NOVANIMAL

Innovations for a future-oriented consumption and animal production

LITERATURE REVIEW ON MEAL CHOICE AND MEAL OFFERING

Jacqueline Frick

January 2018

Abstract

This review paper aims to summarise literature on relevant influences and effective interventions in the field of meal choice and meal offering, in particular relating to the question of how choice and offering of meals containing few or no animal products can be increased. Studies concerning the motives and decision criteria (e.g. attitudes, values, knowledge or preference of consumers, as well as personal preferences, habits, and professional ambitions of chefs) are summarised. In addition, situational and structural facilitators and constraints (know-how, trends, or social norms, etc.) for choice and range of animal products in meals in away-from-home settings are identified. Furthermore, effective interventions to change meal planning, offering and choice are studied. For this, a non-systematic, explorative literature review was conducted.

With regard to meal choice, it was found that among personal motives, taste and health considerations were most relevant. Knowledge of food was relatively low and many consumers seemed to simply not care to a great extent about nutrition. Furthermore, familiarity was found to be an important component of food choice. Important context influences were availability and convenience. There is potential for meat reduction in about half the population who can be expected to essentially be open to behaviour change. Interventions can make use of heuristics by manipulating proximity, anchoring, labelling or prompts.

With regard to meal offering, chefs' concerns about health and sustainability and their responsibility to offer an attractive choice of foods is a good starting point for interventions. The top priority among chefs was customer demand, which they associated mainly with taste and familiarity. Chefs believe that meals should look rich and appetising. Chefs also complained about lack of training and storage problems that prevent them from offering more vegetarian or vegan meals with fresh foods. Interventions should also consider chefs' professional ambitions and curiosity, in particular in haute cuisine. Innovation processes should take feedback into account not only from employees and customers but also from suppliers.

Table of Contents

List of Tables

List of Figures

1 INTRODUCTION AND GENERAL OBJECTIVES

This working paper aims to summarise literature on relevant influences and effective interventions in the field of meal choice and meal offering, in particular relating to the question of how choice/offer of meals with few or no animal products can be increased.

This literature review is part of the project NOVANIMAL ("Innovations for a future-oriented consumption and animal production"), supported by the Swiss National Research Programme (NRP) 69, "Healthy Nutrition and Sustainable Food Production" by the Swiss National Science Foundation. The project aims to answer the overall question of how food patterns can be effectively altered towards resource-light and healthy eating habits containing few animal products. Within the project, the research focus demand and consumption focuses on the question how consumers' meal choice can be influenced by gastronomy in such a way as to motivate consumers to choose resource-light dishes containing few or without animal products more frequently.

2 RESEARCH QUESTIONS

This paper aims to summarise relevant literature for the project NOVANIMAL in two research areas, meal choice and meal offering. An exploratory review was conducted, which raises no claim about completeness of the literature discussed. Separate research questions were formulated for the two research areas: meal choice and meal offering.

2.1 MEAL CHOICE

In this research area, the project NOVANIMAL aims to assess consumer demand for innovative, resource-light meals; to assess consumers' reasons for meal choice and their satisfaction; and to test possible interventions in a field experiment.

Correspondingly, the research questions for this literature review were chosen as follows:

- What motives and decision criteria (e.g. attitudes, values, knowledge, preference) and what situational and structural facilitators/constraints are crucial for consumers' choice of animal products in meals in away-from-home settings, and how strong are these influences?
- What interventions regarding changing meal choice are effective and how much?

2.2 MEAL OFFERING

In this research area, the project NOVANIMAL aims to understand meal production decisions of chefs and strategic decision makers (head chefs, catering managers, restaurateurs) in catering, and to find out how to improve operating parameters and foster professional ambitions to prepare attractive dishes without or with fewer animal products.

Correspondingly, the research questions for this literature analysis were formulated as follows:

- What motives (e.g. personal preferences/habits, curiosity, professional ambitions, client orientation, values) are taken into consideration about working preconditions (e.g. their know-how, infrastructure, guidelines, trends/social norms) are crucial for meal planners?
- What forms of interventions are suitable to change meal planning and meal offering towards few or no animal products?

3 METHODS

A non-systematic, explorative literature review was conducted. The first step focused on textbooks, literature reviews and meta analyses as well as publications from the proposal and from team members. Then a literature search was conducted, based on various combinations of the following keywords:

- diet*, diet change, dietary choice, eating behaviour, eating habits, food consume*, menu*
- vegetarian*, vegan*, plant-based diet, meat consume*
- motives, habits, food preference*, eating attitudes
- interventions
- chef*, professional identity, habitus, professional socialisation

Databases searched were PsycINFO, ERIC, MEDLINE, Econlit, Sociological Abstracts. Abstracts found were then screened. Basically, English and German literature about the above topics was chosen. Where the literature was abundant, it was narrowed down to away-from-home consumption (i.e. restaurants, canteens, takeaways).

Research was excluded if it contained only evidence of nutrition intake, calorie-related behaviour change, obesity prevention, nutritional or health claims, or other health-related topics. Also, studies about specific motives or values like animal welfare, ecology, sustainability or climate-friendly foods were not favoured. Instead, studies comparing several motives were included. Studies focusing on demographic differences in food behaviour were also not reviewed. Some relevant publications or scholars have been identified in a second step when reading the first selection of literature.

4 RESULTS OF MEAL CHOICE

In this chapter, results relating to influences on meal choice and conclusions for interventions are presented. These two topics are organised into two sections. However, the results are not really separable, because much of the evidence of meal choice results in intervention know-how, and intervention studies reveal the influences on meal choice.

4.1 FACTORS EXPLAINING MEAL CHOICE

"Meal choice" itself was not found as a result of the literature search very often. Much of the literature is about "food choice" in general. This also relates to single meal components or raw products. It is noteworthy that many studies conducted in university canteens investigate choice of items, because this is the way food is served in these settings in many countries. In other cultures, canteens offer more complex meals, or buffets from which to choose more freely.

The initial results discussed here relate to single influences on dish choice or food choice (section 4.1.1 and 4.1.2). Then, studies comparing several influences are presented (4.1.3).

Many authors have tried to structure influences on food choice. For example, Rozin (2006) lists biological factors (physiological and evolutionary-adaptive), psychological factors (preference, attitudes, evaluations, knowledge, habits), social factors (norms, social situation) and cultural factors. In order to structure this review according to the research questions, these factors are divided into personal (section 4.1.1) and contextual (section 4.1.2) factors.

4.1.1 Personal factors influencing meal choice

Four clusters of personal influences on food choice were found to be relevant: preferences and habits, knowledge and abilities, values and attitudes, emotions and moods.

Food preferences and habits
Preferences for foods are partly learned, partly innate. For example, preferences for calorie-rich food are innate and universal (Perry & Grace, 2015), and the functionality of these preferences have become dangerous in an environment of abundance. Craving for fat, sugar and salt is particularly harmful if these ingredients are combined in a product.
There are some innate taste biases: the preference for sweet tastes (fruit) or fat, to avoid bitter (toxins), or and aversion to strong tastes like salt or sour

products. Sweet and fat preferences help in finding calorie-rich food. The smell system is much more open than the taste system and relies more on learning (Rozin 2006).

There are several forms of **learning processes** for food preferences (Yeomans, 2006). A simple but powerful form of learning is mere exposure. Repeated exposure leads to preference for familiar stimuli. Secondly, we learn from the evaluation of consequences of flavours (via conditioning). Other forms of learning referring more to the context of the situation (e.g. social learning) are discussed in section 4.1.2.

Food-related learning processes mostly happen in childhood, but are also possible anytime in human lifespan (Aldridge et al., 2009). Preferences are a combination of liking some foods, and disliking others, in particular **unfamiliar foods**. There is a line of research on "picky" or selective eating (refusal to eat foods even after tasting them) and **food neophobia** (general refusal of new foods). Although these are conditions with specific diagnoses, mild and subclinical forms of neophobic reactions can still be a barrier to healthy eating, and are even perceived as such by the picky eaters (Kauer et al., 2015). Picky eaters' diets are particularly low in vegetable, fruit and fish (Zickgraf & Schepps, 2016).

New foods can cause anxiety and suspicion. Therefore this evolutionary mechanism protecting children from eating harmful things, is particularly strong in the first 2 years, and neophobia declines during childhood, under the condition that enough choice alternatives are available. Interestingly, whereas neophobia in general increases with age, willingness to try novel ethnic foods also increases with age (Pliner & Salvy, 2006).

Important influences on neophobia are, for example, direct and indirect information about familiarity, taste and beneficiality, social influences, novelty of the situation and arousal (Pliner & Salvy, 2006). Aldridge et al. (2009) distinguish between visual familiarity, taste familiarity, context familiarity (presentation of food), and categorical familiarity (type of food).

Neophobia is treated like many other phobia via unforced exposure and enabling positive experiences. Providing samples of new foods can stimulate choice of unfamiliar non-fat or fruit or vegetable products in Dutch neophobic young adults (Schickenberg et al., 2011). However, research on interventions in this field are sparse (Zickgraf & Schepps, 2016).

Besides the preference for single foods, there is a preference for compositions of foods. Scholderer et al. (2015) focus on the **acceptability of whole meals** (complex meals). They divide research on the acceptability of complex meals (fit of meal components) into four streams.

1) Studies predicting the overall acceptability of multi-course canteen meals from the acceptability of their component
2) Sensory evaluations of specific product-product combinations
3) Investigations of situational influences on food choice and consumption
4) Studies of the «fit» between the meal centres, side dishes and beverages that constitute a complex meal

The authors follow the latter research strand, and they propose a new method for evaluating meals, so called "meal mapping". The fit between "meal centers" and side dishes is investigated. Knowledge of preferred combinations can be used to adjust meals and create more sustainable offerings. These results are not discussed here any further, because this knowledge is well covered in the research project team.

Knowledge and abilities.
Consumer choices are becoming increasingly complex, not only with regard to taste and preference, but also health, ecological and ethical considerations have to be taken into account when choosing foods. Therefore adequate knowledge is regarded as a necessity - though not sufficient - precondition of healthy or sustainable food choice. Not surprisingly, a lack of knowledge has been found to be one of the top reasons for not adopting a plant-based diet (Lea et al., 2006). A probably more important function than the directly observable influence of knowledge is its significance in the formation of values and attitudes (see next section).

However, knowledge of nutrition is often insufficient. For example, in Switzerland nutritional knowledge is particularly low in men and in adolescents, as well as in people of lower education (Keller et al., 2012). Several myths are very popular, for example that brown sugar is more healthy than white sugar, that fat is generally unhealthy, and the relevance of dairy products for a healthy nutrition is overrated.

There is growing evidence, that for food choices, simple heuristics are often used to reduce complexity (Scheibelhenne et al., 2007; Schulte-Mecklenbeck et al., 2013). Some strategies for simplifying food choices towards desired behaviours are summarised by Sobal et al. (2006, see Table 1):

Table 1: Strategies for simplifying food choice summarised by Sobal et al. (2006)

Strategy	Example
Focusing on one value (e.g. emphasize only cost, taste, etc.)	Eat the cheapest food whenever possible.
Routinisation (standardise, systematise, ritualise)	Eat cereal every day for breakfast.
Elimination (avoid, exclude, prohibit)	Never eat desserts.
Limitation (restrict, regulate, reduce)	Drink only two cups of coffee each day.
Substitution (replace, exchange, fill in)	Choose brown rice instead of white rice.
Addition (augment, include, enhance)	Eat a salad with every evening meal.
Modification (alter, adjust, transform)	Remove fat from meats and poultry.

Abilities have often been discussed in the context of behavioural control (i.e. being able to perform a desired behaviour), for example, in the context of the Theory of planned behaviour (e.g. Ajzen, 2015), which is discussed in the next section.

Values and attitudes

Eating values and attitudes have often been studied within the framework of the theory of planned behaviour (e.g. Ajzen, 2015; cf. Conner & Armitage, 2006). In a meta-analysis of studies on discrete food choices that used the Theory of Planned Behaviour (McDermott et al., 2015), attitudes had the strongest association with behavioural intentions, followed by perceived behavioural control, followed by social norms. However, the impact of perceived control was lower for avoiding unhealthy foods than for including healthy foods into a diet.

An extremely important set of values and attitudes concerns health. In health psychology - besides the Theory of Planned behaviour - the Health Belief model (cf. Rosenstock, 1974) and the Protection Motivation Theory (Rogers, 1975) are most prominent. In the Health Belief Model, perceived susceptibility as a threat, along with perceived efficiency of behaviour and a cost-benefit-analysis, determines the behaviour. The Protection Motivation Theory adds perceptions about one's own competences for actually performing the behaviour (self-efficacy).

With regard to ecological values, the Norm Activation Model (Schwartz, 1977) was applied: Here, existing moral norms are a precondition. Based on this, a feeling of responsibility has to be developed, which then has to be weighted with cost considerations. For this, the consequences of an individual action (e.g. eating less meat) has to be linked to positive environmental effects, and the ability to perform the action has to be perceived. All of the models discussed so far are based on rational choice assumptions.

A conceptual model explaining the role of values in the food choice process has been proposed by the research group of Sobal, Conners, Furst et al. and tries to describe the personal food system and the food choice process (figure 1, e.g. Sobal et al., 2006; Connors et al., 2001; Furst et al. 1996).
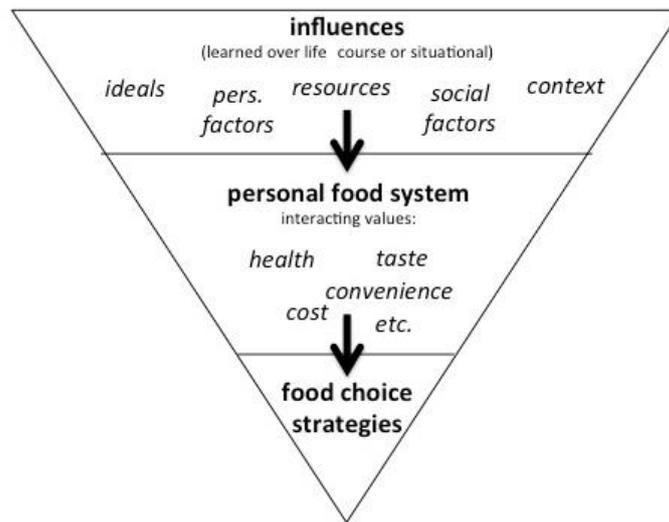
Figure 1: The food choice process model by Connors et al. (2001, simplified illustration)

This model attempts to explain both habitual behaviour as well as reasoned decisions. The authors consider food choice to be the result of several influences, which shape the personal food system. These influences are acquired over a life span along with eating experiences, but also arise from the eating situation itself. They determine the relevance of several values included in the personal food system (e.g. taste, cost or health). Based on this, decision strategies (including heuristics) are shaped. Influences include personal and social/context factors. Among personal factors are perceptions of "ideal" foods for certain situations (e.g. festive dishes containing meat). Social factors relate to the eating situation itself (company) but also eating norms learned in the family during childhood and later as part of cultures and subcultures.

Emotions and moods
One aspect why behavioural models like the Theory of Planned Behaviour have been criticized (not only in the context of eating behaviour), is the fact that emotions or affect are not included (e.g. Köster, 2009). Since taste and pleasure rank so high in food choice motives, explanatory models are needed, which do not merely subsume emotions or experience of pleasure as one of several evaluative components of attitudes formation, but can address them more specifically.

Emotions are relatively short-term affective responses to external events and stimuli. Moods on the other hand are less intensive arousal states, less related to objects and last several minutes or longer. The term "affect" is often used for both emotions and moods.

Emotions have several ways of affecting behaviour (Artho & Jenny, 2016):

- **Attention** is drawn to objects with high (positive or negative) emotional relevance
- Emotionally charged contents are **remembered** more easily, and emotions affect the retrieval of memories
- Emotions are used to make **judgments and decisions**, in particular positive emotions in situations where automatic thinking dominates (affect heuristics: what feels good is good)

One of the conceptual problems with affects and moods is the fact that they are both antecedents and outcomes of food consumption (Gibson, 2006) – in the second case they have an important evaluative function for further (e.g. corrective) food consumption decisions.

Food choices are often instinctive, quick and emotional. Negative emotions as well as positive emotions can promote unhealthy eating (Bublitz et al., 2010; Perry & Grace, 2015). People eat in response to stress or frustration ("comfort eating"), but also feeling good (e.g. in a social situation) can promote over-consumption.

Hunger or eating affect mood if accustomed meal size or eating times are changed or not optimal (e.g. post-lunch dip). Furthermore, not only eating behaviour, but also expectations affect mood (Gibson, 2006). Food disgust and pleasure are nowhere as pronounced than with meat (Rozin, 2006). Taboos on meat products or eating meat at all are very common, and while steaks are one of the most favoured foods, intestines, offal and skin can cause disgust. Expressions about meals' deliciousness were analysed by Ariyasriwatana and Quiroga (2016) on a social media platform. They found pleasure to be related to: sensory qualities, culinary aspects (related to cooking), matters of the heart (affection, mood, craving), health, personal signature (humour, communication), consumer insights and the restaurant.

4.1.2 Context influences on meal choice

Contextual variables can have large effects on eating behaviour and product appreciation/acceptance. For example, the décor and background music determines well-being and thus the time spent on eating (Meiselman, 2006). For food choice in particular, the most relevant context attributes are choice itself (availability), restraints/facilitation on price, and social context (e.g. number of present people). Sometimes the food context (meal composition), which have been discussed above under "preferences" are regarded as context variables (Meiselman, 2006). Interesting is the research on the context of food presentation (menu displays, food counters etc.).

Price and convenience

Price is an important influence on food choice, but is not discussed here in detail, because the intervention strategies in this project exclude financial measures. Important cognitive processes are firstly awareness of the price, and consequently the comparison of price information to earlier or current reference points and integration with other product information. Interestingly, there is always a considerable portion of consumers who make choices based on an unawareness of product prices (Grunert, 2006).

One of the most widely neglected influences on food choice is availability (Rozin, 2006). Many decisions are made out of convenience (e.g. a shorter line at the food counter).

Aesthetic presentation

A further important influence is the design of the menu display. This involves placement on the menu, labelling of items, or item description. The first two criteria focus on getting the customer's attention. Detailed descriptions seem to have a positive effect on value perceptions. Further design elements like highlighted or coloured text, photos, boxes, etc. seem to have a positive effect on item choice.

Social and cultural norms

A review of experimental studies on social eating norms (Robinson et al., 2013) showed that high intake norms as well as low intake norms affect eating behaviour, i.e. amounts as well as type of food eaten. With regard to food type, social norms promoted food choice (choosing low-energy food, intentions to eat fruit and vegetables) but also inhibited food choice (behaviour conducted by a socially undesirable group). People learn from others and take over the eating behaviour of their peers or partners (Rozin, 2006). This occurs even in extreme situations (hunger, fullness). Depending on whether eating much or little is culturally and socially accepted, people will eat the according amount. Historically, overconsumption was a privilege of the wealthy, but this is no longer the case (Perry & Grace, 2015).

4.1.3 Comparative evidence about several influences

As discussed thus far, motives for food choice are manifold, ranging from sensory qualities, hunger and appetite to rational concerns about health and fitness, to context variables such as availability, economic situation, cultural and social influences, personal habits, preferences (e.g. based on personality or past experiences) across a wide range of values (ecological, ethical, status, beauty) to religious, spiritual and magical influences (Pudel & Maus, 1990). Not surprisingly, simple approaches to explaining food choice have failed. Other authors have tried to incorporate many influences, e.g. Köster (2009), who outlined the manifold influences on eating behaviour (Figure 2).
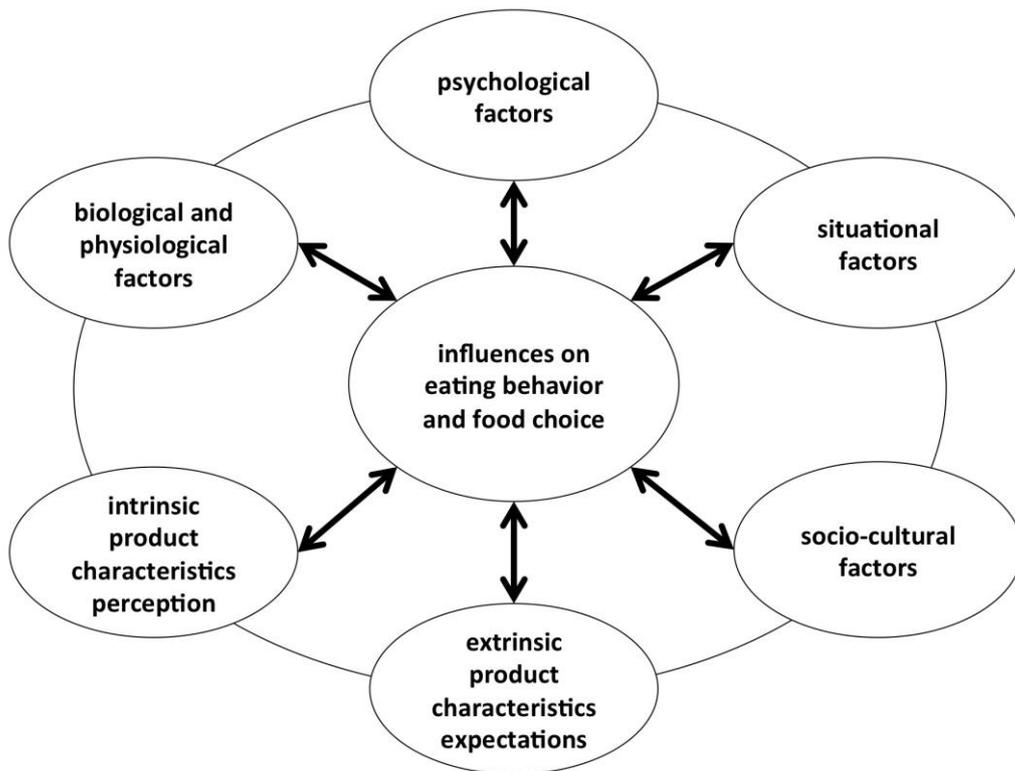
Figure 2: Factors influencing eating behaviour and food choice: a simplified version of Köster's (2009) model

In this model, eating behaviour and food choice is influenced by biological and physiological factors (e.g. genetics, age, physical condition), psychological factors (e.g. learning, personality, cognition, motivation), situational factors (e.g. time, surroundings, habituation, coping), socio-cultural factors (e.g. economical influence, trust in industry, norms), extrinsic product characteristics expectations (e.g. brand label, sustainability, risk perception), and intrinsic product characteristics perception (e.g. appearance, smell, complexity, aversion, boredom). Köster accordingly proposes multi-disciplinary research to explain food choice which is less reductionist, but more observational and deductionist in nature, and which includes data integration from at least two areas of the circle of figure 2.

General motives for food choice
Studying motives is one approach to comparing different influences on meal choice or food choice in general. However, motives are usually reported by participants and could be subject to social desirability. Several instruments have been developed with the intention of measuring various food choice motives simultaneously. Some examples and their results are described here:

Sprösser (2011) developed The Eating Motivation Survey (TEMS), consisting of the following 15 categories (in descending order of motive prevalence):

1. liking (appetite, taste)
2. habits
3. need & hunger (energy, filling)
4. physical well-being (nutrients, energy, balanced)
5. convenience
6. pleasure (reward, enjoyment)
7. traditional eating
8. natural concerns (e.g. organic, production, transport, fair trade, harmful substances)
9. sociability
10. price
11. visual appeal
12. weight control
13. affect regulation (frustration, sadness, stress)
14. external demands (politeness, no time/opportunity)
15. social image.

Sautron et al. (2015) developed an extensive food choice motive questionnaire and tested it on 637 French adults. Their primal motive was taste (8.8 on a scale from 0 to 10), followed by health (7.5), local and traditional production (7.4), absence of contaminants (7.3), and price (7.2). Moderately important were ethics and specific environmental concerns (waste, pollution, impact, fairness; 5.9), and convenience (5.1). Rather irrelevant was innovation (3.7) and general environmental values (3.0).

Steptoe, Pollard & Wardle (1995) developed the "Food Choice Questionnaire" (FCQ) from the data of 358 adults. They found the following factors (in decreasing order of importance): sensory appeal, health, convenience/price, natural content, weight control, mood, familiarity and ethical concern. Women rated health equally important as sensory appeal, and scored higher in ethical concerns.

Motives for meat consumption
Not surprisingly, there seems to be a large portion of passionate meat-eaters in the population who are strongly unwilling to reduce their meat consumption (cf. Graça et al., 2015; Kamm et al., 2015; Tobler et al., 2011). For example, in the Swiss study by Tobler et al. (2011), which is based on the Transtheoretical Model (Prochaska & Velicer, 1997) of behaviour change, the following proportion of respondents were in the respective stages of changing their behaviour to "eat less meat (maximum once or twice a week)":

- 36% pre-contemplation stage (no intention, lack of motivation or ability)
- 5% contemplation stage (intention formation, cost-benefit considerations)
- 11% preparation stage (concrete plan of action)
- 50% action stage (behaviour change)

This means that half of the respondents already perform such behaviour, and the third have no intention of changing their behaviour. In particular, men were more likely to be in the pre-contemplation stage, and women in the action stage.

People use rationalisations to defend their meat consumption and resolve cognitive dissonance (e.g. between loving animals and eating meat). **Rationalisation** strategies are used when behaviour is criticised or one's self-image is threatened (Piazza et al., 2015). Thus feelings of guilt are involved. Rationalisations work best when actors themselves are convinced by them. Therefore, challenging arguments are often overlooked or dismissed. This leads to an overestimation of the evidence favouring one's position ("myside bias" or "belief overkill", see Piazza et al., 2015). According to them, four main rationalisations are common (the four Ns - the first three Ns are common in other fields for justification (e.g. slavery, sexism, etc.), the fourth was proposed by the authors):

- eating meat is **natural** (biology, evolution)
- eating meat is **normal** (social norm in western cultures)
- eating meat is **necessary** (proteins needed for strength & health)
- eating meat is **nice** (taste)

Their results suggest that necessity is the most common rationalisation (around 40%), followed by naturalness (around 20%), niceness (17%), and norm (11%). Vegetarians and restricted omnivores regarded eating meat as "natural", but not so much necessary, normal or nice.

Vainio, Niva, Jallinoja & Latvala (2016) applied the TEMS questionnaire (see above) to a Finnish sample of adults. The ranking of motives was very similar to those of Sprösser (2011), but changes between "beef only" consumers (no soy or bean products) and "no beef" consumer were evident: Beef eaters were less concerned about health, weight and nature, and they rated convenience and price more important than vegetarians did.

Motives for vegetarianism and veganism
Vegetarianism and veganism are commonly seen as behaviours based on a lifestyle or an enduring set of values. Lifestyles are important for identity building, and therefore the set of values has to be consistent with one's behaviour. Two motives were found to be dominant: health and ethical concerns (e.g. Jabs et al., 1998). Health-motivated vegetarians perceive a threat of disease or on the other hand, benefits.

Sometimes, weight-related motives are subsumed to health motives, in other studies they were treated separately because of the additional social component (Janssen et al., 2016). Ethical (or moral) reasons usually comprise animal welfare, animal suffering in farming, animal rights and speciecism (in a study of 329 German vegetarians; Janssen et al., 2016). Besides animal welfare (89%) and health (69%), a third, less prominent or still somewhat unclear motive turned out to be environmental (ecological) reasons (47%). They include concerns about general resource scarcity, specific resource destruction or environmental sustainability. Sometimes, these reasons are subsumed under ethical. Motives of minor importance are distaste, religious motives, hygiene and social reasons (Janssen et al., 2016).

Mäkiniemi and Vainio (2014) found that vegetarian students don't perceive barriers against climate-friendly consumption as relevant as other participants, in particular lack of knowledge, high prices, lack of time or difficulty. So meateaters are higher in perception of these barriers, too. This suggests some starting points for interventions, however, some of these barriers are difficult to overcome.

Vegans are motivated mainly by ethical (animal-related) reasons, secondarily by health and well-being, and then by environmental and other reasons (Janssen et al., 2016). Other studies found environmental reasons to be the second most important. However, multiple motives (ethical/environmental and self-related reasons) were most common, thus strict segmentations of consumers based on the most prominent motive is not useful (Janssen et al., 2016).

Adopting a different diet
The process of changing to a vegetarian can be gradual or abrupt (Jabs et al., 1998), gradual change being more common. With health-motivated vegetarians, the adoption occurred either due to diagnosed diseases (more likely in older people, heart diseases and high cholesterol being the main diagnoses) or for preventive reasons: They intend to avoid future chronic diseases (more likely in younger people), and these decisions are sometimes triggered by health problems of relatives.

Ethical adoptions sometimes occur abruptly in childhood, by making a connection between food and animals. Adoptions in adulthood occur with life transitions (e.g. having a pet, moving to a different area, changes in social relations) or due to new information about animal welfare. Gradual transitions usually occur in a typical order by first eliminating red meat, then fish and chicken, and last dairy products and eggs. People refer to it as "an evolutionary process" or a "journey" (p. 199). Thus ethically motivated vegetarians are more likely to progress to veganism than are health-motivated vegetarians (Jabs et al., 1998).
The transition from one vegetarian diet to another is induced by either physical aversion, significant life changes or new information. Information is either tangi-

ble (from media etc.), or from one's own physical feedback, for example intolerance with health-motivated vegetarians or disgust for meat with ethically motivated vegetarians (Jabs et al., 1998).

Flexitarianism

Different modes of flexitarianism were explored in Dutch consumers by Dagevos and Voordouw (2013) in order to assess the potential of meat reduction. They found that between meat-lovers (consuming meat 7 times a week, around 20 to 25% of consumers in two separate studies) and vegetarians (around 4% or consumers), there is a large (69% to 77%) portion of meat-reducers (i.e. flexitarians). They divided consumers into three subgroups:

- light meat reducers (eating meat 5 or 6 times a week, 30 to 35%)
- moderate meat reducers (eating meat 3 or 4 times a week, 25 to 30%)
- heavy meat reducers (eating meat 1 to 2 times a week, 10 to 15%)

This division has been conducted arbitrarily by the authors, and they admit that the grouping could be optimised, in particular also by not only including frequency information, but also portion sizes. The authors argue that the existence of such an extent of flexitarianism indicates a lot of potential, and that a "cultural dominance of meat" might not be very rigid.

Participants were then grouped by cluster analysis into 5 clusters:

1. Conscious flexitarians: active decisions, ethical and health concerns, personal norm, 70% female, high education
2. Unconscious flexitarians: low ethical and health concerns
3. Extravert flexitarians: reduce meat despite thinking it is a status symbol, younger, health concerns, origin of food is important
4. Disengaged meat-eaters: routinely eating meat, but no particular attachment to it, no moral or personal concerns
5. Meat lovers: no intention of reducing, 62% men

These clusters fit well within the frequency groups above (extravert and unconscious flexitarians constituting the group eating meat 3 to 4 times a week). The authors note that most meat-reducers did not identify themselves as flexitarians, but rather meat-eaters. Also, quite strong changes within the groups during the course of 2 years were found. There is similar evidence from Switzerland that eating attitudes about eating can change significantly within a few years (Siegrist et al., 2015).

A second interesting result from Dagevos and Voordouw (2013) concerns the per-ceived hierarchy of foods by meat-eaters and meat-reducers. Participants were asked to rank 15 protein-rich foods (Table 2). Meat and animal-products are at the top 10 positions for meat-eaters. However, meat reducers firstly replace the rank 1 and 3 by non-meat animal products (cheese and eggs), and secondly, plant-based protein products like nuts, mushrooms and pulses rank among the top 7. Meat-substitutes are only slightly more popular than with meat-eaters, but on the other hand, hamburgers, hotdogs and pork chops rank very low.

Table 2: Hierarchy of foods (Dagevos & Voordouw, 2013)

Hierarchy of foods by heavy meat-eaters	Hierarchy of foods by heavy meat-reducers
1. Chicken (breast)	1. Cheese / Cheese products
2. Beef	2. Chicken (breast)
3. Meatball	3. Egg
4. Chop (pork)	4. Salmon
5. Egg	5. Mushrooms
6. Cheese / Cheese products	6. Nuts
7. Fried fish fillet	7. Pulses
8. Salmon	8. Beef
9. Hamburger	9. Fried fish fillet
10. Minced-meat hotdog	10. Meatball
11. Mushrooms	11. Vegetarian meat substitute
12. Nuts	12. Hamburger
13. Pulses	13. Tofu
14. Vegetarian meat substitute	14. Chop (pork)
15. Tofu	15. Minced-meat hotdog

In an exploration of meat reduction strategies in Dutch consumers (de Boer et al., 2014), meatless meals were appealing to a majority, with only 23% not wanting to change their behaviour. Strategies like smaller portions and meatless days, in combination with more vegetable protein seemed promising, but to dif-ferent consumer segments. Meat substitutes were most often fish (76%), eggs (49%) and cheese (34%), and only 26% substituted meat by meat replacers. Meat replacers seemed not to be familiar to many consumers.

4.1.4   Summary of key results about influences on menu choice

The research question about the strength of motives, decision criteria and situa-tional/structural facilitators or constraints for consumers' menu choice can be answered as follows:

- The most important motive for food choice is **taste**, and secondly **health** considerations. Price and convenience usually rank somewhat lower, and environmental concerns and ethics are of mixed (minor or moderate) importance.
- **Positive emotions** should be evoked to increase attention to options without animal products, to stress tastefulness and to remember existing information, values or norms (e.g. health).
- **Knowledge** about food is relatively low and many consumers seem to simply not care a lot about nutrition. In particular, meat eaters feel that a lack of knowledge keeps them from eating more sustainably. Adding descriptions to foods might also increase their perceived value. Consumers use heuristics to simplify food choices.
- The results about food neophobia suggest two things: First, that **familiarity** is an important component of food choice. In particular, meat replacers are not well known, and information should be provided or experience enabled. Secondly, repeated exposure can increase familiarity and with it, acceptance of new foods.
- Meat lovers stress the necessity to eat meat (the feeling **that proteins are needed** for health and strength). Increasing knowledge is probably not sufficient, but also perceived richness of vegetarian or vegan meals should be increased.
- Important context influences are availability and convenience. Meat eaters are more concerned about **convenience** (time and difficulty), so vegetarian alternatives have to be presented as easy and quick.
- There is **potential for meat reduction** in certain groups. Possibly more than 50% of people are expected to be basically open for behaviour change, consisting of routine meat eaters who are not particularly attached to meat, unconscious light reducers with low ethical or health concerns, and conscious reducers who might be willing to reduce even more. Between 20% and 25% of the population (results from three Dutch studies around 2010) is expected to consist of passionate meat lovers who are not be willing to lower their meat consumption
- **Diet changes** can occur in a relatively short time, but gradually. Consumers first reduce their consumption of red meat, then chicken, fish, and last eggs and dairy products. So interventions reducing red meat might be promising in target groups with high meat consumption, whereas in light reducers, additional reduction of chicken and fish might be the next acceptable step. Motivations for making the step from vegetarian to vegan diets are mostly supported by animal welfare values. Good starting points for diet changes are life changes (e.g. a new work environment, so interventions to reach first visitors of canteens should be considered).

4.2 EFFECTIVENESS OF MEAL CHOICE INTERVENTIONS

Based on the results discussed thus far, it became evident that the intervention strategies used most often – informational measures targeting deliberate decisions – have limited effect in the field of food choice. However, food choice interventions are much more varied than this.

As theoretical bases underlying behaviour change interventions, psychological process models of individual behaviour change are often used. Among them the aforementioned Transtheoretical Model (Prochaska & Velicer, 1997), or similar to this, the Rubicon Model of action phases by Heckhausen & Gollwitzer (1987), which both regard behaviour change a process following a strict sequence, during which different kinds of interventions are possible.

4.2.1 Overview over interventions for behaviour change

There are several possible sources to structure interventions into type segments. Mosler and Tobias (2007) divide intervention instruments to change ecological behaviour in to four sections, of which three are relevant for this project (population based measures are not reviewed). These types largely correspond to the structure used for behaviour influences in section 4.1 in this working paper.
- **person focused interventions:** targeting motivations, beliefs and decisions (e.g. attitudes, values, norms; i.e. mostly promoting willingness to change the behaviour)
- **structure focused interventions:** targeting preconditions of the behaviour (e.g. availability, controllability/constraints, providing resources and infrastructure, i.e. mostly promoting the ability to change behaviour). For these projects, only measures are relevant which do not significantly constrain options or offer strong financial incentives.
- **situation focused interventions:** targeting behaviour more directly (e.g. breaking habits, reminders/prompts to activate existing values/norms, goal setting, feedback).

4.2.2 Nudging strategies

More relevant in the context of the research questions for this paper - which exclude financial measures, policy instruments or larger or social interventions, but rather are directed to individual decisions and behaviour - is the research around interventions that have lately been subsumed under the term "nudge strategies". "Nudging" is a relatively new term of increasing popularity in behaviour change settings and public policy. It is an umbrella term for several strategies which alter the environment in order to make certain options more likely to be chosen (Arno & Thomas, 2016).

A nudge is defined as "any aspect of the choice architecture that alters people's behaviour in a predictable way without forbidding any options or significantly changing their economic incentives" (Thaler & Sunstein, 2008). The manipulations maintain the freedom of choice and the autonomy of the person making the choice. Therefore they have often been labelled as "libertarian paternalism". Strategies that either change economic incentives or restrict behavioural options are not regarded as nudge strategies (Artho & Jenny, 2016). The effective mechanisms of nudges are mainly heuristics (rules of thumb for behaviour) and systematic biases in information processes like perception, memory, thinking or judgement; cf. Artho & Jenny, 2016. Behavioural economics has lead in this research for many years, and still is.

In the field of health-related behaviour, Hollands et al. (2013a) define choice architecture interventions (in micro-environments) as "interventions that involve altering the properties or placement of objects or stimuli […] within the same micro-environment as that in which the target behaviour is performed, typically require minimal conscious engagement, can in principle influence the behaviour of many people simultaneously and are not targeted/tailored to specific individuals" (p. 3).

Although nudge strategies are numerous and often combinations of measures (Artho & Jenny, 2016), Wilson et al. (2016), make an attempt of structuring nudging strategies (see Table 3).

Table 3: Nudging categories according to Wilson et al. (2016), based on Blumenthal-Barby and Burroughs (2012)

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

Only part of nudges are aimed at choices, and only part of them are manipulative. Hansen & Jespersen (2013) divide nudging strategies according to two dimensions:

1) **Mode of thinking:** automatic or reflective (according to Dual Process Theory by Kahneman, 2011)
2) **Transparency:** degree to which the intention behind the intervention and its means are evident

26

Automatic thinking is uncontrolled, effortless, associative, unconscious, skilled and fast. Reflective thinking is controlled, effortful, deductive, self-aware, rule following and slow. Automatic thinking operates on its own, whereas reflective thinking depends on different premises and contexts (which in turn can be based on automatic thinking). Most behaviours can be a result of any mode of thinking. Many food choices are made automatically. As Wansink (2014) states, we are "mindless eaters" and make up to 200 almost unconscious food choices each day.

Nudges always affect automatic modes of thinking (and therefore influence behaviour directly), but they can also affect reflective thinking, for example by influencing attention and other premises of reflexive thinking. In turn, reflective thinking can be a by-product in automatic transparent processes and allow for reconstructing ends and means. Table 4 shows the two dimensions and example interventions for food choice interventions.

Table 4: Categorisation of nudges (cf. Hansen & Jespersen, 2013)

Reflective & transparent: **Facilitation of a decision consistent with self-image and reflected values/preferences** e.g. climate or calorie information, warning of negative health consequences, prompts, making actions or preferences salient (green arrows), social comparison, commitment	**Reflective & non-transparent:** **Manipulation of a decision** **(Indirectly via reasoned action)** e.g. clever wording, framing, adding irrelevant alternatives, highlighting items, promoting affective decision-making, using lotteries as incentives, suggesting scarcity or popularity
Automatic & transparent: **Influencing behaviour directly (technical manipulation)** e.g. missing signs at meat counter; playing agreeable music for evoking positive emotions, express line for vegetarian dishes, explicit visual illusions, green/red lights	**Automatic & non-transparent:** **Manipulating behaviour** e.g. decrease plate size (anchoring), transparent bowls, implicit visual illusions, changing defaults (from opt-in to opt-out), change order of food counters (proximity)

Artho & Jenny (2016) recommend the following procedure for using nudge strategies:

1. Situation analysis to find out whether the action decision is made automatically or reflectively. Aspects like motivation, ability or opportunity for reflective behaviour should be considered.
2. Decide at which point mechanisms and emotions are effective. For example with automatic behaviour, emotions generally affect behaviour directly.
3. Analysis, which basic rules could apply in the specific situation (see set of rules, mechanisms and effects in Artho & Jenny, 2016, Appendix). All of these analyses should be well supported and preferably be empirical.
4. For interventions that use heuristics and biases, experts from behavioural economics, psychology or marketing should be consulted.
5. Check measures for possible unintended negative effects (based on heuristics, biases and emotions).
6. Reflect on objectives and legitimation of measures in general and nudge strategies in particular

4.2.3 Evidence of effectiveness of meal choice interventions

Some of the effects of nudging strategies are impressive (cf. Artho & Jenny, 2016), and these instruments seem promising in particular where conventional measures like information have failed (Perry & Grace, 2015). However, to date there is still little systematic evidence on the effects. In this section, mainly reviews on intervention types are reported, as well as a few single intervention studies and their effectiveness. Almost all of them can be considered as nudging strategies.

Reviews

Wilson et al. (2016) review nudge strategies using **salience** (i.e. accentuation; e.g. labels with calorie content, traffic lights) and **priming** (i.e. the facilitation or regulation of information processing through a preceding stimulus; e.g. visibility, accessibility, availability), as well as combinations of these strategies, which have turned out to be most effective. In the meta-analysis by Arno & Thomas (2016), nudging strategies for dietary behaviour in wealthy nations are reviewed (see Arno & Thomas, 2016, Table 1 for descriptions of the intervention strategies used in the 42 studies). They found an average 15% increase in healthy dietary behaviour based on nudging strategies. Interventions in the local food environment are reviewed by Penney et al. (2016). They intend to create a new socio-ecological framework that can account for intrapersonal, interpersonal, institutional, community and public policy level. Their paper outlines the research plan, and more results can be expected in the near future.

Wansink & Love (2014) review healthy menu strategies like **shifting attention**, enhancing taste expectations, and increasing perception of value. Shifting attention means increasing visibility of the dish or shifting attention away from default items (using graphic methods, dish order, recommendations). **Enhancing taste expectations** can be achieved by labels ("fresh", "light" etc.) or positive sensory, geographic, nostalgic or brand descriptives ("Grandma's homemade chocolate pudding", "succulent Italian Seafood", "Guinness and oysters").

28

Increasing perception of value may work by making it more difficult to compare prices, use of numbers ($25.00 suggests quality, $24.99 suggests good value), or changing quantity or variety of menu composition.

With regard to meat consumption, both readiness and awareness are low (Kamm et al., 2013). **Readiness** should be addressed via social norms (e.g. role models). **Awareness** should be increased in particular regarding "nose-to-tail" aspects. The study found that interventions trying to reduce consumption frequency are more powerful than intervention trying to reduce portion size.

In a review on workplace dietary interventions (Geaney et al., 2013), various effects of **dietary modifications** as well as **nutrition education** are measured, such as on health status and job satisfaction. Some studies reported changed dietary behaviour, but methodological limitations of the studies are also manifold.
Grieger et al. (2016) divided strategies to change food choice – as found in their extensive literature review - into reformulation strategies, substitution strategies, restriction/elimination strategies, supplementation strategies, and education/messages strategies. They found no one single effective strategy, but a number showed potential, including reducing **portion size**, and others, combining permissive and restrictive education messages.

Hollands et al. (2013a, 2013b) discuss changing choice architecture in micro-environments (i.e. small-scale physical and social environments). They review studies by intervention type and target behaviour. With regard to diet change, most interventions found used **labelling** or **sizing**. They did not encounter empirical studies on interventions altering social dimensions (e.g. social norms)
In general, they found several classes of intervention strategies (Table 5):

Table 5: Typology of choice architecture interventions (cf. Hollands et al., 2013)

Intervention class	Intervention type	Effects
Primarily alter **properties** of objects or stimuli	**Ambience** (aesthetic, atmospheric)	majority of studies report effects
	Functional Design (equipment like receptacles, or environment)	no consistent findings
	Labelling (apply information to product at point-of-choice)	multiple outcomes, no consistent pattern
	Presentation (sensory qualities, visual design of packaging)	no consistent overall finding
	Sizing (size/quantity of product)	majority of studies report effect
Primarily alter **placement** of objects or stimuli	**Availability** (add behavioural options)	effects, but often multiple interventions
	Proximity (make behavioural options easier / harder, reduce/increase effort, e.g. by layout)	variety of outcomes, majority of studies report effects
Alter both properties and placement of objects or stimuli	**Priming** (motivational, incidental cues in environment > non-conscious behavioural response)	multiple outcomes in many studies, no consistent pattern
	Prompting (non-personalized information to promote/raise awareness of a behaviour)	variety of outcomes, majority of studies report effects

Some of these strategies are discussed below in more detail:

Labelling

Providing information (e.g. by labelling) is widely used and researched, but has limited effects (Perry & Grace, 2015). In particular, understanding nutritional information is often problematic for some parts of the population.

Plate size

One of the most well known and also most effective interventions was reported by Wansink & Ittersum (2013), who tested the relevance of a plate size illusion on buffet food serving. Plate size serves as a visual anchor, and therefore food portions seem smaller on large plates. The study found stunning differences for the overall trays of food needed when either large (d = 29.2cm) or small (d = 24.6cm) plates were offered for different foods at a lunch buffet, such as salads, beef, fish or enchiladas. For all of these foods, significantly lower amounts of food trays were needed in the condition with smaller plates.
No difference was detected for soup, and people seem to actually have put more tacos on small plates than on large plates.

The implications for interventions based on these findings include: use smaller plates to reduce waste and food intake (and use larger plates for better nutrition). Thus near the healthy food items, larger plates should be positioned, and smaller plates near the unhealthy items. Similarly, Libotte et al. (2014) found effects of plate size.

Proximity

A re-arranged lunch line resulted in an increase of healthier foods (Hanks et al., 2012; Wansink & Hanks, 2013). The authors observed that participants simply selected the first food they saw.

Verbal Prompting

The effect of verbal prompts (i.e. requests or tips) to increase fruit choices was explored in a field experiment (van Kleef et al., 2015). Different prompts suggesting ordering a healthy side dish resulted in a significant increase in sales.

30

4.2.4   Summary of key results about meal choice interventions

The research question about the effectiveness of interventions to change meal choice can be answered as follows:

- As previously discussed, customers often use heuristics to simplify their food choices. Instead of letting them choose their heuristics, heuristics can be offered to them in interventions (nudge strategies).
- Some of the most effective interventions used proximity (convenience, e.g. choosing the first available food) and anchoring (e.g. by changing plate size) effectively. Smaller plates can be used to make portions appear bigger, and hence increase expectation of satiety.
- The results of labelling showed mixed effects, and labelling alone might not be a promising strategy.
- The same applies to prompts. They are helpful, but only in combination with other strategies, e.g. positive emotions, and increased convenience.

5 RESULTS OF MEAL OFFERING

5.1 FACTORS INFLUENCING MEAL OFFERING

Hardly any study was found to investigate the behaviour of chefs and decision-makers in the food service industry explicitly linked to reducing or replacing animal products (section 5.1.1.). More literature is available on healthy meal production in general, but this usually relates to multiple issues like salt, sugar, fat, or cholesterol reduction, increase of wholegrain products, or more generally to portion size or calorie reduction (section 5.1.2.). Hardly any of the found studies include environmental motivations for reducing animal products or increasing fruit and vegetables.

Offer of meat or vegetarian meals
Summers (2013) examined the offer of meat alternatives in schools. She first reviews US national school nutrition policies and programmes, programmes for offering meat alternatives and vegetarian meals. Then, in a qualitative survey, she explores school personnel's (cafeteria managers and workers, district-level personnel, food educators, food committee members; n=18) perceptions on providing vegetarian meals. Demand, presentation and community support were facilitators to serving vegetarian meals. Perceived key barriers were students' preferences, lack of familiar foods, greater food waste, negative parent attitudes, lack of training and resources, wrong labelling, students reporting hunger after vegetarian meals, and a possible drop in lunch participation.

In a third step, Summers examines barriers and facilitators for serving vegetarian option among district-level food service personnel: Facilitators are community support and involvement, demand, flexibility of guidelines, choice & variety, providing familiar options. Barriers for serving vegetarian meals were individual preferences, expected drop in participation, greater food waste, public opinion, negative staff attitudes, and costs.

5.1.1 Offer of healthy and climate-friendly food

Reichler and Dalton (1998) study US chefs' attitudes toward healthy food preparation (fat, salt, sugar and cholesterol reduction, fruit and vegetable increase, meat portion reduction, use of whole grains), and related knowledge. The majority of chefs believed that their customers do not care about dietary guidelines and nutrition, nevertheless, they felt responsible to offer healthy menus.

31

Another study by Condrasky et al. (2007) examined chefs' opinions about portion sizes, nutrition information and weight management. Influences on portion size were presentation of foods, costs and customer expectations. Further, chefs thought to serve "regular" portions, but the reported servings were 2 to 4 times greater than government standards. Results suggest that cultural norms for portion size influence the amount of food served on the plate.

In interviews with senior menu development and marketing executives of major casual dining and fast food chains in the US (Glanz et al., 2007), health and nutrition (i.e. low fat, low calorie, high fruit and vegetables proportion) was found to be rated important by a every fourth or fifth respondent. Obstacles for offering more healthy menus were increased preparation time, and high labour costs (training/skills).

In a study of US restaurant chefs' opinions about reducing calorie content (Obbagy et al., 2011; n=432), 93% of chefs estimated that calorie content could be reduced by 10-25% without customers noticing. Strategies for reducing energy were preferred to strategies for reducing portion size. Consumer demand was identified as the greatest barrier, followed by the need for staff skills and training, and high ingredient cost. Taste was rated most influential for success.

Ozdemir and Caliskan (2014) analysed in their literature review general issues of menu management. They point out that menu planning was traditionally a process relying mainly on chefs' gastronomic knowledge, but gradually expanding into aspects like availability and cost of menu items, profitability of items, and customer demand.

Customer expectations
In general, chefs are aware of environmental issues and express positive attitudes and their responsibility to offer healthy meals (e.g. Middleton 2000). However, they think that ultimately, customers should be self-responsible and not restricted in their choice. Middelton (2000) found in her study of chefs in Scotland that customer requests are perceived as the main barrier or reason to offer healthy menus. Similarly, Glanz et al. (2007) found "limited appeal" to customers to be an obstacle for creating healthy dishes.

Contextual factors
Among context factors, problems arise from additional storage requirements or storage problems like short shelf life of the produce (Glanz et al., 2007). Murphy & Smith (2009) examined supply chains in the context of touristic meal offerings (local products). The main obstacles in supply chains are perceived regarding knowledge, flexibility, and product quality.
Chefs' motivation to offer local products are freshness, enhanced dining experience (cultural context of foods), and rising popularity among customers. Chefs show a high self-perceived responsibility of chefs to communicate information

about their products and also educate their staff. At the same time, frustration about lacking governmental understanding of and support for culinary tourism was expressed (unnecessary regulations, a lack of marketing budget).

5.1.2 Summary of key results of influences on meal offering

The research question about the motives and considerations of chefs regarding menu planning for less animal products can be answered as follows:

- In general, chefs regard healthy and sustainable meals to be important, and feel they have the responsibility to offer a range of food accordingly. However, this should not lead to restriction of choice for customers. Also, chefs estimate that many customers do not care about eating healthy.
- Customer demand is one of the top priorities for chefs. This is associated mainly with tastefulness. Also, foods have to be familiar to the customer.
- Reducing portion size was not favoured by the chefs, because they expected the demand to drop. Chefs thought to serve "regular" portions, but the servings were bigger than recommended. In the view of the chefs, menus have to look rich and tasteful.
- A further obstacle to offer healthy meals is perceived as a lack of skills or training of the staff.
- Concerns of chefs about structural conditions relate to storage problems for fresh foods.
- No indications of social or cultural norms as obstacles to cook healthy and sustainable meals were found. Also, no threat to the professional self-image or dissonances to personal preferences were mentioned. Chefs were mainly concerned about lower demand and profitability.

5.2 INTERVENTIONS AND INNOVATIONS FOR MORE SUSTAINABLE MEAL OFFERING

In the course of this literature review, no specific literature about suitable interventions to change chefs' attitudes or behaviour to serve meals without or with less animal products were found. But there exists a field of research regarding optimising innovation processes in culinary settings in general.

5.2.1 Innovation management strategies

Culinary innovations are recognised as increasingly important, but research about it is relatively new and has emerged only around the turn of the millennium (Harrington et al., 2009). Harrington and Ottenbacher (2013; Ottenbacher & Harrington, 2007) describe how innovation processes in culinary setting can be managed.
Several innovation management models were found in Michelin-starred restaurants, which largely followed the process of idea generation – screening/business analysis – trial – concept development – testing – (training) – commercialisation.

This formal approach minimizes risks and is suitable for bigger changes. However, a proper balance of free-flowing creativity and management strategies is suggested. Differences were found in different cultures (countries) regarding the participatory nature in these stages, customer orientation, use of technology or science. The authors stress the importance of interaction with the customers and suppliers. The most popular sources of inspiration are shown in Table 6.

Table 6: Sources of inspiration for Michelin-starred chefs in Ottenbacher and Harrington's (2007) study

Source	Percentage reporting
Visiting colleague's restaurants	84
Cooking literature	75
New cooking technology	33
Visiting food markets	25
Cooking shows	17
Travelling abroad	17
Experiences from previous employers	17
Ideas from customers	17

Quick service restaurants chains apply a similar innovation management strategy (Ottenbacher & Harrington, 2009), but use more sophisticated market research strategies, testing and marketing plans. Here, the most popular sources of inspirations were suggestions from employees, and visiting upscale restaurants. Furthermore, current food trends were monitored through magazines, cookbooks, food seminars.

Similarly, Olsen (2015) discusses Design Thinking concepts in food innovation. She stresses three aspects: consumer empathy, visualization and rapid prototyping, and collaboration. First, it is important to know consumer demands and care about them. However, food innovation has always relied more on experts (e.g. producers) than on consumers. Rapid prototyping or experimenting (test-improve-retest) helps making mistakes as fast as possible, because visualisations and prototypes are much more tangible than ideas and concepts. Collaboration with producers and consumers can significantly contribute to innovation, but still closed innovation dominates over open innovation ("sharing-is-winning") in the food sector.

5.2.2 Systemic aspects of creativity and innovation

In contrast to this management-oriented view of innovation, Stierand et al. (2014) discuss the innovation process in Haute Cuisine taking socio-cultural dimensions into account.
The innovation process itself (i.e. performing tests and evaluations) is regarded by the interviewed chefs to be sequential and purposive and thus manageable. Creativity (i.e. expert creativity in this case, not team creativity) is described by the authors as a process not occurring sequentially, but in a more systemic way.

Innovation depends both on creativity and the social evaluation of the product. Creativity, on the other hand, is regarded to be intuitive and embodied, and not a manageable exercise. In this sense, creativity is something developing over many years, driven by the will to push the boundaries to reach perfection. Creativity is not needed here to solve problems, but to create surprises and pleasure.

Stierand et al. (2014) propose a systemic model of creativity and innovation in Haute Cuisine, which relies on interaction between chefs, customers, as well as guides and the culture and practices in their cuisines (see Figure 3). Chefs interact both with the culture ("domain" in the sense of Csíkszentmihályi, 1997) and the customers (the "field"). The restaurant guides are a player specific to Haute Cuisine. The authors point out that it would be promising to further investigate how successful chefs liberate themselves from their "inherited background" (culture).
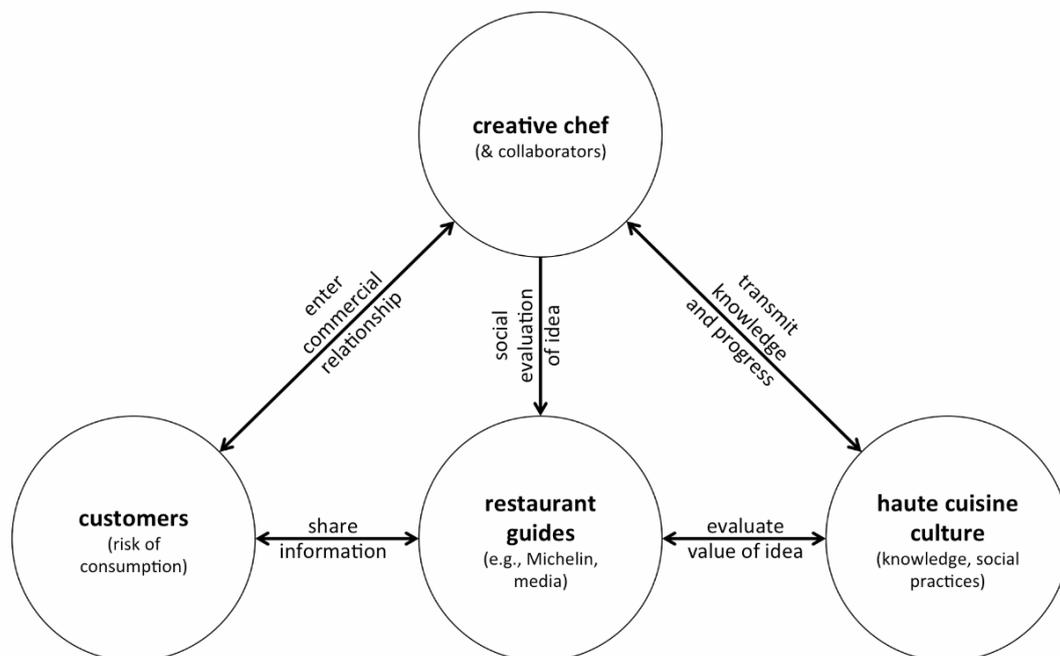

Figure 3: Systemic model of creativity and innovation in Haute Cuisine (Stierand et al., 2014)

The authors discuss significantly different operation preconditions and success factors in these types of restaurants. In comparison with the average restaurant Haute Cuisine relies less on efficiency, cost, suppliers and other factors. In excellent cuisine, beauty and emotions, novelty, and the will to create the ultimate experience are central. Therefore, the results may not be transferred to other chefs easily.

5.2.3 Acceptance of innovations

Even if chefs are able to create new dishes without animal products, innovations have to be made attractive to the customers. A possible theoretical framework

for this could be the Diffusion of Innovations Theory of Rogers (2003), although this theory is generally more population-related and focuses on different adopter types, and less on aspects of the innovation itself or its presentation. However, Rogers discusses preconditions for the knowledge acquisition and in particular a persuasion phase which relates to perception of characteristics of the innovation (see Table 7). These preconditions and characteristics can be used to facilitate the acceptance of innovations, e.g. trialability, observability, relative advantages, perceived complexity, compatibility with existing values, or norms of the social system or previous practice.

Table 7: Process of innovation adoption by Rogers (2003)

Process phase	Preconditions
0. (prior to adoption process)	Prior Conditions: - previous practice - felt needs/problems - innovativeness - norms of the social system
1. Knowledge	Characteristics of the decision-making unit: - socioeconomic characteristics - personality variables - communication
2. Persuasion	Perceived characteristics of the innovation: - relative advantage - compatibility - complexity - trialability - observability
3. Decision (adoption or rejection of innovation)	
4. Implementation	
5. Confirmation	

5.2.4   Summary of key results of meal offering interventions

The research question about interventions to foster meal planning and meal offering with less or no animal products can be answered as follows:

- Culinary innovations are improved through involvement of customers and suppliers. However, a sharing culture is rare in innovation processes. Although consumer demand is considered important, innovations rely more on expertise.
- In Haute Cuisine, a strong professional ambition and curiosity for exploring unusual things is evident. Chefs are determined to achieve the ultimate eating experience, create beauty, evoke emotions, and offer surprises rather than meet expectations. In restaurant chains, on the other hand, orientation to trends and market are dominant.
- Inspiration comes from professionals visiting colleagues and in particular upscale restaurants, and from reading professional literature.
- The innovation process in restaurant chains is managed straightforwardly and based on feedback from employees and market research, whereas high-starred chefs stress the importance of free-flowing creativity much more.
- In Haute Cuisine, a strong influence of the particular restaurant culture (i.e. knowledge and social practices) was found.

6 GENERAL DISCUSSION AND CONCLUSIONS

6.1 MEAL CHOICE

Within the research area meal choice, the project NOVANIMAL intends to assess consumer demand for innovative, resource-light meals, to assess consumers' reasons for meal choice and their satisfaction, and to test possible interventions in a field experiment.

Food choice is based on many influences acquired through life experiences, and such long-term influences like values and social or cultural influences are not easily or rapidly changed. So for short-term interventions, **transfer of new knowledge** (for example about meat replacers used), is not a good option. The interventions have to be targeted to the short-term decision process and the choice behaviour itself. The same applies to **values and attitudes**. However, existing knowledge, values and attitudes could be activated for the choice process. Among the values that can be activated (e.g. in meal descriptions or with labels), health concerns seem most promising.

One of the key elements is **taste**, the most important influence on food choice. If the meal evokes positive emotions, it will be chosen again. Tastes that are familiar are most promising, but exotic tastes might be favoured if the meal is labelled as ethnic.

Taste can only influence menu choice once the meal or parts of it is known already and positive expectations are activated. Therefore innovative meals have to **look attractive** in addition. For this, multiple intervention strategies are possible, from a lush-looking portion size (indicating sufficient protein intake) to attractive arrangement (use of colours), to evoking positive emotions in sensory descriptions to priming strategies (e.g. by a prompt at the entrance of the canteen that relates to information at the counters).

Besides making the plate look attractive, the process of getting it should not be neglected. Shorter lines and uncomplicated ordering could be a key influence to choice. Simplicity and speed of the choice process are important.

Meat-free meals are often designed to look as if there was meat on it. Meat replacers are often at least shaped and arranged on the plate in the accustomed way.

This is not surprising if the importance of **familiarity** for food acceptance is considered. When considering meat replacement products, the effects of neophobia and a lack of knowledge of these products have to be considered.

If the meal is not in the traditional main-dish/side-dish/vegetables form, a form that customers can relate to (e.g. gratin, hotpot or the like) should be chosen. Flexitarianism and its motives are still not well researched. Shedding more light on subgroups of **flexitarians** might be a promising approach for evaluation.

6.2   MEAL OFFERING

Within the research area menu offer, the project NOVANIMAL aims to understand meal production decisions of chefs and strategic decision makers, and to find out how to improve operating parameters and foster professional ambitions to prepare attractive dishes without or with fewer animal products. For this research aim and the corresponding empirical project phases, the following topics seem particularly relevant:

One of the top influences on chefs' meal planning is **customer demand**. It would be worthwhile to explore what chefs think about the demands for vegetarian or vegan dishes in their relative clientele, or what exactly flexitarianism implies for their offer. These results could then be compared to results from the NOVANIMAL work package "Meal choice", should it include the question of **flexitarianism**.

Another important topic that should be addressed is **staff skills** and possible necessary **training**. Also, **sources of inspiration** for creating new dishes should be explored, and in particular the role of the **professional exchange** in their community to create vegetarian and vegan dishes.

Personal Values relating to healthy eating, sustainability or animal welfare should be explored among chefs, but it can be expected that these values are already high in chefs.

No results were found about the **professional ambition** to offer attractive vegetarian or vegan dishes. Results about Haute Cuisine suggest that there are generally strong ambitions, but in an average restaurant, economic and convenience factors might be more relevant. In general, there is little research into these issues, and therefore these might be promising new research areas.

Among structural barriers, **technical requirements** and **organisational guidelines and regulations** should be considered. These were mentioned in the studies, but it is not clear how important they are. Of course, the budget is also of higher importance.

7 REFERENCES

Ajzen, I. (2015). Consumer attitudes and behavior: The theory of planned behavior applied to food consumption decisions. Rivista di Economi Agraria, 70 (2), 121-138.

Aldridge, V., Dovey, T.M. & Halford J.C.G. (2009). The role of familiarity in dietary development. Developmental Review, 29, 32-44.

Ariyasriwatana, W. & Quiroga, L.M. (2016). A thousand ways to say "Delicious!" – Categorizing expression of deliciousness from restaurant reviews on the social network site Yelp. Appetite, 104, 18-32

Arno, A. & Thomas, S. (2016). The efficacy of nudge theory strategies in influencing adult dietary behavior: a systematic review and meta-analysis. Public Health, 16, 676.

Artho, J. & Jenny, A. (2016). Erweiterung der sozialwissenschaftlichen Grundlagen zur Konzeption von Interventionen im Umweltbereich. Energieforschung Stadt Zürich. Bericht Nr. 32, Forschungsprojekt FP-1.12.

Bublitz, M.G., Peraccio, L.A. & Block, L.G. (2010). Why did I eat that? Perspectives on food decision making and dietary restraint. Journal of Consumer Psychology, 20, 239-258.

Condrasky, M., Ledikwe, J.H., Flood, J.E., & Rolls, B.J. (2007). Chefs' Opinions of Restaurant Portion Sizes. Obesity, 15, 2086-2094.

Conner, M. & Armitage, C.J. (2006). Social psychological models of food choice. In R. Shepherd & M. Raats (eds.), The psychology of food choice (pp. 41-57). Oxfordshire: CABI Publishing.

Connors, M., Bisogni, C. A., Sobal, J., & Devine, C. M. (2001). Managing values in personal food systems. Appetite, 36 (3), 189–200.

Csíkszentmihályi, M. (1997). Creativity: Flow and the Psychology of Discovery and Invention. HarperCollins, New York.

Dagevos, H., & Voordouw, J. (2013). Sustainability and meat consumption: is reduction realistic? Sustainability: Science, Practice, & Policy, 9(2), 60–69.

de Boer, J., Schösler, H., & Aiking, H. (2014). "Meatless days" or "less but better"? Exploring strategies to adapt Western meat consumption to health and sustainability challenges. Appetite, 76, 120–128.

Furst, T. Connors, M., Bisogni, C., Sobal, J. & Falk, L. (1996). Food choice: a conceptual model of the process. Appetite, 26, 247-265.

Geaney, F., Kelly, C., Greiner, B.A., Harrington, J.M., Perry, I.J. & Beirne, P. (2013). The effectiveness of workplace dietary modification interventions: A systematic review. Preventive Medicine, 57, 438-447.

Gibson, E.L. (2006). Mood, emotions and food choice. In R. Shepherd & M. Raats (eds.), The psychology of food choice (pp. 113-140). Oxfordshire: CABI Publishing.

Glanz, K., Resnicow, K., Seymour, J., Hoy, K., Stewart, H., Lyons, M., Goldberg, J. (2007). How Major Restaurant Chains Plan Their Menus: The Role of Profit, Demand, and Health. American Journal of Preventive Medicine, 32 (5), 383-388.

Graça, J., Oliveira, A., & Calheiros, M. M. (2015). Meat, beyond the plate. Data-driven hypotheses for understanding consumer willingness to adopt a more plant-based diet. Appetite, 90, 80–90.

Grieger, J.A., Wycherley, T.P., Johnson, B.J. & Golley, R. (2016). Discrete strategies to reduce intake of discretionary food choices: a scoping reviews. International Journal of Behavioral Nutrition and Physical Activity, 13, 57.

Grunert, K.G. (2006). Marketing parameters and their influence on consumer food choice. In R. Shepherd & M. Raats (eds.), The psychology of food choice (pp. 161-177). Oxfordshire: CABI Publishing.

Hanks, A.S., Just, D.R., Smith, L.E. & Wansink, B. (2012). Healthy convenience: nudging students toward healthier choices in the lunchroom. Journal of Public Health, 34 (3), 370-376.

Hansen, P.G. & Jespersen, A.M. (2013). Nudge and the manipulation of choice. A framework for the responsible use of the nudge approach to behavior change in public policy. European Journal of Risk Regulation, 1, 3-28.

Harrington, R.J. & Ottenbacher, M.C. (2013). Managing the culinary innovation process: The case of new product development. Journal of Culinary Science & Technology, 11, 4-18.

Harrington, R.J., Baggs, C. & Ottenbacher, M.C. (2009). Moving from a tacit to a structured culinary innovation process. A case for the BASIC and just-right plots in evaluation. Journal of Culinary Science & Technology, 7, 73-88.

Heckhausen, H. & Gollwitzer, P.M. (1987). Thought Contents and Cognitive Functioning in Motivational versus Volitional States of Mind. Motivation and Emotion, 11 (2), 101–120,

Hollands, G.J., Shemilt, I., Marteau, T.M., Jebb, S.A., Kelly, M.P., Nakamura, R., Suhrcke, M. & Ogilvie, D. (2013a). Altering micro-environments to change population health behavior: towards an evidence base for choice architecture interventions. Public Health, 13, 1218.

Hollands, G.J., Shemilt, I., Marteau, T.M., Jebb, S.A., Kelly, M.P., Nakamura, R., Suhrcke, M. & Ogilvie, D. (2013b). Altering choice architecture to change population health behaviour: a large-scale conceptual and empirical scoping review of interventions within micro-environments. Cambridge: University of Cambridge.

Jabs, J., Devine, M. & Sobal, J. (1998). Model of the process of adopting vegetarian diets: Health vegetarians and ethical vegetarians. Journal of Nutrition Education, 30 (4), 196-202.

Janssen, M., Busch, C., Rödiger, M. & Hamm, U. (2016). Motives of consumers following a vegan diet and their attitudes towards animal agriculture. Appetite, 105, 643-651.

Kahneman, D. (2011). Thinking fast and slow. New York: Farrar, Straus & Giroux.

Kamm A., Hildesheimer G., Bernold E., Eichhorn D. (2015) Ernährung und Nachhaltigkeit in der Schweiz. Eine verhaltensökonomische Studie. Zürich: FehrAdvice & Partners AG mit Unterstützung des Bundesamtes für Umwelt BAFU.

Kauer, J., Pelchat, M.L., Rozin, P. & Zickgraf, H.F. (2015). Adult picky eating. Phenomonology, taste sensivity, and psychological correlates. Appetite, 90, 219-228.

Keller, U., Battaglia, R.E, Beer, M., Darioli, R., Meyer, K., Renggli, A., Römer-Lüthi, C. & Stoffel-Kurt, N. (2012). Sechster Schweizerischer Ernährungs-bericht. Bern: Bundesamt für Gesundheit.

Köster, E. P. (2009). Diversity in the determinants of food choice: A psychological perspective. Food Quality and Preference, 20(2), 70–82.

Lea, E. J., Crawford, D., & Worsley, A. (2006). Public views of the benefits and barriers to the consumption of a plant-based diet. European Journal of Clinical Nutrition, 60 (7), 828–837.

Libotte, E., Siegrist, M. & Bucher, T. (2014). The influence of plate size on meal composition. Literature review and experiment. Appetite, 82, 91-96.

Mäkiniemi, J.-P. & Vainio, A. (2014). Barriers to climate-friendly food choices among young adults in Finland. Appetite, 74, 12-19.

McDermott, M.S., Oliver, M., Svenson, A Simnadis, T., Beck, E.J., Coltman, T., Iverson, D., Caputi, P. & Sharma, R. (2015). The theory of planned behaviour and discrete food choices: a systematic review and meta-analysis. International Journal of Behavioral Nutrition and Physical Activity, 12, 162.

Meiselman, H.L. (2006). The role of context in food choice, food acceptance and food consumption. In R. Shepherd & M. Raats (eds.), The psychology of food choice (pp. 75-199). Oxfordshire: CABI Publishing.

Middleton, G. (2000). A preliminary study of chefs' attitudes and knowledge of healthy eating in Edinburgh's restaurants. Hospitality Management, 19, 299-412.

Mosler H.J. & Tobias R. (2007). Umweltpsychologische Interventionsformen neu gedacht. Umweltpsychologie, 11 (1), 35-54.

Murphy, J. & Smith, S. (2009). Chefs and suppliers: An exploratory look at supply chain issues, in an upscale restaurant alliance. International Journal of Hospitality Management, 28, 212-220.

Obbagy, J.E., Condrasky, M.D., Roe, L.S., Sharp, J.L. & Rolls, B.J. (2011). Chefs' Opinions about Reducing the Calorie Content of Menu Items in Restaurants. Obesity, 19, 332–337.

Olsen, N.V. (2015). Design thinking and food innovation. Trends in Food Science & Technology 41, 182-187.

Ottenbacher, M. & Harrington, R.J. (2007). The innovation development process of Michelin-starred chefs. International Journal of Contemporary Hospitality Management, 19 (6), 444 – 460.

Ottenbacher, M.C. & Harrington, R.J. (2009). The product innovation process of quick-service restaurant chains. International Journal of Contemporary Hospitality Management, 21 (5), 523-541.

Ozdemir, B. & Caliskan, O. (2014). A review of literature on restaurant menus: Specifiying the managerial issues. International Journal of Gastronomy and food science, 2, 3-13.

Penney, T.L., Brown, H.E., Maguire, E.R., Kuhn, I. & Monsivais, P. (2016). Local food environment interventions to improve healthy food choice in adults: a systematic review and realist synthesis protocol. BMJ Open, 5 (4).

Perry, B.D. & Grace, D.C. (2015). How growing complexity of consumer choices and drivers of consumption behavior affect demand of animal source foods. EcoHealth, 12, 703-712.

Piazza, J., Ruby, M.B., Loughnan, S., Luong, M. & Kulik, J. (2015). Rationalizing meat consumption. The 4Ns. Appetite, 91, 114-128.

Pliner, P. & Salvy, S.-J. (2006). Food neophobia in humans. In R. Shepherd & M. Raats (eds.), The psychology of food choice (pp. 75-92). Oxfordshire: CABI Publishing.

Prochaska, J.O. & Velicer, W.F. (1997). The transtheoretical model of health behavior change. American Journal of Health Promotion, 12, 38–48.

Pudel, V. & Maus, N. (1990). Ernährung. In R. Schwarzer (ed.), Gesund-heitspsychologie: Ein Lehrbuch (pp. 151-167). Göttingen: Hogrefe.

43

Reichler, G. & Dalton, S. (1998). Chefs' attitudes toward healthful food preparation are more positive than their food science knowledge and practices. Journal of the American Dietetic Association, 98 (2), 165-169.

Robinson, E., Thomas, J., Aveyard, P. & Higgs, S. (2014). What everyone else is eating: A systematic review and meta-analysis of the effect of informational eating norms on eating behavior. Journal of the Academy of Nutrition and Dietetics, 114, 414-429.

Rogers, E.R. (2003). Diffusion of innovations. 5th ed. New York: Free Press.

Rogers, R.W. (1975). A protection motivation theory of fear appeals and attitude change. Journal of Psychology, 91, 93-114.

Rosenstock, Irwin (1974). Historical origins of the Health Belief Model. Health Education & Behavior, 2 (4), 328–335.

Rozin, P. (2006). The integration of biological, social, cultural and psychological influences on food choice. In R. Shepherd & M. Raats (eds.), The psychology of food choice (pp. 19-39). Oxfordshire: CABI Publishing.

Sautron, V., Péneau, S., Camilleri, G.M., Muller, L., Ruffieux, B., Hercberg, S. & Méjean, C. (2015). Validity of a questionnaire measuring motives for choosing foods including sustainable concerns. Appetite, 87, 90-97.

Scheibehenne, B., Miesler, L., & Todd, P. M. (2007). Fast and frugal food choices: Uncovering individual decision heuristics. Appetite, 49 (3), 578–589.

Schickenberg, B., van Assema, P., Brug, J. & de Vries, N.K. (2011). Product samples stimulate choice of unfamiliar health products. Appetite, 57, 197-201.

Scholderer, J., Kügler, J.O., Veflen Olsen, N. & Verbeke, T. (2013). Meal mapping. Food Quality and Preference, 30, 47-55.

Schulte-Mecklenbeck, M., Sohn, M., de Bellis, E., Martin, N., & Hertwig, R. (2013). A lack of appetite for information and computation. Simple heuristics in food choice. Appetite, 71, 242–251.

Siegrist, M., Visschers, V. H. M., & Hartmann, C. (2015). Factors influencing changes in sustainability perception of various food behaviors: Results of a longitudinal study. Food Quality and Preference, 46, 33–39.

Sobal, J., Bisogni, C.A., Devine, C.M. & Jastran, M. (2006). A conceptual model of the food choice process over the life course. In R. Shepherd & M. Raats (eds.), The psychology of food choice (pp. 1-18). Oxfordshire: CABI Publishing.

Sprösser G. (2011). Why we eat what we eat: Psychological influences on eating behavior. Doctoral Dissertation. University of Konstanz.

44

Steptoe, A., Pollard, T. M., & Wardle, J. (1995). Development of a measure of the motives underlying the selection of food: the food choice questionnaire. Appetite, 25(3), 267–284.

Stierand, M., Dörfler, V. & MacBryde, J. (2014). Creativity and innovation in haute cuisine: Towards a systemic model. Creativity and innovation management, 23 (1), 15-28.

Summers, A.C. (2013). Vegetarian meals in the national School Lunch Program: Exploring the barriers and facilitators. Doctoral dissertation, Baltimore: John Hopkins University.

Thaler, R.H. & Sunstein, C. (2008). Nudge: improving decisions about health, wealth, and happiness. New Haven: Yale University Press.

Tobler, C., Visschers, V. H. M., & Siegrist, M. (2011). Eating green. Consumers' willingness to adopt ecological food consumption behaviors. Appetite, 57 (3), 674–682.

Vainio, A., Niva, M., Jallinoja, P. & Latvala, T. (2016). From beef to beans: Eating motives and the replacement of animal proteins with plant proteins among Finnish consumers. Appetite, 106, 92-100.

Van Kleef, E., van den Broek, O., & van Trijp, H.C.M. (2015). Exploiting the spur of the moment to enhance healthy consumption: Verbal prompting to increase fruit choices in a self-service restaurant. Applied Psychology: Health and Well-Being, 7 (2), 149-166.

Wansink, B. (2014). Slim by design: Mindless eating solutions for everyday life. New York: Harper Collins.

Wansink, B. & Hanks, A.S. (2013). Slim by design: Serving healthy foods first in buffet lines improves overall meal selection. PLoS ONE, 8 (10).

Wansink, B. & Love, K. (2014). Slim by design: Menu strategies for promoting high-margin, healthy foods. International Journals of Hospitality Management, 42, 137-143.

Wansink, B. & von Ittersum, K. (2013). Portion Size Me: Plate-induced consumption norms and win-win solutions for reducing food intake and waste. Journal of Experimental Psychology: Applied, 19 (4), 320-332.

Wilson, A.L., Bukley, E., Bukley, J.D. & Bogomolova, S. (2016). Nudging healthier food and beverage choices through salience and priming. Evidence from a systematic review. Food Quality and Preferences, 51, 47-64.

Yeomans, M.R. (2006). The role of learning in development of food preferences. In R. Shepherd & M. Raats (eds.), The psychology of food choice (pp. 93-112). Oxfordshire: CABI Publishing.

Zickgraf, H.F. & Schepps, K. (2016). Fruit and vegetable intake and dietary variety in adult picky eaters. Food quality and preference, 54, 39-50.