carrots or other vegetables in general. Whereas the negative comments were a mixture of the sound not leading to any grocery shopping ideas or again commenting on the first part of the sound, the peeling of a carrot.

The last part of the online questionnaire remained of general comments for the sound, which did not give much response, perhaps due to the question being voluntary to answer. However some feedback was given and one of the responses were worth highlighting: "*Exciting that you can use sounds to evoke one's urge to eat vegetables. At least the sound did that for me*".

5.2 Case study

The findings from the case study were providing an insight to the customers' vegetable buying behavior in REMA 1000, through both video observations and structured interviews. The video observations were recorded with a thermal camera in the fruit and vegetable section in REMA 1000, and were used to investigate the amount of time the customers spent at the fruit and vegetable scape and their activities, in order to track any changes during the phases *pre*, *primo*, and *medio* of the intervention. The structured interviews were made with the customers at REMA 1000 and were used to investigate who could be affected by the sound nudge, either the customer's planning to buy vegetables or customer's not planning to buy vegetables. Furthermore, the structured interviews were investigating who noticed the sound. The interviews were conducted in the phases *pre*, *primo*, *medio*, and *ultimo*.

5.2.1 Observation

In order to investigate the customer's buying behavior a video observation with a thermal camera was used. A total count of 2222 customers were observed during the three video observed phases, more specifically in *pre* (N=808), *primo* (N=766) and *medio* (N=648), with a distribution of 38% male, 51% female. 11% of the customers were categorized as unknown due to the thermal video footage making them difficult to identify. As mentioned previously in the coding section, the gender was identified by looking at posture, height, hair, and clothes.

Table 4. **Gender distribution in the phases**. The phases represented in the observations were *pre, primo*, and *medio*. The table is illustrated in percentages.

Phase	Male	Female	Unknown
Pre [%]	29	53	18
Primo [%]	42	51	7
Medio [%]	45	48	7
Total [%]	38	51	11

Table 4 illustrates that a few more females was identified at the *fruits- and vegetable-scape* of REMA 1000 than the males, however the males could be hidden in the unknown gender.

Figure 13 illustrates the time spent in the fruit and vegetable section of REMA 1000 distributed between the time intervals; 'X < 10 seconds', '10 seconds < X > 30 seconds', and 'X > 30 seconds'.

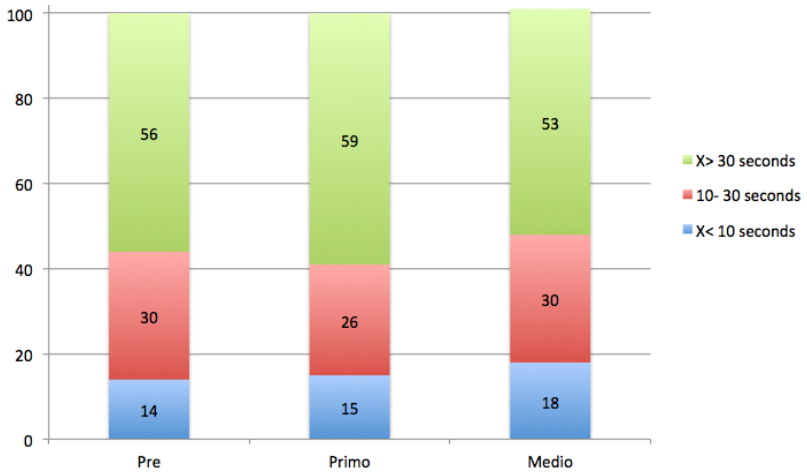


Figure 13. **Time spent in the fruit and vegetables section.** The three time intervals are distributed from the phases *pre, primo*, and *medio* and shown in percentages.

As Figure 13 illustrates the majority of customers spend more than 30 seconds in the fruit and vegetables section both in *pre* (56%), *primo* (59%) and *medio* (53%) respectively. Figure 13 of the time spent in the fruit and vegetable section in REMA 1000 shows no remarkable difference in the three phases.

Figure 14 illustrates the distribution of the customer's different activities from the fruit and vegetable section in REMA 1000.The activities were found by watching the video observation and using post-coding, and were categorized as; 'passing', 'looking/wondering', 'returning and grabbing', as elaborated in the previous section regarding coding. The customers could practice more than one activity when being observed, which explains how the percentage exceeds 100%.

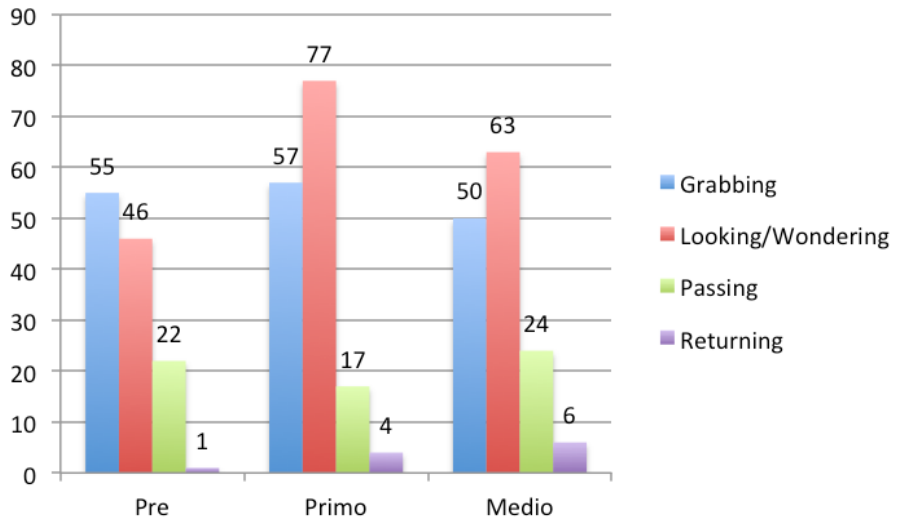


Figure 14. **Different activities in the fruit and vegetable section at REMA 1000.** The figure illustrates the distribution of the activities in percentages.

Figure 14 illustrates no apparent changes in the activities of 'passing', 'returning', and 'grabbing'. However the activity 'looking/wondering' increased from the phase *pre* (46%) to the phases *primo* (77%) and *medio* (63%). This change in activity of looking/wondering suggested that the customers were wondering about the sound nudge at the *fruits- and vegetables-scape* of REMA 1000.

These findings will contribute to answer the secondary research question: "*How can a thermal camera be used to track customer behavior in supermarkets?*"

5.2.2 Structured interviews

The findings of the structured interviews were used to gain knowledge of the customers at REMA 1000 and gain insight in order to explain the customer's behavior and how they perceived the sound nudge, by looking at the answers in general, and not the phases separately. The interviews were conducted in the phases; *pre*, *primo*, *medio*, and *ultimo*.

The total count of respondents in the interviews was 582 individuals distributed over *pre* (174), *primo* (165), *medio* (124) and *ultimo* (119). The respondents included 48% males and 52%

females between 18-85 years of age. The distribution of the respondents' occupation is shown in figure 15, and is correlated to the answers further down.

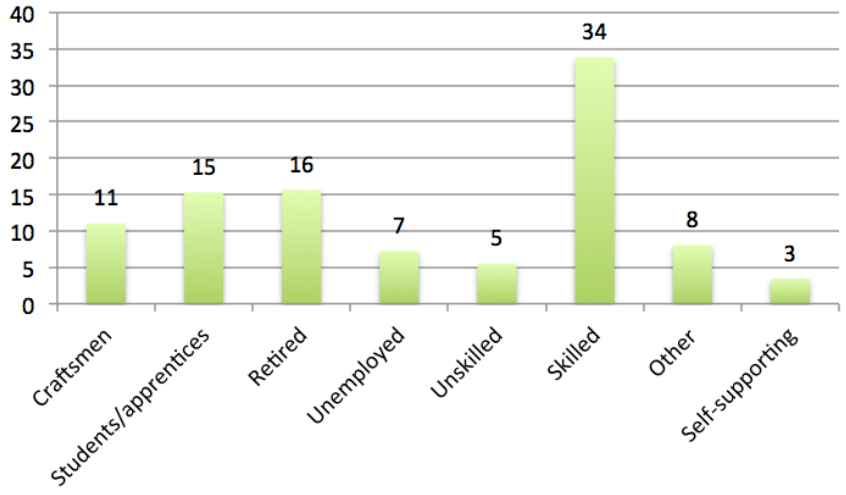


Figure 15. **Distribution of respondents' occupations**. The figure illustrates the distribution in percentages.

This study focuses on the respondents from three occupation groups; craftsmen (11%), unskilled (5%), and skilled (34%). These occupations were found to be interesting due to their opposing answers especially in noticing the sound, which will be elaborated on later in the findings. Figure 16 illustrates the answers of whether the customer's planned to buy vegetables before entering the supermarket.

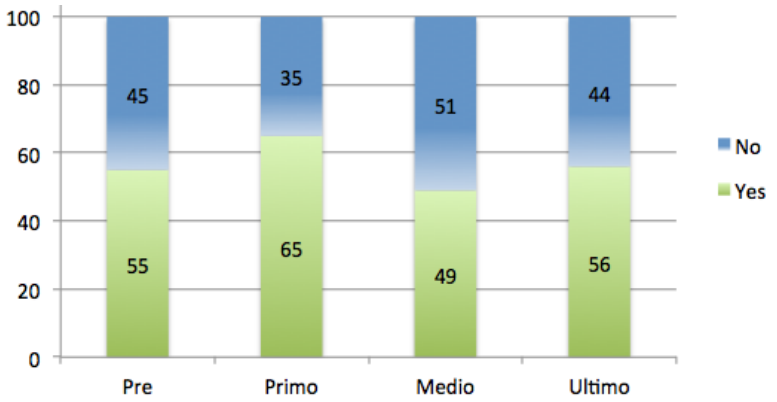


Figure 16. **Did you plan to buy vegetables?** The customers response to their intention of buying vegetables, presented in percentage over the phases; *pre, primo*, *medio* and *ultimo.*

As seen in figure 16, the response from the customer's plan to buy vegetables was approximately equal, with a slightly bigger representation of customers who planned to buy vegetables.

The customers *not planning* to buy vegetables mostly stuck to the plan of not buying any vegetables, however 13-22% bought vegetables anyways (the percentage can be seen appendix 9a). Those customers were subsequently asked *why* they did not plan to buy vegetables. The response was mostly due to having it at home already (32%) or due to a specific planned grocery purchase (26%) e.g. only diapers. 9% of customer's answered they were buying the vegetables elsewhere or later. An overview of all the answers to why they did not buy any vegetables can be found in appendix 9b. Nearly one third of those who *did not plan* to buy vegetables, but bought it anyway, were skilled (30%), while a smaller part of the craftsmen (20%) and unskilled (7%) bought vegetables even though they had not planned to. Half of the customers who bought vegetables even though they had not planned to, were female (50%). Further information on the gender distribution of who bought vegetables but did not plan to, can be found in appendix 9c.

The majority of those who had *planned* to buy vegetables were female (62%), and almost every customer who bought more than they had planned were female (85%) as well. Nearly half of those who had planned to buy vegetables were skilled (49%) and a minor part were craftsmen (7%) and unskilled (5%). As mentioned previously these three occupations were in focus as they distinguish themselves from the others.
The customers planning to buy vegetables were asked whether or not they stuck to their plan, almost half of those who bought more than they had planned were skilled (45%), and a small part were unskilled (10%), while no craftsmen had bought more than they had planned. For specific percentage-wise information on all answers from the interviews see appendix 9d.

After implementing the sound nudge in the supermarket, in *primo*, *medio* and *ultimo*, all the respondents were asked if they heard the sound played at the *fruits- and vegetables-scape* of the supermarket. In *primo* 5% noticed the sound. In the phase *medio* 13% noticed the sound and in *ultimo* 21% noticed the sound. The majority of those who noticed the sound were female (74%), and when looking at occupation, half of those who noticed the sound were skilled (49%), while there were no craftsmen (0%) or unskilled (0%) noticing the sound. This could indicate that

those getting affected by the sound were mainly skilled and female (see appendix 9e for an overview of all the answers in percentage).

Of all the customers noticing the sound it was interesting to investigate what they heard in the different phases. The answers to what they heard, were categorized using post coding, and are shown in figure 17.

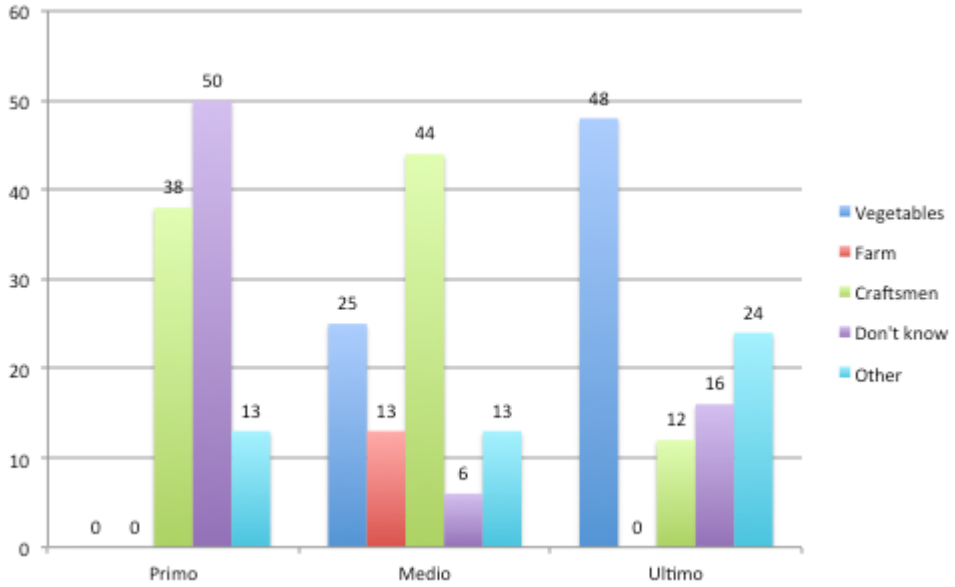


Figure 17. **What did the sound make you think of?** The different perceived sounds in the phases primo, medio and ultimo presented in percentage.

As seen in figure 17, in *primo* 38% answered that they heard the sound as craftsmen working and 50% either did not know or could not hear it good enough. In *medio* 25% noticed the sound as either vegetables or carrots as intended, and 13% heard the sound as farming sounds, e.g. grunting pigs. In *ultimo* 48% of the customer's heard the sound as vegetables/carrots.

The answers from the structured interviews will be used in the discussion in order to answer two of the secondary research questions: "*In what way can the sound of peeling, cutting and eating carrots be altered to affect the customer's buying behavior in supermarkets?*" and "*Which customer groups can be affected by the sound of carrots in supermarkets?*".

5.3 Intervention study

The findings from the intervention study will present the findings related to which degree the sound has been exposed to the customers at REMA 1000, and furthermore the changes in the sales of vegetables and carrots during the phases *pre*, *primo*, *medio*, *ultimo*, and *post*. As mentioned previously, the sales figures used in this study were confidential and will therefore not be presented. Instead an index 100 bar chart with indications of the significant differences combined with P-values will be presented to indicate an increase or a decrease in the sales figures of vegetables and carrots separately.

5.3.1 Sound Log

The sound log presents the number of times the sensor has been activated and therefore how many times the sound was played in REMA 1000. The sound was active in *primo*, *medio*, and *ultimo*. As seen in table 5 the sound "three sounds of carrots" was in *primo* played at a sound level similar to the supermarket's average noise level measured in decibel, and the motion sensor had a narrow trigger area. In *medio* the sound was added more volume with a similar trigger area as in *primo*. In the phase *ultimo* the sound was changed into only being "One sound of carrots", the volume were similar to *medio* and the trigger area had been broadened.

Table 5. **Triggering of the sensor**. The tables illustrated the number of times the sound has been activated and additional information of the intervention.

Phases	Sound log	Sound of carrots	Volume	Trigger area
Primo	16008	"Three sounds of carrots"	Average	Narrow
Medio	14915	"Three sounds of carrots"	Higher	Narrow
Ultimo	34317	"One sound of carrots"	Higher	Wide

As table 5 illustrates, the sensor was more than twice as active in *ultimo* with the count of 34317 times the sensor was activated in the *fruits- and vegetables-scape*. The broader trigger area suggested that the sound was reaching more customers than in the previous phases *primo* and *medio*, which can be seen in table XX. These findings were helpful in investigating the secondary

research question "*In what way can the sound of peeling, cutting and eating carrots be altered to affect the customer's buying behavior in supermarkets*" and will be elaborated on in the discussion of the findings.

5.3.2 Sales figures

The sales figures of vegetables and carrots were collected for 2016, which counts for *pre, primo, medio, ultimo* and *post*. The sales figures from the same period have been collected in 2015, to compare the patterns in both years, especially with considerations to the impact the holiday may have, in order to see whether the sound nudge had an effect. The sales figures from 2015 were collected similarly to 2016, taking the complexity of comparing weeks in a supermarket into account with e.g. the holidays falling on different weeks throughout the years.
First, the sales figures are presented for all the vegetables in REMA 1000, which have been modified into index-100 numbers, and secondly, the sales figures for the units of all carrots are presented.

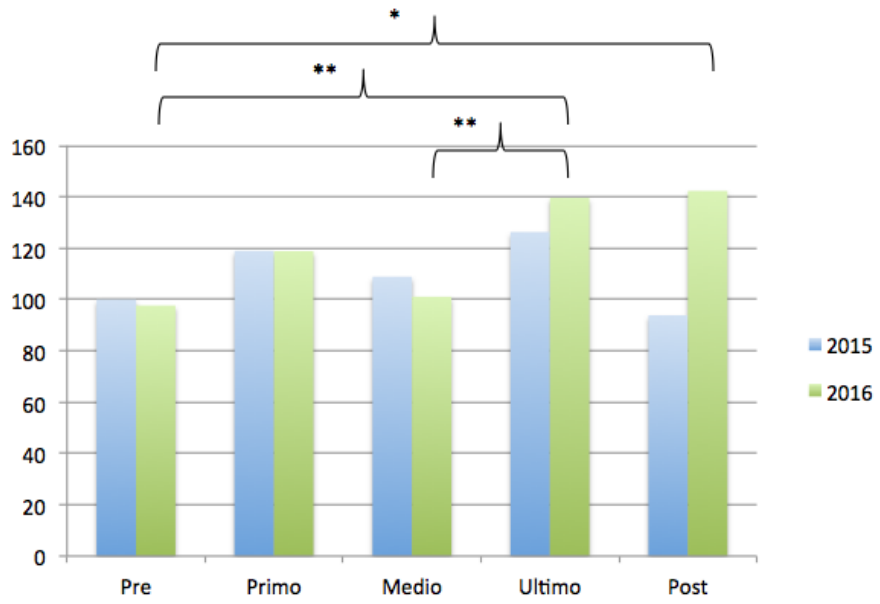


Figure 18. **Index 100 bar chart: Sales figures (Median) for all vegetables.** The bar chart illustrates the sales figures of all vegetables, which has been transformed into index 100 numbers (*Pre* 2015=100), and the significance between the different phases (* = P < 0,05 , ** = P < 0,01). The exact P-values can be found in appendix 10a.

As seen in figure 18 a significant increase in the total sale of vegetables was found between the phases *pre* and *ultimo (P = 0,001)*, *pre* and *post (P = 0,011)* and *medio* and *ultimo (P=0,007)* in 2016.
No significant differences were seen in either of the phases in 2015 in the vegetable sales. This could indicate that the sound "One sound of carrots" could have a positive effect on the sales of vegetables in REMA 1000.

After analyzing the total sale of vegetables it was interesting to see whether the sale of carrots had a significant difference due to the sound nudge.

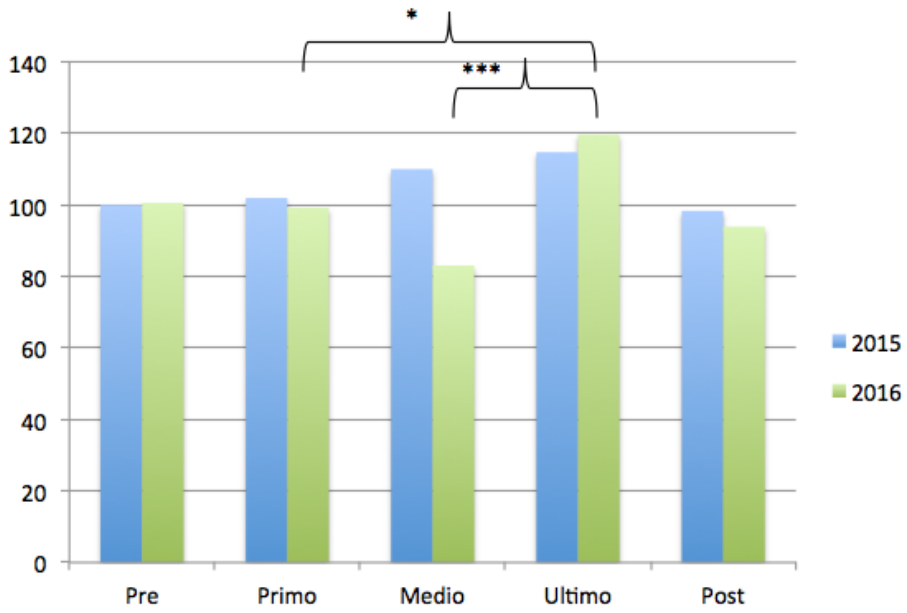


Figure 19. **Index 100 bar chart: Sales figures (Median) for all carrots.** The bar chart illustrates the sales figures of all carrots, which has been transformed into index 100 numbers (*Pre* 2015=100), and the significance between the different phases (* = P < 0,05 ; *** = P < 0,001). The exact P-values can be found in appendix 10b.

As presented in figure 19, a significant increase in the total sales of units of carrots was found between *primo* and *ultimo (P = 0,012), medio* and *ultimo (P = 0,000)* in 2016.
In 2015 there was no significant difference in the similar phases. This could indicate that the sound "One sound of carrot" had a positive effect on the sales of carrots, in between the phases. However, there was no significant difference from the baseline measurement *pre* in comparison with any of the other phases.

These findings will be used for explaining the primary research question: "*To what extent can the sound of peeling, cutting and eating carrots increase the sale of vegetables in supermarkets?*"

5.4 Summary of findings

The main findings from this study consisted firstly from the sound nudge development phase, where the sound was chosen and developed on. The sound chosen for this study was the sound of peeling, cutting and eating a carrot.
Secondly, the main findings from the case study consist of both findings from observations and from structured interviews. The findings of the activities at the *fruits- and vegetables-scape* suggested, more customers were looking/wondering in the *primo* and *medio*. From the structured interviews it was found the customers planning to buy vegetables and the customers that did not plan to buy vegetables, but bought it anyways were primarily female and/or having a skilled occupation. No craftsmen bought more than planned. It was found that the sound nudge was most noticeable in *ultimo*. As found from the sales figures, there was a significant difference in the sales of vegetables between *pre-ultimo* and *pre-post* towards an increased sale of vegetables. Furthermore it was found that there was a significant difference between *primo-ultimo* also indicating an increase in sales of carrots, and a significant difference in between *medio-ultimo* indicating an increase of carrot sales.

6. Discussion

The discussion is parted in three; findings, methods and policy implications seeking to answer the primary and secondary research questions.

6.1 Findings

The intervention at REMA 1000 was based on the sound nudge, which therefore were developed before the intervention took place. Therefore the sound nudge development will be discussed first as the sound and volume was changing through the intervention. Afterwards the findings throughout the phases will be discussed.

6.1.1 The sound nudge development

As previously mentioned, the sound chosen for the intervention at REMA 1000 was the sound of crunchy vegetables. As seen in figure 9 of the responses from questionnaire 1 included crunchy vegetables, nature/silence, sports, hospital, music, and other. In relation to the context of the intervention taking place at a supermarket, all the sounds were considered as possible solutions. However, first of all since the intervention were supposed to take place in a supermarket, the sound should fit into the context, and according to Ryan (1940) two or more sensory modalities cooperate in order to perceive everyday objects. At the supermarket the customers can both see, and touch the vegetables, and with the sound nudge they could furthermore hear everyday sounds of them. Of all the ideas from *questionnaire 1* the sound of crunchy vegetables had the possibility of affecting most of the senses rather than the remaining sounds. Second of all, the sound of crunchy vegetables was a more specific sound than e.g. sports or nature/silence, which were simpler to develop and measure.

After having chosen the sound of crunchy vegetables for further development, seven different vegetables or fruit were recorded by cutting, tearing, peeling and eating them. Out of the seven options the sound of carrots were considered the most appealing both due to having most different recorded sequences (peeling, cutting and eating), and due to carrots being less juicy to chew than the other recorded foods. Furthermore some of the other vegetables simply were too crunchy and were difficult to recognize by only listening to the sound.

The success criteria were that the respondent was able to identify either the peeling, cutting and eating of a carrot or all three sequences of the sound. 75% of the respondents heard the sound as being from carrots, meaning that the majority of the respondents were able to identify the sound as being either of carrots, which were the success criteria for using the sound in the intervention at REMA 1000. Furthermore 88% heard the sound as being of healthy food (incl. carrots, vegetables in general, and fruit), meaning that the sound were perceived as being related to healthy food, which in the end could affect the fruit and vegetable purchase in the supermarket. Furthermore, Kahneman (2013b) mentions that memories of experiences gives a sense of familiarity at makes you recognize it later. Hearing the sound of carrots being peeled, cut and eaten could give a sense of familiarity due to previous experiences from the kitchen. All three sequences of the sound of carrots were used as storytelling of how the carrots are prepared and

eaten and making it more recognizable what the sound were. Therefore it could suggest that the sound could trigger the respondents' memories and therefore could be influenced to purchase vegetables. The first sound developed for this intervention was called "Three sounds of carrots".

6.1.2 The case study and the intervention study at REMA 1000

This discussion will take departure in the sound and its development through the phases of the intervention with the findings of the case study and the intervention study in REMA 1000, ending with a discussion of the general findings.

6.1.2.1 Phase pre

This phase was used for collecting baseline sales figures and to video record observations while conducting interviews at REMA 1000 before implementing the sound nudge in the *fruits- and vegetables-scape* in the supermarket. Most of the customers in this phase were spending more than 30 seconds, which could indicate that the customers in the *fruits- and vegetables-scape* felt desired to stay and explore this area.
These findings represented the customer's normal shopping behavior.

6.1.2.2 Phase primo

The first intervention phase *primo* shows no change in the amount of time spent in the fruit and vegetable scape. This suggests that the first sound nudge of "Three sounds of carrots" did not affect the customers into being there longer, which could indicate that the sound either influenced the behavior of *approach* nor *avoidance*. However, the findings shows that the customers did tend to wonder/look more around, which could indicate that the customers were wondering of what sound they could hear in the fruit and vegetable scape triggering their *system 2* by making them wonder of a sound not being there usually. The intention of the sound was to activate the customer's *system 1* by making the sound underlying and making them act automatically on the sound. However, being presented for the sound at REMA 1000 for the first time may result in activating *system 2* by making the customer's reflect and wonder of the sound not being there usually and finding a memory to connect to the sound and later on making *system 1* adopt the sound. The customers have not yet before heard the sound in this context, however it might be a sound that is familiar to them, so the customers might need to grow accustomed to the

sound being played at REMA 1000. And therefore at a later point could be affected by the sound. Another reason for why the customers were looking/wondering more than the previous phase, could also be explained by the observation being made on a payday, meaning that the customers potentially were browsing more due to larger purchasing. However, it did not affect the sales significantly.

Of the 5 % hearing the sound, most of the customers did not know what they heard, or heard it as craftsmen working. This shows that the first sound "Three sounds of carrots" did not trigger the memory of vegetables, so the sound did not work as intended. A reason for why the customers heard the sound as craftsmen could be explained by the presence of craftsmen in the supermarket, due to the construction site surrounding the area. These findings correspond with the statistical findings, as there was no significant increase in the sales from *pre* to *primo* in either the sales of all vegetables or the carrots.
It can be speculated that the sound level was too low to notice and in addition, the customers did not hear the sound simply because they did not expect it to be present. The decibel (DB) measurement was made in a single moment in time and the sound level might have been different than when conducting the structured interviews, however the sound was designed to be heard subtlety, at the moment when measuring DB level it could be heard. The sound level being subtle was also due to considerations of the staff not being annoyed by the sound during their working hours.

6.1.2.3 Phase medio

The sound "Three sounds of carrots" was played at a higher volume, with the intention of making it more noticeable for customers. The amount of time spent in the *fruits- and vegetables-scape* were not slightly different than the previous phase. There was a decrease in customers looking/wondering in this phase, which could be explained by the customer's *system 1* taking over starting to recognize the sound at the *fruits- and vegetables-scape*. As previously mentioned, *system 2* needs to connect the sound to a memory in order to act automatically on it. Acting automatically on a nudge can in this case also be connected to priming, meaning that the sound can trigger a memory that in the end can lead to action. *System 2* also believes it is in total control over its actions and does think it can be affected by priming, but the mind can be tricked which a

customer expressed by reflecting on having bought a vegetable that was not planned. However, according to the findings from the interviews in REMA 1000, the customers could still not identify the sound being played as carrots. Only 13% of all interviewees noticed a sound in the *fruits- and vegetables-scape*. Most of the customers heard it as working craftsmen, this could indicate that the sound was triggered with a delay. Meaning that the customers could have exited the area before all the sequences of the sound were played and the first sounds might have sounded like craftsmen due the storytelling of the sound not coming to justice. This could explain why there was no significant increase in the sales, from *pre* to *medio*, though the findings from the interviews shows that there has been an improvement in how the sound was perceived. Furthermore, the findings from the interviews were contradictory to the observations, this could be explained by the sampling method, and that the interviewed customers not necessarily entered the *fruits- and vegetable- scape.* Since the sales did not increase and most of the customers could not identify the carrots, could be explained by the *halo effect*. According to this, the sequence in which something is presented for the customer, matters. As the sound "Three sounds of carrots" sequence consists of three different sounds, it could be speculated that the customers only responded to the first part of the sound being played. This may correspond to the findings from *questionnaire 2*, where most of the participants could identify the last sound better than the other two, and they thought the last sound was more pleasant as well. Therefore the first two parts of the sound "Three sounds of carrots", being peeling and cutting carrots, were removed. The remaining part of eating a carrot was therefore used and was called "One sound of carrot".

6.1.2.4 Phase ultimo

The condition of broadening the motion sensors trigger area and only playing the sound "One sound of carrot", resulted in 21% customers hearing the sound. Of those, most customers heard it as intended, like crunchy vegetables. This indicated that "One sound of carrot" was easier for the customers to recognize in the supermarket, and may suggest that the *halo effect* should be considered, as the sequence matters. It might have been easier to distinguish from the background noise, and the sound of eating a carrot might be more recognizable than the sound of peeling or cutting a carrot. Therefore this sound could have affected the customer's *system 1* making them act automatically on the sound. Furthermore the customers might have affected

each other, by one of the customers seeing another customer grabbing vegetables might leave them compelled to do what they think others may think was expected of them. In this case it could have been the thought of buying vegetables. This effect on the customers is known as the spotlight effect. No video observations were available in this phase, however, it can be speculated that there was a change in the behavior of the customers' activities towards more grabbing and looking/wondering, due to the sound potentially having an effect on the sale of vegetables.

The findings showed a significant increase in the sales of all vegetables from the baseline *pre* to *ultimo*. Furthermore, a significant increase in the vegetable sales was found from *medio* to this phase *ultimo* as well. These statistical findings correspond with the findings from the interviews, and it could therefore suggest that the sound of a crunchy vegetable, in this case eating a carrot, could increase the sales of vegetables. Furthermore, the trigger area had been broadened which also could explain the significant change in the sales of vegetables, since the sound was triggered more than in the previous phases. The change in the sales could also not be ruled out to be caused by sales offers of vegetables. With those factors in mind, there was tested for any significance in 2015 within the sales of vegetables over the same phases, and no significance was found in either of the phases. This could back up the findings of the sound actually having an effect on the increased sales of vegetables, due to the same factors in all probability were present in both years.
In addition, it was interesting that the sales of carrots had a significant increase as well, which seems to justify that the customers could associate the sound with a carrot, and possibly could trigger their memory to change the customer's behavior. However, no appreciable differences in the sales of carrots were found. Only a significance between *medio* and *ultimo* were found slightly more appreciable. Due to the difference not being found in the previous year in between the phases it could indicate that the change in sound could have an effect on the sales of carrots.
All this provides a great indication that the sound "One sound of carrot" had an effect on increasing the sales of vegetables and possibly the carrots as well, however it is only tested in one specific supermarket. With factors of a *foodscape* possibly affecting the findings in mind, such as staff, other customers and choice architecture. The findings of the sound nudge intervention, suggests that when looking at the same period the previous years it could indicate that the increased sales of vegetables was due to the sound nudge.

6.1.2.5 Phase post

The findings suggested there was a statistically significant increased sale of vegetables from *pre* to *post*. It can be assumed that it was the sound nudge having affected the customers into buying more vegetables, and the *spotlight effect* further affecting the customers into buying more vegetables. It could furthermore be explained by the sales offers of vegetables. However, findings from 2015 did not have any statistically significance, therefore it is assumed it was due to the sound nudge.

6.1.2.6 General discussion of the findings

Out of the asked customers that did not plan to buy vegetables most customers stuck to the plan of not doing so. It could be due to them not attending the *fruits- and vegetables-scape* where the sound was playing. Therefore they were supposedly never exposed to the sound nudge and therefore could not be affected by it. However, a few of the interviewed customers that did not plan to buy vegetables bought it anyways. Most were with a skilled occupation, meaning they had a university degree or a university college degree. This group of customers was potentially affected by the sound since they did not plan to buy vegetables but ended up doing so anyway. Of the customers who ended up buying vegetables, most were either female or skilled. No craftsmen planning to buy vegetables bought more than planned. Of the interviewed customers hearing the sound, most were female or skilled. No craftsmen or unskilled customers heard the sound.
All of the findings from the interviews corresponds with the presented assumption that the ones who were going to be affected by the sound nudge, would be skilled, as they are the ones who adapt to health campaigns, and equally the unskilled who would not get affected as much (Christensen et al. 2010; Groth & Fagt 2003).
Lastly it should be mentioned that the interviewed customers not buying any vegetables but either having it already or having an intention to buy it later could potentially be affected by the sound nudge as well, because they intend to enter the *fruits- and vegetables-scape* at a later point than at the time of the interview.

Since REMA 1000 was seen as a *foodscape*, meaning that REMA 1000 aside from selling food has a staff providing a service for the customers. The staff could potentially also affect the customers into buying more vegetables, which can be described as *priming*, if the staff would ask into the

customers' vegetable buying behavior. A simple question could potentially affect the customers' vegetable buying behavior. The staff explaining about this intervention to curious customers could also have affected the buying behavior.

The discussion of the findings suggests that there is a need for further research within this field of using a sound nudge to increase the sales of vegetables and to which customer groups can be affected by it. This is due to the complexity of a *foodscape*, the changes in sales offers and the fact the sound was placed in such a way that not all customers were exposed to the sound and that the supermarket was placed in a construction site.

6.2 Methods

This section will discuss the strengths and weaknesses of the methods used in this study.

6.2.1 Pragmatism and Mixed methods

The philosophy of social constructivism was used as a guiding tool of interpretation in order to understand the statements of the participants in the structured interviews and to evaluate further development of the sound. REMA 1000 is a social construction, a particular context different from the one at home or the one at work. Considering this paradigm in correlation with the theoretical framework, have provided guidance that has been useful in order to change the customers' behavior. As an example, the customers shopping at REMA 1000 might affect each other, which previously was mentioned as *the spotlight effect*. This can furthermore be seen as socially constructed, as increased sale through the ideology of *the spotlight effect* might be the reality that works in REMA 1000, but it might not work in another supermarket.
The reason for using mixed method in this study was that quantitative methods and qualitative methods contribute with separate advantages, and contribute to triangulation that could strengthen this study. First of all, the study consisted of the sales figures used for investigating the sales changes through the phases. Second of all, observations and structured interviews was used to understand the customers behavior. With these different aspects of how the sound nudge intervention affected were contributing to triangulation and therefore strengthening this study. As the pragmatic approach and mixed method seemed to be coveted by the researchers

presented in this study, it does also have its disadvantages. The most crucial is that, for each method, it should be considered that it could be time consuming. It could be argued that using one methodological approach might be less time consuming, though it would only provide either breadth or depth to the investigation as for example only using the sales figures to investigate how the sales figures would change through the intervention phases. However, in mixed method, when time is limited, the advantage of this approach could potentially fade, as it can be time consuming to obtain the same thoroughness as if using only one.

6.2.2 Action Research Cycle

The framework of the action research cycle provides an ongoing evaluation. However it could be argued that other cyclical methodological frameworks would have provided the same benefits, but by having two simultaneous studies (case study and intervention study), this framework seemed to be sufficient. As mentioned, this action research cycle was used as inspiration, as action research seeks knowledge of the context and hereby use that knowledge to change the context, as this study did. In addition to this, it should be noted that doing action research means researchers collaborating with practitioners. In this study the practitioners would be REMA 1000, and the researchers would be the authors. Even though REMA 1000 did participate in the intervention, they did not take an active part in creating it. It could however have been beneficial to take the course by involving them even more and letting them partake in the solutions and progress of the intervention as action research points to.

6.2.3 Development & Placement of the Sound nudge

The development of the sound nudge was made by the use of two questionnaires, which for this study was found as being sufficient for the purpose of testing the sound in a supermarket. Due to the context of a supermarket, the obvious sound to develop was the sound of crunchy vegetables. However the responses of *questionnaire 1* indicated several other suggestions on different sounds to test. These other responses could be interesting to test in a supermarket as well, or maybe in other settings in order to investigate their potential effect on people. However, due to the limitation of time it was only possible to test one theme of sound in this study, though it could be interesting to investigate further.

After developing the sound, it was exposed to potential customers, and feedback on the sound was provided. In order to make the sound more realistic to experience for the potential customers, it could have been considered to add natural sounds from the supermarket environment, e.g. customers talking, staff restocking, and till sounds. Therefore it could be argued that the respondents were not in the mode of being a customer. These additions to the sound could have provided a more real feedback before implementing the sound in REMA 1000. Furthermore, it could have been beneficial to test the sound under controlled conditions, putting more emphasis on the development of the sound. Setting up an experiment with the different sounds, under strictly controlled condition, before implementing the sound in uncontrolled conditions. It could also have been beneficial to test the three different sound nudge separately at three different supermarkets in order to exclude the potential effect the sound nudge could have had on among the phases.

According to Ryan (1940), it is beneficial to combine more sensory cues in order to affect and stimulate a certain action, which is why the sound was placed near the carrots in the *fruits- and vegetables-scape*. However it was possible for customers to enter REMA 1000 without entering the *fruits- and vegetables-scape* as seen in figure 6. Therefore it could have been interesting to place the sound and the motion sensor elsewhere as for example near the entrance so all customers were exposed to the sound. The entrance area included fruit and vegetables and other food and non-food groceries as well. It can be speculated that the sound could have a positive effect on sale of vegetables there as well.

However, the sound setup limited our possibilities to affect every customer, due to REMA 1000's décor.

6.2.4 The equipment

As just mentioned, the sound equipment setup had some limiting factors. As marked on the map in appendix 5b the sensor had a range limit in which it could capture movement, and the speakers had a limit of volume it could produce. However, the most crucial limitation of the equipment, in this study, was that the speakers only could be placed one meter away from the single-chip-computer. This limited the distance in which the sound could be heard by the customers, as it would only be played within a certain range, and the further the distance away

from the speakers, the more the sound faded into being very subtle background noise. Extending the cable for the speakers would have made it possible for the sound to be spread into a wider area having a more mellow sound, rather than having the speaker being placed side by side concentrating the sound at that spot. However, by extending the cables, it would limit the amount of power that would be able to run through and the speakers had not been able to play the sound. The sound equipment did not require any further activation after it had been programmed to be active from 8 AM until 9 PM, so it ought to be self-functioning. As this was the case, it did not require daily checkups throughout the sound nudge intervention. It was however once experienced, when the equipment required a re-programming, that the equipment was missing power, due to the power cord was unplugged from the power supply and the sensor had been covered somehow. These obstructions could possibly have been prevented by being present at all times, though it would be very time consuming and the presence of the researchers could possibly manipulate the research by the customers being aware of the observation and might act accordingly.

6.2.5 Observations

Using a hidden camera in order to observe the customers is advantageous, hence the interference from the researcher is non-existent, and the customers will thereby act like they usually do in this context (Bjørner 2015a). Furthermore, using a thermal camera considers the privacy issues there might be, when recording people who are unaware. Privacy consideration may often be the biggest issue when researchers want to use recordings in public places, and using a thermal camera can be helpful (Gade 2014), but there are some limitations. In this study, the functions of the thermal camera enabled manual tracking of the customers' movements within the *fruits- and vegetables-scape*, how much time they spent, their activity and to some extent identification of gender and age. However, there were some difficulties getting this information, due to the thermal imaging, which made it impossible, in some occasions, to identify the gender in the recordings. As the thermal camera records by using temperature, it was only possible to see the silhouettes of the customers as seen in appendix 11. Moreover, as the fruits and vegetables generate no noticeable heat, they faded into the surroundings, which made it nearly impossible to identify the product, and therefore difficult to observe which products the customers chose. In

addition to this, the thermal camera had several configurable options, to adjust the quality of the picture. During the recordings it was found that improving the quality and brightening the picture required a large storage device. The thermal camera was configured and tested before it was used to record in *pre*, but the camera had a preconfigured focus-point, which resulted in the surrounding being darkened if the focus spot were capturing any heat at that particular spot. This complicated the identification of the customers in *pre*. The focus-point was adjusted and the quality got improved in the remaining phases. However, the intention of using the video observations at the same time as the structured interview was spoiled in the last phases, due to the quality improvement of the video recordings. This change caused the already recorded data to be overwritten. Therefore the observations were forced to be used at a different time than the interviews. These difficulties with the thermal camera could possibly have been determined beforehand by conducting a pilot study under controlled conditions. This could furthermore have helped by getting more familiar with the equipment, when doing the intervention at REMA 1000. However, using a regular video camera could also have been sufficient, due to customers being informed about being observed by surveillance cameras from REMA 1000 as theft protection. Using a regular video camera would have made it easier to identify gender, age and record their immediate reaction when they were getting exposed to the sound nudge. However, the thermal camera could be useful if the single purpose was to track movement and patterns. Using a regular camera could have provided more precise information on gender and age, facial expression, eye and head movement, choice of product and whether they carried a shopping list, or any reaction, which could have been analyzed in correlation with the other data. In this study, the thermal camera (Axis Q1922) was used with considerations on privacy issues in order to get anonymous recordings. The company making this camera has several partners offering software with different purposes, such as customer tracking, but only to newer camera models. However, it is possible to use the Axis Q1922 with secondary software, that is used to process the recordings into informational grid charts that will illustrate where and how often the subjects move, as shown in appendix 12. Though it is very time consuming, as you may only track one individual at the time, frame by frame. Additionally it requires that the placement of the camera, allow sight of the surface of which the individual move (Nielsen 2014). Real-time tracking using a thermal camera is however under development (Gade 2014).

The placement of the camera presents another issue, when using it in this particular REMA 1000. The spatial architecture and placements of shelves in REMA 100 made it difficult to use this type of camera, as it could not be raised high enough to get the grid overview of all the customers, making it possible to track the customers automatically. However, it may be beneficial in hypermarket, where the limit of the ceiling is extended.
There are some alternative camera technologies, using a 360-degree lens, and in combination with certain software is able to identify humans and capable of tracking their movement automatically, in real-time, which could be used in REMA 1000.
The technical limits and advantages of the thermal camera have been presented, that may argue for a better solution to this study. However, besides what the camera was intended to do, some technical difficulties did occur during this study that caused a loss of data, that may or may not have happened, using a regular camera that was more user-friendly and familiar.

6.2.6 Interviews and sampling

The structured interviews in REMA 1000, were performed behind the checkout aisles, where to customers had just purchased their goods, taking the *mere-measurement effect* into considerations, as the customers' purchase could be affected by the interview. The selection of participants, using convenience sampling, provided this study with a large amount of data. However, when conducting the interviews with this sampling approach, customers not entering the *fruits- and vegetables-scape* were also included. This sampling approach, including everyone available, even those who did not enter the sound nudge area, may have caused an unreliable outcome of whether the sound could be noticed or not. A more careful selection that only considered those who were spotted in the *fruits- and vegetables-scape*, could possibly have strengthened the development of the sound, due to more feedback from those, who actually got exposed to the sound nudge.
In relation to data collection and data interpretation, there was an important point to be made in relation to the validity and reliability of this study. Even though precaution have been made in order to strengthen the reliability of the study, it was difficult to exclude the bias of human involvement, as this study did consist of two different individuals. The tone of which the questions were asked could be different, and it also depended on the customers and how they

seemed to react to being approached. Furthermore, the procedures in processing data, some information could have been different. Even though schemes and instructions were agreed upon, there could have been slightly different procedures affecting the analysis, such as the interpretation of the customers' actions and descriptives in the video observations.

Using the approach of convenience sampling was important to take into consideration when analyzing the data, since this type of sampling only provides information from participants being present from the time of the data collection (Bjørner 2015a). As the reasons for why the customers did not buy vegetables, included that they would buy it later, already had it at home, were at work or school, one could speculate that there might have been a correspondence between these answers and the time that the interviews took place. The interviews took place between 9 AM and 12 AM, hence it was considered, due to a conversation with the manager of REMA 1000 that the customers shopping in that timespan would be more willing to participate, as the majority would not be in a rush to get home after work. However, it should be mentioned that changing the timespan was considered, to a time where people were shopping for dinner, though the reasoning for doing this seemed unnecessary, as the customers shopping before noon possibly could be the target-group for this study as well. It would have been optimal if the interview and the observations had been collected at the same time span, as it was intended, hence it would give a snapshot of that particular moment. However, due to the technical issues with the thermal camera it was not possible in this study. Furthermore, the structured interviews could with benefit have been analyzed similar to the observations, to see the differences in responses during the intervention phases in order to be compared to the findings from the observations. It was however, not possible due to differences in coding observations and interviews.

6.3 Policy implications

Previous initiatives have been promoting health by increasing the general knowledge of the public (Asbjørn 2009; Fødevaredirektoratet 2003). Viewing the initiatives in isolation has been insufficient (Nielsen et al. 2016). This study seeks to add to people's already existing knowledge of healthy eating behavior, focusing on vegetables, by triggering their memories towards

vegetables. As the population is familiar with the '6 á day campaign', this study used that knowledge as a basis for acting upon the sound nudge, which presumably could remind them about previous experiences from the kitchen or elsewhere, and specifically with vegetables. Previous research (Hynes & Manson 2016) found that everyday sounds affects customers. The sound of crunchy vegetables can be considered an everyday sound according to the answers from *questionnaire 2*, which is confirmed in this study as the sound nudge had an effect on the sale of vegetables. Furthermore, Wansink (2014) found that longer time spent in the aisles increased the sales from that particular area. It is assumed that the customers in the *fruits- and vegetables-scape* spent longer time in the area, as there was an increase in sales of vegetables. However, due to missing data it could not be confirmed that the increased sales was due to spending more time in the *fruits- and vegetables-scape*.

The presence of the sound nudge in a *fruit- and vegetables-scape* could contribute to one of the themes in REMA 1000's CSR strategy "the healthy family". This study shows that exposing people to the sound "One sound of carrot", contributed to an increase in the sales of vegetables. This could furthermore indicate a general increase in sales at REMA 1000, which not only benefits REMA 1000, but also if other supermarkets implemented the sound nudge it might benefit them as well. An increased sale is in the interest of supermarkets, especially if this is done by promoting the health of the general public. More vegetables bought could imply more availability of vegetables for the population and therefore a higher intake of vegetables in general; meaning that this sound nudge initiative might contribute to the population meeting the daily vegetable intake requirements. According to EUFIC (2012) lack of availability of vegetables could be a cause for less consumption. Promoting a healthier eating behavior also has implications for policy makers in the country, as this may contribute to a decrease in the prevalence of health related diseases. As aforementioned, there has been a change in governance towards *new governance*, which focuses on how the public and the private sectors have become more equal in how they influence society. REMA 1000 and most other supermarkets, have, as private actors, incorporated a CSR strategy. A key point in using a CSR strategy is how it is communicated to the general public. If REMA 1000, looking forward, can increase focus on communicating that they are promoting the healthy choice as the easy choice, and continuously enhance the experience in their *fruits- and vegetables-scape*, this may affect the shopping behavior, as this study shows. In addition, feeling healthier might improve *long-term loyalty*, as of today's focus on health and

being healthy. Klein & Dawar (2004) found that there is a correlation between CSR strategies and competitiveness among supermarkets. REMA 1000 in Carlsbergbyen has been successful in this regard, as they were awarded "the best REMA 1000 in Denmark 2014" (Vesterbro-nyt 2014). Awards could increase *competitiveness*, as winning an award becomes a promotion for the supermarket and could keep them busy in wanting to become frontrunners of doing CSR. This promotion could presumably increase the *long-term loyalty* of the customers as the environmentally and socially aware, due to customers presumably wanting to shop quality products being best for themselves and the environment (Mollah 2014). This study can potentially be used as a strategy in promoting the supermarket in its effort to make the healthy choice the easy choice and make it a frontrunner in using new innovative strategies, such as using sound nudges to influence customers towards a healthier shopping behavior. However, more research within the field of sound nudging is needed.

7. Conclusion

This study tested three different sound compositions in a *fruits- and vegetables-scape* at a supermarket. The sound "One sound of carrot" had an effect on customer behavior. The effect could be a consequence of the increased sound volume of the sound nudge, assuring that more people heard it. In addition, simplifying the sound to consist of only eating a carrot may have made it easier for people to recognize and put it in context, as well as hearing all of the sound before exiting the *fruits- and vegetables-scape* before exiting the *fruits- and vegetables-scape*. It could also be a consequence of the sound being triggered more often at a larger area.
No changes were found in the observations in the intervention phase that had the best effect on the customers, due to technical difficulties with the thermal camera. It can be useful when doing anonymous observations and if the setting allows the camera to be placed high. Being familiar with the equipment is a necessity, therefore doing a pilot study could be beneficial.
The customers in the supermarket most affected by the sound nudge were primarily those who adapts more easily to health- and information campaigns, such as customers with a university degree or a university college degree. Females were also more affected than males, which could be due to them being more into health. Which correlates with Christensen et al. (2010) and Groth & Fagt (2003).

Finally, a statistical significant increase in the sale of vegetables was found during the phase with "one sound of a carrot". However this might not only be due to the sound. The intervention was in a natural setting, in a supermarket, and other factors could influence sales, such as special offers, *the spotlight effect*, and staff affecting the customer behavior. These factors were taking into considerations, by investigating the sales figures from the previous year, where no statistical significance was found. Since this study indicates the sound nudge's effect on the increased sales of vegetables, further research within this field of using sound nudging is needed to fully understand its significance.

8. References

Asbjørn, M., 2009. Kampagner måles på kendskabet. *Bjerg Kommunikation*. Available at: http://kommunikationsmaaling.dk/artikel/kampagner-males-pa-kendskabet/ [Accessed May 12, 2016].

Becker-Olsen, K.L., Cudmore, B.A. & Hill, R.P., 2006. The Impact of Perceived Coporate Social Responsibility on Consumer Behavior. *Journal of Business Research*, 59, pp.46–53.

Besley, T. & Ghatak, M., 2007. Retailing Public Goods: The Economics of Corporate Social Responsibility. *Journal of Public Economics*, 91, pp.1645–1663.

Biltoft-Jensen, A. et al., 2015. *Potentiel effekt af at spise Nøglehulsmærkede produkter*, Søborg.

Bitner, M.J., 1992. Servicescapes: The Impact of Physical Surroundings on Customers and Employees. *Journal of Marketing*, 56(2), pp.57–71. Available at: http://www.jstor.org/stable/1252042.

Bjørner, T., 2015a. Data Collection. In H. Persson, ed. *Qualitative Methods for Consumer Research*. Latvia: Livonia Print, pp. 57–94.

Bjørner, T., 2015b. Reporting. In H. Persson, ed. *Qualitative Methods for Consumer Research*. Latvia, pp. 107–112.

Bjørner, T., 2015c. Research design. In Henning Persson, ed. *Qualitative Methods for Consumer Research*. Latvia, pp. 17–56.

Boch, A., *Obesity Governance - D4 Literature review*, Oslo.

Bryman, A., 2012a. Research Designs. In *Social Research Methods*. New York: Oxford University Press Inc., pp. 44–78.

Bryman, A., 2012b. Sampling. In *Social Research Methods*. New York: Oxford University Press Inc., pp. 183–207.

Bryman, A., 2012c. Structured interviewing. In *Social Research Methods*. New York: Oxford University Press Inc., pp. 208–230.

Bryman, A., 2012d. Structured observation. In *Social Research Methods*. New York: Oxford University Press Inc., pp. 267–287.

Bryman, A., 2012e. The nature of quantitative research. In *Social Research Methods*. New York: Oxford University Press Inc., pp. 159–182.

Cambridge University Press, Cambridge dictionaries online. Available at:

www.dictionary.cambridge.org/dictionary/english/party [Accessed June 1, 2016].

Christensen, C.B. et al., 2010. Sund livsstil – hvad skaber forandring ? , pp.1–102.

Creswell, J.W., 2007. Philosophical, Paradigm, and Interpretive Frameworks. In *Qualitative Inquiry & Research Design - Choosing among Five Approaches*. California: SAGE Publications, inc, pp. 15–34.

Dahlager, L., 2015. Børnefamilierne spiser næsten ingen grøntsager. *Politiken*. Available at: http://politiken.dk/mad/ECE2648661/boernefamilierne-spiser-naesten-ingen-groentsager/ [Accessed May 12, 2016].

David, M. & Sutton, C.D., 2004a. Collecting and Coding Data. In *Social Research*. London: SAGE Publications Ltd, pp. 175–186.

David, M. & Sutton, C.D., 2004b. Ethnography and Case Study Research. In *Social research*. London: SAGE Publications Ltd, pp. 101–114.

Denscombe, M., 2010a. Mixed Methods. In *The Good Research Guide - For small-scale social research project*. Berkshire: Open University Press McGraw-Hill Education, pp. 137–152.

Denscombe, M., 2010b. Writing up the research. In *The Good Research Guide - For small-scale social research project*. Berkshire: Open University Press McGraw-Hill Education, pp. 308–328.

Doane, D. & Abasta-Vilaplana, N., 2005. The Myth of CSR. *Stanford Social Innovation Review*, pp.23–29.

Dolphijn, R., 2004. Intruduction: Talking Food. In T. Lorenz, ed. *Foodscapes: Towards a Deleuzian Ethics of Consumption*. Delft: Eburon Publishers, pp. 12–31.

Du, S., Bhattacharya, C.B. & Sen, S., 2007. Reaping Relational Rewards from Corporate Social Responsibility: The Role of Competitive Positioning. *International Journal of Research in Marketing*, 24, pp.224–241.

EUFIC, 2012. Fruit and vegetable consumption in Europe – Do Europeans get enough? *European Food Information Council Review*, pp.1–7. Available at: http://www.eufic.org/article/en/page/RARCHIVE/expid/Fruit-vegetable-consumption-Europe/.

Filho, J.M. de S. et al., 2010. *Strategic Corporate Social Responsibility Management for Competitive Advantage*, Available at: http://search.proquest.com/docview/1448424649?accountid=8144.

Flyvbjerg, B., 2006. Five Misunderstandings About Case-Study Research. *Qualitative Inquiry*, 12(2), pp.219–245.

Forskningscenter for Forebyggelse og Sundhed, Aalborg Universitet & Steno Diabetes Center A/S, 2016. *Sundhed og Lokalsamfund – SoL*, Frederiksberg.

Fødevaredirektoratet, 2003. *6 om dagen - Spis mere frugt og grønt*, Available at: http://www.foedevarestyrelsen.dk/Publikationer/Alle publikationer/2003201.pdf.

Fødevarestyrelsen, 2013. De officielle kostråd [The official dietary advice]. , pp.1–28.

Gade, R., 2014. *Taking the Temperature of Sports Arenas*. Aalborg University.

Groth, M.V. & Fagt, S., 2003. *Kvinder og mænds sundhedsbevidsthed 1995-2001*,

Harris, A. et al., 2006. The Use and interpreatation of Quasi-Experimental Studies in Medical Informatics. *J Am Med Inform Association*, 13(1), pp.16–23.

Hynes, N. & Manson, S., 2016. The sound of silence: Why music in supermarkets is just a distraction. *Journal of Retailing and Consumer Services*, 28, pp.171–178. Available at: http://www.sciencedirect.com/science/article/pii/S0969698915300849.

Jørgensen, M.S. et al., 2012. *Obesity Governance - D8 Evaluation of Best Practices*, Aalborg.

Kahneman, D., 2013a. A Machine For Jumping to Conclusions. In *Thinking, Fast and Slow*. New York: Farrar, Straus and Giroux, pp. 79–88.

Kahneman, D., 2013b. Cognitive Ease. In *Thinking, Fast and Slow*. New York: Farrar, Straus and Giroux, pp. 59–70.

Kahneman, D., 2013c. The Associative Machine. In *Thinking, Fast and Slow*. New York: Farrar, Straus and Giroux, pp. 50–58.

Kahneman, D., 2013d. The Characters of the Story. In *Thinking, Fast and Slow*. New York: Farrar, Straus and Giroux, pp. 19–30.

Kahneman, D., 2013e. The Lazy Controller. In *Thinking, Fast and Slow*. New York: Farrar, Straus and Giroux, pp. 39–49.

Kirkwood, B.R. & Sterne, J.A.C., 2003. Basics. In F. Goodgame, V. Pinder, & K. Moore, eds. *Essential Medical Statistics*. Massachusetts: Blackwell Science Ltd, pp. 3–30.

Klein, J. & Dawar, N., 2004. Corporate Social Responsibility and Consimers' Attributions and Brand Evaluations in a Product-Harm Crisis. *International Journal of Research in Marketing*, 21, pp.203–217.

Lake, A.A. et al., 2010. The foodscape: Classification and field validation of secondary data

sources. *Health and Place*, 16(4), pp.666–673. Available at: http://dx.doi.org/10.1016/j.healthplace.2010.02.004.

Lam, S.Y., 2001. The Effects of Store Environment on Shopping Behaviors: A Critical Review. *Advances in Consumer Research*, 28. Available at: http://www.acrwebsite.org/volumes/display.asp?id=8468.

Lidl, Gå efter duften. Available at: http://www.lidl.dk/da/laekkert-brod-i-Lidl.htm [Accessed May 14, 2016].

Lindahl, M. & Juhl, C., 2007. Opgavens indhold. In *Den sundhedsvirdenskabelige opgave - vejledning og værktøjskasse*. København: FADL's Forlag A/S, pp. 35–102.

Mollah, M.A.S., 2014. The Impact of Relationship Marketing On Customer Loyalty At Tesco Plc, UK. *European Journal of Business and Management*, 6(3), pp.21–55. Available at: http://iiste.org/Journals/index.php/EJBM/article/view/10526.

Måltidspartnerskabet, Kampagne årshjulet. Available at: http://maaltidspartnerskabet.dk/projekt/kampagne-aarshjulet/#lightbox/0/ [Accessed May 12, 2016a].

Måltidspartnerskabet, Om partnerskabet. Available at: http://maaltidspartnerskabet.dk/om-partnerskabet/ [Accessed May 12, 2016b].

Nielsen, K.R., Hansen, P.G. & Skov, L.R., 2016. Do supermarkets really nudge us to eat unhealthily? *iNudgeyou - The Applied Behavioural Science Group*. Available at: http://inudgeyou.com/archives/6638 [Accessed May 12, 2016].

Nielsen, S.Z., 2014. Movement Pattern Analysis in "Smart Cities." In Frederiksberg: Department of Geosciences and Natural Resource Management (IGN), p. 6.

Nordic Council of Ministers, 2010. *The Keyhole : Healthy choices made easy*, Copenhagen.

Olsen, T.D., 2010. *Hospital Foodscape Design*. Aalborg University.

Parastatis, M.H., 2015. How to uncover the unknown, unconcious and unspoken: qualitative methods within sensitive research. In *Qualitative Methods for Consumer Research*. Latvia: Persson, Henning, pp. 149–167.

Pedersen, A.N. et al., 2015. *Danskernes kostvaner 2011-2013*,

Piacentini, M., MacFadyen, L. & Eadie, D., 2000. Corporate Social Responsibility in Food Retailing. *International Journal of Retail & Distribution Management*, 28(11), pp.459–469. Available at: http://dx.doi.org/10.1108/09590550010356822.

REMA 1000, 2015. *Code of Business Conduct - REMA 1000's policies for Social Responsibilities*, Horsens. Available at: http://rema1000.dk/wp-content/uploads/2015/11/Code-of-Business-Conduct-UKPwC-M29Z0Sv.pdf.

REMA 1000, Historien om REMA 1000. Available at: http://rema1000.dk/om-rema-1000/organisationen/historie/ [Accessed May 17, 2016].

Ryan, T.A., 1940. Interrelations of the Sensory Systems in Perception. *Psychological Bulletin*, 37(9), pp.659–698.

Savin-Baden, M. & Major, C.H., 2013a. Data analysis. In *Qualitative research - The essential guide ti theory and practice*. Abingdon: Routledge, pp. 434–450.

Savin-Baden, M. & Major, C.H., 2013b. Qualitative research. In *Qualitative research - The essential guide ti theory and practice*. Abingdon: Routledge, pp. 3–17.

Shaw, H., 2006. CSR in the Community: Redefining the Social Role of the Supermarket Giants. *Social Responsibility Journal*, 2(2), pp.216–222.

Solomon, M. et al., 2006. Perception. In *Consumer Behavior - A European Perspective*. Essex: Prentice Hall Europe, pp. 1–701.

Spence, C. & Wang, Q., 2015. Sensory expectations elicited by the sounds of opening the packaging and pouring a beverage. *Flavour*, 4(1), p.35. Available at: http://www.flavourjournal.com/content/4/1/35.

Thaler, R.H. & Sunstein, C.R., 2009a. Biases and Blunders. In *Nudge - Improving Decisions About Health, Wealth, and Happiness*. London: Penguin Books Ltd., pp. 17–39.

Thaler, R.H. & Sunstein, C.R., 2009b. Choice Architecture. In *Nudge*. London: Penguin Books Ltd., pp. 83–102.

Thaler, R.H. & Sunstein, C.R., 2009c. Following the Herd. In *Nudge - Improving Decisions About Health, Wealth, and Happiness*. London: Penguin Books Ltd., pp. 53–73.

Thaler, R.H. & Sunstein, C.R., 2009d. Introduction. In *Nudge - Improving Decisions About Health, Wealth, and Happiness*. London: Penguin Books Ltd., pp. 1–14.

Thaler, R.H. & Sunstein, C.R., 2009e. Resisting Temptation. In *Nudge - Improving Decisions About Health, Wealth, and Happiness*. London: Penguin Books Ltd., pp. 40–52.

Thorbeck, F., 2014. Sundt slik øger Lidls omsætning. *Detailfolk.dk*. Available at: http://detailfolk.dk/detailnyheder/sundt_slik_oeger_lidls_omsaetning.html [Accessed May 12, 2016].

Vallgårda, S., 2012. Nudge-A new and better way to improve health? *Health Policy*, 104, pp.200–203. Available at: http://dx.doi.org/10.1016/j.healthpol.2011.10.013.

Vesterbro-nyt, 2014. Vesterbro-købmand kåret for bedste butik. Available at: http://vesterbro-nyt.dk/a00809-1235-vesterbro-koebmand-kaaret-for-bedste-butik/ [Accessed May 27, 2016].

Wang, A. & Anderson, R.B., 2011. A Multi-Staged Model of Consumer Responses to CSR Communications. *Journal of Corporate Citizenship*, (41), pp.51–68. Available at: http://search.ebscohost.com/login.aspx?direct=true&db=bth&AN=67653382&site=ehost-live.

Wansink, B., 2014. Four: Supermarket Makeovers. In *Slim by Design*. New York: HarperCollins Publishers, pp. 113–146.

Wansink, B. & Sobal, J., 2007. Kitchenscapes, Tablescapes, Platescapes, and Foodscapes. *Environment and Behavior*, 39(1), pp.124–142.

Winson, A., 2004. Bringing political economy into the debate on the obesity epidemic. *Agriculture and Human Values*, 21(4), pp.299–312.

World Health Organisation, 1986. The Ottawa Charter for Health Promotion. *Health Promotion*. Available at: http://www.who.int/healthpromotion/conferences/previous/ottawa/en/ [Accessed May 29, 2016].

YouGov, 2014. YouGov-analyse om Nøglehulsmærket. , pp.1–57. Available at: http://www.noeglehullet.dk/NR/rdonlyres/FDA6ED15-D048-48CF-B724-65F410B167BB/0/YouGov_2014_Noeglehulsmaerket_kendskab_og_kundskab_i_fire_maalgrupper.pdf.

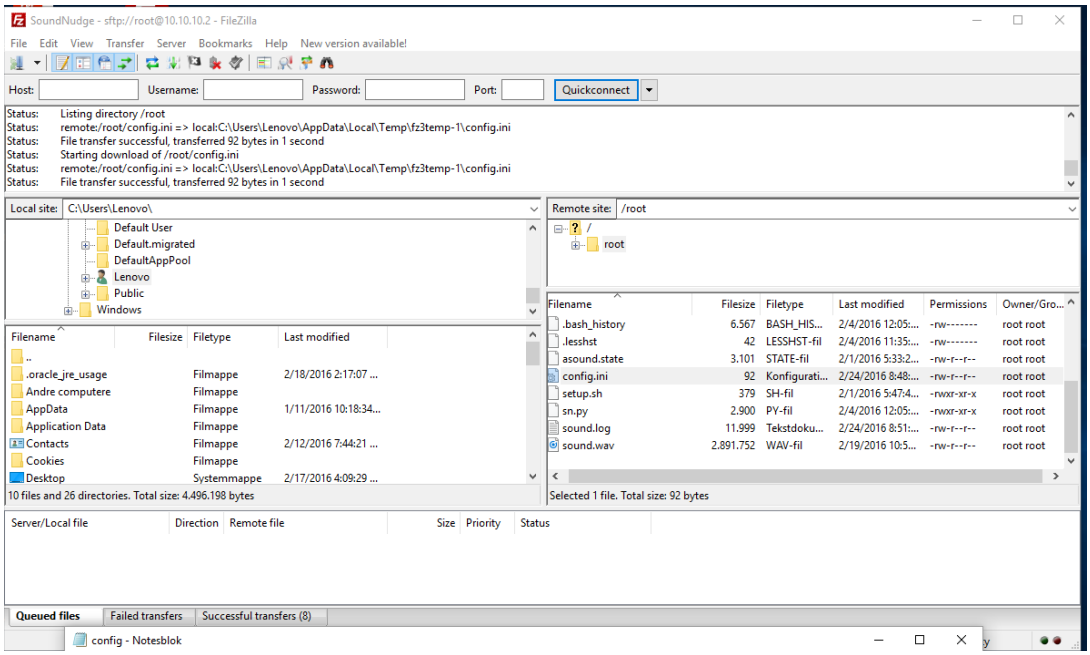
Appendix 1

The dates of collecting *questionnaire 1+2*

Sound nudge development	Date	Time
Questionnaire 1	27th of November 2015	11 - 13
Questionnaire 2	25th-29th of January 2016	(online)

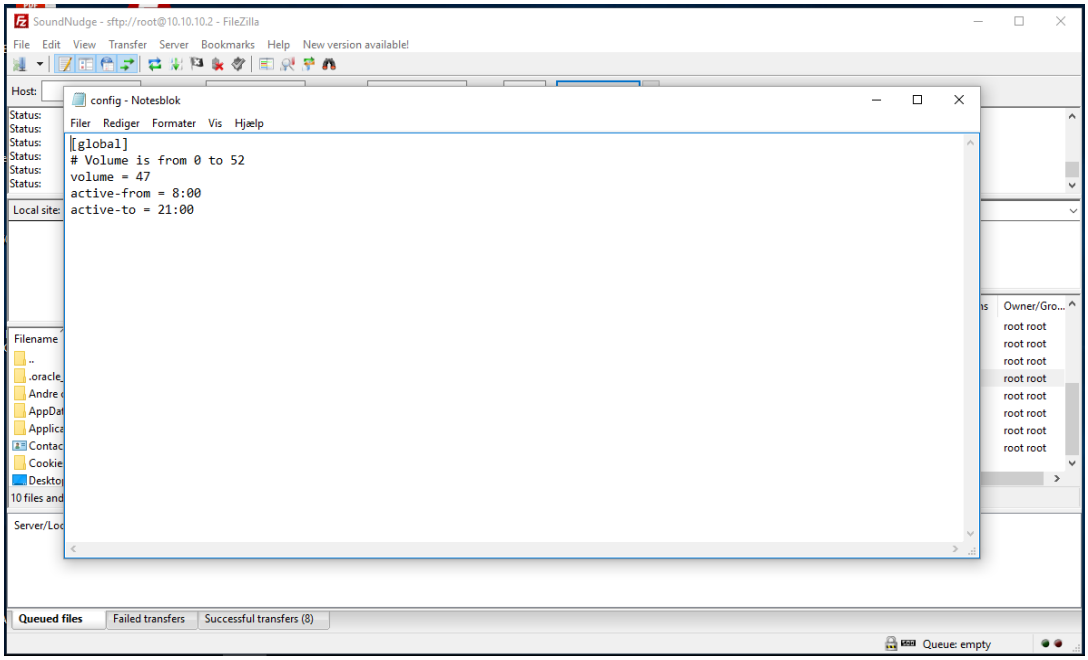
Appendix 2

Appendix 2a:



Screenshot of FTP-server: The screenshot shows the FTP-server, where the configuration file could be accessed and the sound-file could be inserted.

Appendix 2b:



Screenshot of the configuration file: The screenshot shows the file where the volume and time of activation could be adjusted.

Appendix 3

Appendix 3a:

Observations: The dates of video observations

Phase	Observation date	Observation time
Pre	22nd of February	14 - 17
Primo	29th of February	14 - 17
Medio	21st of March	14 - 17

Appendix 3b:

Structured interviews: The dates and time of conducting interviews

Phase	Date	Time
Pre	22nd of February 2016	9 - 12
Primo	29th of February 2016	9 - 12
Medio	14th of March 2016	9 - 12
Ultimo	4th of April 2016	9 - 12

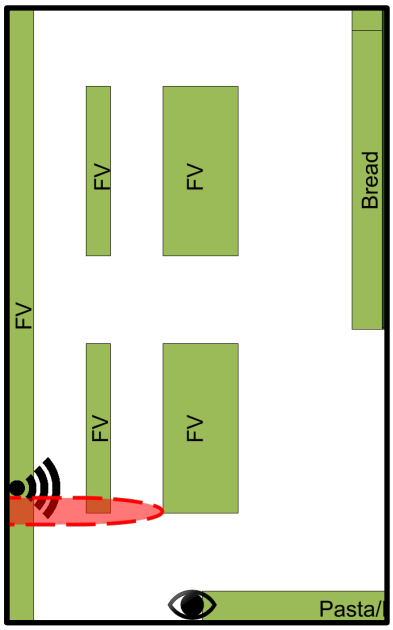
Appendix 4

Overview of the intervention

Phase	Date	Weeks	Sound
Pre	17/2 - 23/2 2016	1	No sound
Primo	24/2 - 8/3 2016	2	Three sounds of carrot
Medio	9/3 - 22/3 2016	2	Three sounds of carrot - higher volume
Ultimo	23/3 - 5/4 2016	2	One sound of carrot - higher volume
Post	6/4 - 12/4 2016	1	No sound

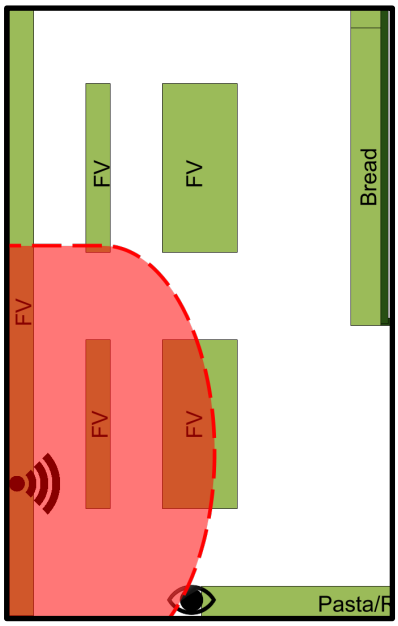
Appendix 5

Appendix 5a



Motion Sensor Primo and Medio: The exact where the motion sensor could trigger the sound.

Appendix 5b



Motion sensor Ultimo: The area where the motion sensor could trigger the sound.

Appendix 6

Dates of 2016 and 2015: The dates are modified so mondays and holidays fit each other.

Pre

2016	2015
17 February	18 February
18 February	19 February
19 February	20 February
20 February	21 February
21 February	22 February
22 February	23 February
23 February	24 February

Primo

2016	2015
24 February	25 February
25 February	26 February
26 February	27 February
27 February	28 February
28 February	01 March
29 February	02 March
01 March	03 March
02 March	04 March
03 March	05 March
04 March	06 March
05 March	07 March
06 March	08 March
07 March	09 March
08 March	10 March

Medio

2016	2015
09 March	11 March
10 March	12 March
11 March	13 March
12 March	14 March
13 March	15 March
14 March	16 March
15 March	17 March
16 March	18 March
17 March	19 March
18 March	20 March
19 March	28 March
20 March	29 March
21 March	30 March
22 March	31 March

Ultimo

2016	2015
23 March	01 April
24 March	02 April
25 March	03 April
26 March	04 April
27 March	05 April
28 March	06 April
29 March	07 April
06 April	08 April

07 April	09 April
08 April	10 April
09 April	11 April
10 April	12 April
11 April	13 April
12 April	14 April

Post

2016	2015
13 April	15 April
14 April	16 April
15 April	17 April
16 April	18 April
17 April	19 April
18 April	20 April
19 April	21 April

Appendix 7

Questionnaire 1 **The participants' answers**

Respondenter	M/F	Alder	Når jeg nævner ordet "sundhed", hvilken lyd tænker du så på?	Hvad er din begrundelse for lige præcis den lyd?
1	1	18	Stilhed, modsat larm og industri	Mark og stilhed
2	1	20	Selleri der knaser eller planter	Den måde det knaser på når man spiser
3	2	24	En skinger fløjte	Tynd og ihærdig aerobic person, det er sundhed for mig
4	1	25	En der spiser et æble	Det kan repræsentere sundhed, det virker opfriskende. En frisk følelse
5	2	21	En glad lyd, latter	Sundhed gør mig glad
6	2	21	En hund der gør	Det var det jeg kom til at tænke på
7	2	21	Havet, bølger	Svømning, at være sund
8	1	25	Lyden af vind, Arla reklame	Idyllisk, grønt, rart og nede på jorden. Yoghurt reklame. Fungerer godt i naturen
9	2	24	Broccoli der knaser i munden eller løbebånd	Spise sundt og en balance, mad og motion
10	2	30	Gulerod der knaser	Sundt, sprødt og orange
11	1	22	Lyden af nogen der løber	Når man løber, så prøver man at være sund
12	1	23	Inden lyd forbundet med sundhed	Jeg går ikke så meget op i sundhed
13	1	29	Techno musik	Det er relateret til et fitness center
14	1	24	Vandfald	Rolig sindstilstand, natur
15	1	24	Sirene fra en ambulance	Jeg er en pessimist, man lægger mærke til lyden
16	1	28	Keltisk musik	Det fremmer søvnen, man får en bedre søvn
17	1	22	Buddist klokke	Det repræsenterer en afslappende sindstilstand
18	1	32	Hjertelyd fra hospital	Egen sundhed, jeg har røget rigtig mange cigaretter

19	1	33	Et salathoved der brydes	Et billede der popper op. Underbevidst at salat er sundt
20	1	44	Ambulance	Sundhedsvæsenet
21	1	23	En triangel	Det minder mig om en gang på sygehuset i Ungarn
22	2	24	Skovlyd	Løbe
23	1	26	Elevator	Har arbejdet på et hospital
24	2	22	Health monitor	
25	1	26	Vind	Løbe
26	1	26	Bip fra monitor	
27	1	21	Blop	Brocolli der bliver lagt i vand
28	1	26	McDonalds	Det modsatte af sundhed
29	1	21	Vindpust/brusen	Løbe/motion
30	1	23	Ingenting	
31	2	26	Lyden af en balancebold	Er fysioterapeut
32	1	30	Drinking water	
33	2	21	Puls	
34	2	20	Ingenting	
35	2	20	Sound of water	
36	1	20	Naturlyd: Havet, fuglekvider	
37	1	23	Silence of a Hospital	
38	1	19	Sport/idrætshal	
39	1	20	Motionscenter	
40	1	20	Bid af knækbrød	
41	1	21	Blød lyd	Positiv lyd: lyden af sundhed
42	1	21	Glad tone	
43	1	24	Ingenting	
44	1	22	Naturlyd	Skov
45	1	47	Grov, melodisk lyd	

Appendix 8

Answers in *questionnaire 2*

The original responses to 'Elaborate what you think of the sound' ('Uddyb hvad du synes om lyden')

Original comment	Positive comments - Translated	Original comment	Negative comments - Translated
Den første del af lydklippet var ikke lige så rart at lytte til, som den sidste del. Det er vel altid rart at spise en gulerod :)	The first part of the sound was not as nice to listen to, as the last part. I guess it is always nice to eat a carrot :)	Jeg synes der var forskel på de 3 lyde, så det er svært at beskrive. Fx synes jeg den første del var ubehagelig, men ikke de to næste dele.	I thought there was a difference between the 3 sounds, so it is difficult to explain. E.g. I think the first part of the sound was unpleasant, but not the following two parts.
Lyden kommer fra køkkenet, og lyde er tilknyttet minder. Denne køkkenlyd får mig til at tænke på min mor, da jeg endnu boede hjemme hos mine forældre, der står og laver god hjemmelavet mad. Hun gav mig tit en gulerod i hånden, inden vi skulle spise, så jeg kunne klare sulten til spisetid. Lyden minder om tryghed. Derudover får jeg lyst til at spise friske grøntsager som gulerødder, kål, salat, æbler, pepperfrugt - alt hvad der knaser (ligesom med reklamen for cocacola, hvor lyden af bruset får en til at få lysten til at drikke det). Paradoksalt nok er jeg dog bange for knive, da jeg tit har mareridt om knive. Det lyder som en stor kniv, så bare den kun bruges til at skære grønt og ikke kommer ud af køkkenet, forbliver lyden, og alt hvad den	The sound is from the kitchen, and sounds are connected to memories. This sound makes me think about my mother, when I was living at home with my parents making good homemade food. She gave me a carrot in the hand before we were having dinner so I could handle my hunger before dinner time. The sound reminds me of comfort. Additionally it makes me want to eat fresh vegetables such as carrots, cabbage, salad, apples, pepper - everything that is crunchy (just like with the Coca Cola commercial, where the sound of the fizz makes you want to drink it).	Den første 'skrælle-lyd' var virkelig ubehagelig. Ved første lyd, mindede det mig om noget kradsende mod en overflade, der ikke skal kradses! De to næste var fine nok.	The first 'peeling sound' was really unpleasant. The first sound reminded me about something scratching against a surface that should not be scratched! The following two sounds were fine.

repræsenterer, tryg og rar i mine øjne.			
Man får jo associationer til forskellige madvarer og madlavning - for mit vedkommende æbler og grøntsager. Det kan jo godt være lidt ubehageligt at høre nogen tygge, men egentlig ikke i det tilfælde her. Der er jo ikke smaskelyde som sådan.	You are associating to different foods and to cooking - for my part apples and vegetables. It can very well be a little unpleasant to listen to somebody chew, but really not in this case. It is not like "champing sounds".	Jeg synes egentlig at den er lidt irriterende. Den minder mig om at gulerødder er kedelige og lidt besværlige, fordi man skal skrælle dem.	I actually think it is a bit annoying. It reminds me that carrots are boring and a little troublesome, because you have to peel them.

The original answers to the question 'Elaborate, what specific shopping ideas?' (Giver lyden dig nogle særlige ideer til indkøb, hvis ja, uddyb venligst)

Original comment	Positive comments - translated	Original comment	Negative comments - translated
Ja, friske grøntsager og frugt! - Gulerødder, pepperfrugt, chili, kål, salat, æbler, radisser, agurk... Alt hvad der er sprødt, frisk, råt, sundt, farverigt med antioxidanter og vitaminer. Jeg får lyst til at spise mere raw food.	Yes, fresh vegetables and fruit! - Carrots, pepper, chili, cabbage, salad, apples, radishes, cucumber… Everything crispy, fresh, raw, healthy, colorful with antioxidants and vitamins. Now I want to eat more raw food.	Den sidste del, hvor det lyder som om man der bliver spist en gulerod, kan god fører tanker hen til, hvordan sådan en ser ud og jeg kom til at tanke på om jeg havde nogen i køleskabet. Så jeg vil klart sige at den sidste lyd, kunne påvirke mig mere end den første.	The last part, where it sounds like a carrot being eaten, can lead the thoughts to how such looks and it made me wonder if I had any in the refrigerator. I will evidently say that the last sound could affect me more than the first.
Ja, gulerødder. Hvilket allerede står på indkøbslisten ;)	Yes, carrots. Which already are already written on the shopping list ;)	Mad, gulerødder, filt (for at dæmpe lydene fra den første lyd)	Food, carrots, felt (in order to muffle the sounds from the first sound).
Gulerødder og grønt/frugt generelt. Slik, kage og kød kan ikke lyde sådan.	Carrots and vegetables/fruit in general. Candy, cake and meat cannot sound like that.	Jeg får IKKE lyst til at købe æbler eller gulerødder eller andet sprødt	I do NOT get any need to buy apples or carrots or anything else crispy.

Generelle kommentarer

Original comment:
Spændende, at man kan bruge lyd til at vække éns lyst til at spise grønt. Det gjorde lyden i hvert fald for mig.

Translated:
Exciting that you can use sounds to evoke one's urge to eat vegetables. At least the sound did that for me.

Appendix 9

Appendix 9a:

Distribution (%) of answers, "Did you plan to buy vegetables": If no, did you buy vegetables anyway?

Answer	Pre	Primo	Medio	Ultimo
Yes	***20%***	***22%***	***22%***	***13%***
No	80%	78%	78%	88%

Appendix 9b:

Distribution (%) of answers from structured interview "Did you plan to buy vegetables": If no, why not?

Answers	Pre	Primo	Medio	Ultimo	Total
Unanswered	0,00%	3,60%	3,30%	0,00%	***1,60%***
Have it at home/have bought	32,50%	38,20%	23,30%	35,30%	***32,10%***
Buy it later/elsewhere	13,30%	5,50%	10,00%	3,90%	***8,80%***
Don't eat it/don't eat it that much	8,40%	7,30%	3,30%	7,80%	***6,80%***
At work/school	4,80%	10,90%	0,00%	5,90%	***5,20%***
Spontaneous	7,20%	5,50%	1,70%	0,00%	***4,00%***
Specific purchase	22,90%	10,90%	38,30%	33,30%	***26,10%***
Don't know/Other	10,80%	18,20%	20,00%	13,70%	***15,30%***

Appendix 9c:

Distribution (%) of occupation from structured interview of the customers who bought more: "If Yes, did you stick to your plans"

			More than planned
Occupation	Craftsmen	Count	0
		% within If Yes, did you stick to your plans	0,0%
	Student	Count	3
		% within If Yes, did you stick to your plans	15,0%
	Retired	Count	1
		% within If Yes, did you stick to your plans	5,0%
	Unemployed	Count	1
		% within If Yes, did you stick to your plans	5,0%
	Unskilled	Count	2
		% within If Yes, did you stick to your plans	10,0%
	Skilled	Count	9
		% within If Yes, did you stick to your plans	45,0%
	Other	Count	3
		% within If Yes, did you stick to your plans	15,0%
	Self-supporting	Count	1
		% within If Yes, did you stick to your plans	5,0%

Total	Count	20
	% within If Yes, did you stick to your plans	100,0%

Appendix 9d:

Distribution (%) of gender from structured interview: "Did you notice the sound at the fruits- and vegetable department?"

			Yes	No
Gender	Male	Count	13	170
		% within Did you notice the sound at the green department?	26,5%	47,9%
	Female	Count	36	185
		% within Did you notice the sound at the green department?	73,5%	52,1%
Total		Count	49	355
		% within Did you notice the sound at the green department?	100,0%	100,0%

Appendix 9e:

Distribution (%) of occupation: Did you notice the sound at the fruits and vegetable department?

			Yes	No
Occupation	Craftsmen	Count	0	46
		% within Did you notice the sound at the green department?	0,0%	12,9%
	Student	Count	9	53
		% within Did you notice the sound at the green department?	18,4%	14,9%
	Retired	Count	4	57
		% within Did you notice the sound at the green department?	8,2%	16,0%
	Unemployed	Count	5	27
		% within Did you notice the sound at the green department?	10,2%	7,6%
	Unskilled	Count	0	27
		% within Did you notice the sound at the green department?	0,0%	7,6%
	Skilled	Count	24	109
		% within Did you notice the sound at the green department?	49,0%	30,6%
	Other	Count	4	25
		% within Did you notice the sound at the green department?	8,2%	7,0%

	Self-supporting	Count	3	12
		% within Did you notice the sound at the green department?	6,1%	3,4%
Total		Count	49	356
		% within Did you notice the sound at the green department?	100,0%	100,0%

Appendix 10

Appendix 10a

P-values of the total vegetable sale. The vegetables were sold in REMA 1000.

Phases		2016	2015
Pre	Primo	,208	,947
	Medio	,730	,996
	Ultimo	,001**	,672
	Post	,011*	,799
Primo	Pre	,208	,947
	Medio	,782	,991
	Ultimo	,099	,939
	Post	,399	,273
Medio	Pre	,730	,996
	Primo	,782	,991
	Ultimo	,007*	,761
	Post	,067	,476
Ultimo	Pre	,001**	,672
	Primo	,099	,939
	Medio	,007*	,761
	Post	,990	,099
Post	Pre	,011*	,799
	Primo	,399	,273
	Medio	,067	,476
	Ultimo	,990	,099

Appendix 10b

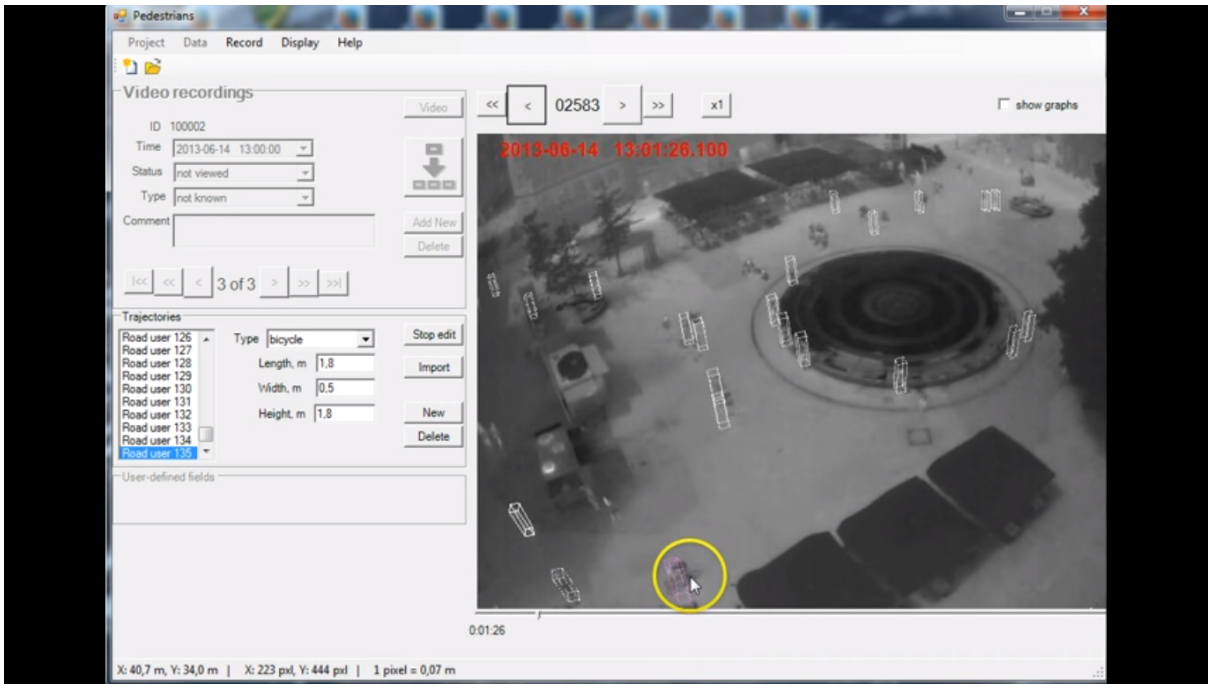
P-values of the total carrot sale. The carrots were sold at REMA 1000.

Phases		2016	2015
Pre	Primo	,916	1,000
	Medio	,130	,776
	Ultimo	,321	,948
	Post	,953	1,000
Primo	Pre	,916	1,000
	Medio	,324	,650
	Ultimo	,012*	,920
	Post	1,000	1,000
Medio	Pre	,130	,776
	Primo	,324	,650
	Ultimo	,000**	,993
	Post	,515	,772
Ultimo	Pre	,321	,948
	Primo	,012*	,920
	Medio	,000**	,993
	Post	,057	,946
Post	Pre	,953	1,000
	Primo	1,000	1,000
	Medio	,515	,772
	Ultimo	,057	,946

Appendix 11:

View of the thermal camera

Appendix 12:



Screen from Søren Zebits Nielsens YouTube-video: "Ground Truth Annotation in T Analyst". https://www.youtube.com/watch?v=qul0SFps_A4&list=PLObqpq0OykEMmNrX7eH3gqG8ThC9Hyolz&index=8