Chapter 1
General introduction
Food choices

A food choice may seem a conscious act; you want something tasty, maybe healthy or ready-to-eat and preferably not too expensive, because you can only spend your money once and, in addition, satisfy your hunger also just once. Some food choices are indeed conscious practices. However, a lot of food choices are made quick and automatically, without well deliberated considerations what to choose, for example choices made in the worksite cafeteria. Besides the availability of food itself (is there a salad bar?), food choices are fairly influenced by many individual factors like habits (i.e. always taking soup), food preferences, and (sub)culture. In addition to those elements, environmental factors like the way food is displayed, the following order in which you pass by the food products, laying in front or at the back of a counter, being available in abundance or being scarce are also steering food choices. More and more is understood that these factors unconsciously influence food choices and therefore affect associated overweight rates. Thus, also when having lunch at work, peoples’ food choices are influenced by the environment of the worksite cafeteria. Many employees use the work cafeteria numerous times during their lives, which has a significant impact on their food intake. It is therefore essential to investigate how worksite cafeterias can support healthier food choices and can contribute to the prevention of overweight.

The studies outlined in this thesis describe the development and evaluation of the intervention called The healthy worksite cafeteria. The aim of the intervention was to encourage Dutch employees to purchase healthier lunch items as an effect of nudging and social marketing strategies. In this general introduction I will introduce some issues regarding food choice, existing interventions and strategies to improve eating behaviour in point-of-purchase settings, and more specifically in worksite cafeterias. Furthermore, I will provide the general aim and outline of this thesis.

What we should eat versus what we eat

The World Health Organisation (WHO) states: ‘A healthy diet helps to protect against malnutrition in all its forms, as well as noncommunicable diseases (NCDs), including type 2 diabetes, heart disease, stroke and cancer.’ A healthy diet consists of vegetables, fruit, legumes (e.g. lentils and beans), nuts and whole grains (e.g. unprocessed maize, millet, oats, wheat and brown rice). Besides recommendations of what we should eat, we should limit the total energy intake from free sugars and fat and the intake of salt.\(^1\)

The most recent Dutch National Food Consumption Survey (2012-2016) shows that if Dutch adults would eat more fruits, vegetables and plant based proteins and less red and processed meat products, less salt, less sugar sweetened beverages and overall less calories they can lower their health risks.\(^2,3\) That would be beneficial, because overweight and diet-related NCDs increased over the past decades.\(^4\) In 2018, 50.2% of Dutch adults were overweight.\(^5\) Overweight and obesity in itself also increase the risk of all-causes of death, high blood pressure, type 2 diabetes, coronary heart disease, stroke
and some types of cancer.\textsuperscript{6,7} In addition to the negative impact of obesity on quality of life of individuals and public health in general, obesity also has economic effects. In the Netherlands, about a quarter of the medical costs are attributable to overweight-related diseases.\textsuperscript{8,9} In addition to medical costs, there are also societal costs associated with obesity. For example, a review on the effects of overweight and obesity on productivity loss revealed substantial short-term and long-term indirect costs. Especially absenteeism and presentism (working while sick) contribute to high indirect costs.\textsuperscript{10} All in all, improving dietary intake of Dutch adults is of the utmost importance.

\textbf{Settings in which we make food choices: the worksite cafeteria}

The diet of the Dutch population may become healthier by improving the nutrient content and by lowering the number of kilocalories (kcal). Intervening in eating behaviour can be done at places where we make food choices regularly; in the supermarket, at home, at the train station or in other out of home settings, like in the worksite cafeteria. In the supermarket, for example, interventions can use the habit or impulse of responding to price offers by executing price offer interventions.\textsuperscript{11,12} In addition to the supermarket, the worksite cafeteria also is a highly suitable location for targeting both conscious and habitual or impulsive food choices. The Netherlands has a working population of almost 9 million people\textsuperscript{13} of which about 45\% have lunch daily at the worksite cafeteria.\textsuperscript{14,15} It provides the opportunity to reach people more than once and over a longer period of time as they visit the worksite cafeteria regularly. In addition, interventions in worksites could potentially reach a large part of the adult population in a natural social context, including many who not intend to change their eating behaviour.\textsuperscript{16,17} Finally, although a Dutch lunch usually consists of a sandwich, either from home or from the worksite cafeteria, snacks such as deep fried snacks and puff pastry snacks are more consumed by Dutch people compared to other Europeans\textsuperscript{18} and are also offered and consumed during lunch break at work. Those snacks have a relatively high amount of saturated fat and are high in calories and therefore their intake should be limited. In short, the worksite cafeteria seems a suitable place to intervene in food choice behaviour.

\textbf{Interventions to affect food choice in the worksite cafeteria}

Globally, studies in worksite cafeterias to improve food choices used different strategies, such as increasing the availability of healthy foods like fruits and vegetables and products low in energy density\textsuperscript{19,20}, offering smaller serving sizes\textsuperscript{21}, providing nutrition information on menus\textsuperscript{22}, placing a sign with the message ‘Pick me! I am low-calorie’ on a low-fat product\textsuperscript{23}, or showing a nutrition logo on healthy products.\textsuperscript{17} Also in the Netherlands, worksite cafeterias have been used as a setting for interventions aimed to improve eating behaviour.\textsuperscript{24–29} Despite the slightly different eating culture at work in the Netherlands, these interventions use similar strategies (both based on pro-
viding information as well as interrupting habitual choice behaviour) and show similar mixed results. Not all strategies evaluated were effective in improving eating behaviour, for example placing a nutrition logo on healthier food items in the worksite cafeteria did not show a nutritionally meaningful intervention effect for the sales of healthier items. However, adding a small portion size of a hot meal to the displayed range (that inclined customers to switch to a smaller portion of their regular meal) was an effective strategy. Furthermore, like the examples previously mentioned, often single strategies were studied in isolation, whereas multiple strategies conducted at the same time could possibly have a larger effect. For example, the effect of the single strategy of adding a small portion size could potentially have a larger effect if this smaller meal is offered at the start of the buffet, as people tend to choose the food items they encounter first more often. Furthermore, in some cases environmental interventions in Dutch worksite cafeterias contained both effective and ineffective outcomes. Placing informational sheets alongside food products to visualise healthier food choices (i.e., the caloric value of foods was translated into the duration to perform a certain (occupational) activity to burn these calories) was modestly effective in changing behavioural determinants (social support, self-efficacy and attitude) towards eating less fat. It was however ineffective in decreasing actual fat intake, or improving fruit and vegetable consumption of office workers. Altogether, both experiments in foreign and in Dutch worksite cafeterias offer opportunities to develop a possibly more effective intervention for Dutch worksite cafeterias. Simultaneously conducting strategies that trigger automatic, habitual behaviour seems a promising approach.

**Behavioural theories and food choice in worksite cafeterias**

For the development of an intervention in Dutch worksite cafeterias, some insight in theory of food choice behaviour is useful. The past decades, research in the field of psychology and behavioural economics showed that a lot of food choices are made quite automatically through subconscious processes. Figure 1 presents an overview of behavioural theories, presenting the development in the ideas regarding the degree of rationality in choice behaviour, including the dual process theory of the Elaboration likelihood model (ELM). The ELM explains two major routes of how we process stimuli: the central and the peripheral route. Nobel prize winner Daniel Kahneman provided further interpretation of the ELM by differentiating the two routes more. Kahneman called the peripheral route ‘intuition’ (system 1) and the central route ‘reasoning’ (system 2). People make most of the decisions concerning food fast and automatically, via system 1, relying on general impressions and heuristics (mental shortcuts) or habits. An example of an heuristic is: ‘the higher priced product probably is higher in quality’, or a habit can occur like ‘always taking a fried snack on Friday’. But also the environment influences food choices. For example, choosing the option first displayed at the buffet. The environmental research model for weight gain prevention (the EnRG...
Neoclassical economic behaviour theory (1900)

Starting point → Knowledge → Behaviour

deliberate / rational

Theory of planned behaviour (1975)

Attitude

Starting point

Subjective norm → Intention → Behaviour

Perceived behavioural control

deliberate / rational

time consuming

Elaboration likelihood model (1986)

Starting point

Knowledge → Behaviour

Heuristics

deliberate / rational

time consuming

intuitive / quick

Central / system 2

Peripheral / system 1

Figure 1. Schematic overview of behavioural theories.

Showing the development over time of the views regarding the degree of rationality in choice behaviour. From the Neoclassical economic behaviour theory to the Theory of planned behaviour and the Elaboration likelihood model (ELM) it was recognized that behaviour depends on multiple determinants and is not completely rational.

framework) of Kremers et al. (2006) shows the environmental factors (physical, socio-cultural, political and economic) in relation to other factors, such as cognitive mediators as attitude, affecting weight gain.

Knowing this, supporting people to eat healthier with the counteraction of an environment supporting the opposite is ineffective. In addition to all types of education and training, it would be beneficial if the food environment would support healthier choices by for example changing the food offer and how it is presented. It is therefore obvious to develop and implement an environmental intervention to stimulate healthier food choices in the worksite cafeteria.
Nudging and social marketing

The emergence of nudging

In the last paragraph, I mentioned that the physical environment should be used to trigger a certain food choice. A response to the knowledge of the influence of the physical environment on behaviour is called nudging. Nudging is described in 2008 by Richard Thaler and Cass Sunstein in their book *Nudge: Improving decisions in health, wealth and happiness*. Nudges are small environmental encouragements to initiate the desired behaviour, without forbidding other behaviours, making it a form of so-called libertarian paternalism or soft paternalism. Soft paternalism is the idea that private and public stakeholders can affect behaviour without violating freedom of choice, hence it is by most people seen as legitimate for them to do so. Nudges, also classified as choice architecture, can be used to encourage people to show healthier eating behaviour. An example of a nudge in the worksite cafeteria is to place fruit next to the cash desk triggering an impulsive purchase.

The emergence of social marketing

In accordance with nudging, social marketing also is a relatively new approach with the equal aim to (voluntarily) change behaviour. The overall aim of social marketing is to improve individual welfare and society, such as improving public health, not to benefit the organisation who uses social marketing. The theory of social marketing originated from commercial marketing and the goal to motivate people towards certain behaviour, in the case of commercial marketing; buying the targeted product. Marketing creates a feeling of really need wanting a certain product. Social marketing uses these techniques, reflected in eight key elements, to change behaviour of consumers for a social overall goal, for example, eating healthier in the worksite cafeteria to improve health. Figure 2 shows the eight benchmarks of social marketing applied to the development of an intervention aimed at changing food choice behaviour in the worksite cafeteria. The benchmark criteria are a set of integrated concepts. For example, involving the target audience when developing an intervention is a consequence of the benchmarks behaviour, customer orientation, insight, exchange and competition and is a key element of social marketing. These insights in exchange should for example be illustrated in the price element. The original emphasis on product, place, price and promotion, the 4 P’s of commercial marketing are reflected in the method mix.

Social marketing in worksite cafeterias is promising

Knowing what moves and motivates the target group is important to evoke behaviour change. Related to the worksite cafeteria for example, it is important to know which factors trigger the purchase of relatively unhealthy food items to use these triggers to nudge customers towards healthier purchases. In the beginning of the emergence of
### Figure 2. Social Marketing Benchmark Criteria

As adapted by French et al. (2006) based on the six benchmark criteria of Andreasen (2002), applied to the development of an intervention to change food choice behaviour in the worksite cafeteria.

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<th>Aim:</th>
<th>Method:</th>
<th>Intervention strategies</th>
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<tr>
<td><strong>Behaviour</strong> The intervention is focused on influencing specific behaviours, not just knowledge, attitudes and beliefs. And it should have clear, specific, measurable and time-bound behavioural goals. <strong>Example:</strong> An increase in purchase behaviour of fruit or healthy salads in the worksite cafeteria during lunchtime.</td>
<td><strong>Customer orientation</strong> Focuses on the target audience. Fully understands their lives, behaviour and issues, using a mix of data sources and research methods. But also gaining key stakeholder understanding. <strong>Example:</strong> Interviewing catering and facility managers regarding the daily ins and outs of worksite cafeterias.</td>
<td><strong>Segmentation</strong> Avoids a ‘one size fits all’ approach: identifies audience ‘segments’, which have common characteristics, then tailors interventions appropriately. <strong>Example:</strong> Tailoring an intervention aimed at men, to choose healthier snacks.</td>
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<td><strong>Theory</strong> Uses behavioural theories to understand target behaviour and to develop the intervention. <strong>Example:</strong> Using the insights of the automatic versus conscious ways of purchase behaviour in the worksite cafeteria.</td>
<td><strong>Insight</strong> Identifies ‘actionable insights’ – pieces of understanding that lead intervention development. This could be for example knowing emotional or physical barriers to execute the desired behaviour. <strong>Example:</strong> If the employees have one, very short lunch break and the worksite cafeteria has long waiting lines, this barrier could be overcome by introducing healthy foods in small breaks at the worksite, being more applicable and therefore more effective.</td>
<td><strong>Method mix</strong> Uses a mix of methods to bring about behaviour change. The original emphasis on product, place, price and promotion, the 4 P’s from commercial marketing are reflected in the method mix. <strong>Product:</strong> large share of healthy products, like salads <strong>Place:</strong> healthy products offered at prominent places <strong>Price:</strong> healthy products attractively priced <strong>Promotion:</strong> healthy products attractively promoted</td>
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<td><strong>Exchange</strong> Considers costs and benefits of adopting and maintaining a new behaviour; maximises the benefits and minimises the costs to create an attractive offer. <strong>Example:</strong> The new behaviour of choosing salad instead of fries will only last if the taste, the price, the convenience and the feeling when having salad, is better than when having fries.</td>
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<td><strong>Competition</strong> Seeks to understand what competes for the audience’s time, attention, and drivers to behave in a particular way. <strong>Example:</strong> The new behaviour of choosing a salad instead of fries will only last if the salad is seen as a reward when rewarding for hard work is a driver.</td>
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**Figure 2. Social Marketing Benchmark Criteria.** As adapted by French et al. (2006) based on the six benchmark criteria of Andreasen (2002), applied to the development of an intervention to change food choice behaviour in the worksite cafeteria.
social marketing, a review of three systematic reviews suggested there is ‘strong evi-
dence’ for the effectiveness of social marketing to change diet behaviour.42 Since then,
more worksite health promotion interventions were developed using social marketing. 
Carins et al. (2014) identified 16 interventions using social marketing to encourage 
healthy eating behaviour between 2000 and 2012. These included however also inter-
ventions aimed at children and increasing fruit and vegetable intake was in half of the 
interventions the health goal.43 The use of social marketing to develop interventions to 
change food choice behaviour in worksite cafeterias is quite new; up till 2006 Gordon 
only found one study.42 Sawada et al. (2019) found three studies in their review about 
social marketing including financial incentive programs at worksites, that all three only 
used the price-element of social marketing.44 We can conclude a gap exists in research 
concerning the use of social marketing to develop an intervention aimed at healthier 
eating behaviour in worksite cafeterias. The use of nudging strategies alongside social 
marketing strategies in such an intervention seems to fit well. Both have the aim to 
change behaviour and involving the target group (the social marketing approach) 
enables the development of even more effective nudges, because they match the 
behaviour of the target group.

More methodological high quality nudging studies in worksite cafeterias needed 
In contrast to the absence of interventions using social marketing in worksite cafeterias, 
the effect of interventions including nudging strategies has frequently been studied in 
worksite cafeterias in recent years. 19,27,29,45-49 For example, single strategies such as 
the following order of a buffet 30 or the effect of introducing a small portion of a hot 
meal 27 or enlarging the availability of healthy snacks at the checkout counter 47. These 
are examples of environmental cues that can provoke behaviour. They can respond to 
our feeling of what is normal to do, known as norm communication. But they can also 
have effect by being the option most effortless or just attractive or fun to do. A lot of 
these experiments were executed in a controlled setting or just single strategies were 
examined. As a result, effects do not necessarily apply to a real life situation. In the case 
of the study showing the effect of the buffet order, food items were not priced individ-
ually. What if the first items were very expensive? Would the effect of the buffet order 
disappear? An what happens with the effect if you visit this buffet daily? Would you get 
‘immune’ for the order effect? These aspects underpin the need for simultaneously 
executing nudging strategies in a real life setting. Furthermore, using elements of social 
marketing such as involving the target audience and other stakeholders in intervention 
development would increase the chance of being successful in changing behaviour. 
In addition to the opportunity to improve the content of a worksite cafeteria interven-
tion to enhance eating behaviour, there is also room for improvement of the quality and 
reporting of the studies.50 To illustrate, there is a lack of well-designed studies including 
randomised conditions or well-matched comparison groups. Sub-optimal study de-
signs, for example quasi-experimental studies and uncontrolled intervention studies, make it hard to attribute any reported effects directly to the intervention. Also, objective measures of dietary change are needed.\textsuperscript{50-52}

Collecting self-reported intake or self-reported purchase data could lead to recall bias \textsuperscript{53,54}, whereas sales data does not. Despite these shortcomings in the before mentioned studies, the worksite cafeteria remains a promising setting to endorse healthy food choices. It advocates for the development and evaluation of an intervention with multiple simultaneously executed nudging and social marketing strategies. Furthermore, a robust study design is a prerequisite, preferably a randomised controlled trial in a real life setting, including objective measures and sufficient intervention duration.

**Aim of this thesis**

The aim of this thesis was to develop the intervention *The healthy worksite cafeteria* with nudging and social marketing strategies and to evaluate its effectiveness on objectively measured purchase behaviour of Dutch employees. *The healthy worksite cafeteria* which, during the experiment was called *The worksite cafeteria 2.0*, being more neutral in the sense of revealing its goal, had the aim to encourage Dutch employees to purchase healthier lunch items.

**Outline of this thesis**

In the studies described in this thesis, we used different methodologies to study the target group and to develop the intervention. Chapter 2 describes a qualitative focus group study with the target group, Dutch employees, that gains insights in what moves and motivates them. This is very relevant in order to develop an intervention with a fair chance of making purchase behaviour healthier. Chapter 3 describes the study in which we interviewed 14 experts to get insights into the feasibility of possible intervention strategies and how to increase the effectiveness of the intervention. The intervention development and study design is described in chapter 4. To evaluate the effectiveness of the intervention *The healthy worksite cafeteria* on purchase behaviour, we performed a randomised controlled trial (RCT) of 12 weeks in 30 worksite cafeterias. In this study, described in chapter 5, we collected objective (sales) data of employees’ food purchases. In chapter 6 we describe a cross-sectional study to gain insights in the associations of vitality with personal and behavioural characteristics of the target group by means of self-reported questionnaire data (figure 3). This thesis ends with chapter 7 with a General discussion, wherein I discuss the main findings and the methodological strengths and limitations of the study. I relate the findings of this thesis to current knowledge of effectiveness of nudging and discuss ethical aspects. Finally, I propose recommendations for further research, policy and practice.
Figure 3. Outline of thesis: Healthy eating at work.
The studies described in this thesis: two qualitative studies exploring the target group and experts’ opinion as input for intervention development (chapters 2 and 3), the intervention development and protocol of an RCT in worksite cafeterias (chapter 4), the results of an RCT in 30 worksite cafeterias (chapter 5). A cross-sectional study about vitality of the target group of Dutch employees (chapter 6).
References
18. EFSA, EFSA Comprehensive European Food Consumption Database in Exposure Assessment. 2011, European Food Safety Authority: Parma.