Identifying barriers to decreasing meat consumption and increasing acceptance of meat substitutes among Swedish consumers

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ABSTRACT

A key lifestyle change people could make to reduce their environmental impact is to reduce their meat consumption. However, meat is still a staple in many people’s diet, and some consumers are reluctant to cut down. Meat substitutes, if accepted as adequate replacements for meat, may offer a suitable alternative without leaving consumers feeling dissatisfied. The aim of the present study was to identify psychological barriers to reducing meat consumption and increasing use of meat substitutes among Swedish consumers. Participants engaged in focus group discussions around purchasing, preparing, and consuming meat and meat substitutes. Four main themes were identified through thematic analysis: uncertainty, scepticism, health, and identity. These are discussed in relation to previous work on the barriers to reducing meat consumption. Strategies to communicate the environmental impact of meat to consumers and effect change through behavioural interventions are considered.

1. Introduction

Food production is a major contributor to climate change (Hallström et al., 2015) with some estimating that around 20–30% of the environmental impact comes from the food industry of Western countries (Tukker & Jansen, 2006). The environmental impact of different food products varies greatly, and the impact of the same product can also vary substantially depending on the producer (Poore & Nemecek, 2018). Nonetheless, the production of meat accounts for a considerable proportion of this environmental toll (Laestadius et al., 2016). By extension, meat consumption has a substantial negative impact on the environment (Hedenus et al., 2014). Importantly, the environmental impact of even the lowest-impact animal products exceeds that of plant-based alternatives (Poore & Nemecek, 2018). As such, actions to mitigate food-related environmental damage at the consumer level require a reduction in consumption of animal products. A reduction in global meat consumption would lead to a significant reduction in emissions of greenhouse gases (GHG) related to climate change (Martín & Brandão, 2017; Pignon et al., 2017), particularly if reductions are made in countries where meat consumption is high or rising (Stoll-Kleemann & Schmidt, 2017).

1.1. Meat consumption in a Swedish context

Levels of meat consumption 1 in Sweden rose steadily for many years, although this has recently subsided, and we now see a slight reduction – from a record high of 88.4 kg per capita in 2016 to 78.6 kg per capita in 2020 (Swedish Board of Agriculture, 2021). In a national survey conducted in 2020, around 75% of Swedish consumers indicated that they were not planning to reduce their meat intake in the coming year, a figure that was relatively stable over a 5-year-period. However, the proportion of people indicating that they never eat vegetarian dishes decreased from 21% to 12% within the same time frame (Sifo/Axfood, 2020). Attitudes and behaviours around meat in Sweden thus seem to be in a state of fluctuation. In the first National Food Strategy for Sweden (Swedish Government Prop, 2016) ‘consumers and the market’ is one of three specially targeted areas, and consumers’ ability to make informed sustainable choices is highlighted as particularly important. It has been calculated that replacing 50% of the meat consumed in Sweden with domestically produced grain legumes could translate to a 20% decrease in national GHG emissions (Röss et al., 2020). Understanding how issues concerning meat consumption could be communicated to consumers is thus of immediate interest in Sweden. In order to do this, first the

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1 Total consumption = slaughtered weight (including bones and other non-edible parts as well as losses during processing).

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barriers to reducing meat and embracing non-meat alternatives must be identified and explored.

1.2. Factors affecting meat consumption

Concern for the environment affects consumer decisions (Carlson et al., 2007) and awareness of the environmental impact of meat can increase willingness to change one’s meat consumption behaviour (Whitmarsh & O’Neill, 2010). In a study set in a university catering facility, it was found that showing the GHG emissions associated with different meals using a system of carbon labelling led to fewer purchases of the red-labelled (high emission) dishes relative to when no labelling was used (Brunner et al., 2018). However, there are still many consumers who are not aware of the environmental cost of meat consumption (MacDiarmid, Douglas, & Campbell, 2016; Mylan, 2018; Sanchez-Sabate & Sabaté, 2019). This means that, especially among those with limited awareness or knowledge about the relationship between meat consumption and climate change, there may be a tendency to underestimate the environmental impact of meat. As such, instead of reducing their meat intake, some consumers prefer to make other changes to lead a more sustainable lifestyle, e.g., by prioritising sourcing local, organic or seasonal food, recycling more, or reducing food waste (Holm & Mølb, 2000; MacDiarmid et al., 2016). Concerns regarding animal welfare and health are also sometimes found to be stronger motivators to reduce meat consumption than environmental issues (Sanchez-Sabate & Sabaté, 2019), although Hielkema and Lund (2021) found that environmental concern was a strong driver for reducing meat consumption among Danish consumers.

Food motives and choices also relate to issues of identity, status, social norms, and tradition (Cheah et al., 2020; Cuevas et al., 2021; Leroy & Praet, 2015; Stoll-Kleemann & Schmidt, 2017). For example, MacDiarmid et al. (2016) found that meat was perceived as essential for both health and tradition reasons among Scottish consumers, which MacDiarmid et al. (2016) found that meat was perceived as essential for both health and tradition reasons among Scottish consumers, which contributed to their reluctance to change. Intention to change and individual motives for meat consumption are also important and can be assessed with stages-of-change. For example, Klockner (2017) captured the changing interplay between personal norms, attitudes, and social norms in describing patterns of beef consumption among Norwegian consumers at different stages of change. Similarly, Danish consumers at different stages of change regarding meat consumption were found to have differing motivations for their consumption choices (Hielkema & Lund, 2021). Stage-of-change could offer a pragmatic way to conceptualise the relative importance of different food consumption motives and patterns among consumers, as well as a method for grouping them. Hielkema and Lund (2021) suggested that interventions and strategies to encourage meat reduction among consumers should be tailored with stage-of-change in mind.

1.3. Meat substitutes

A recent longitudinal study in New Zealand revealed that the likelihood of omnivores transitioning to vegetarian or vegan diets within the 1-year timeframe studied was very low (Milfont et al., 2021). However, even if such sudden dietary change or elimination of meat from one’s diet may be highly challenging for consumers, reducing meat consumption by replacing it in at least some meal applications should be more achievable. Meat substitutes – defined here as plant-based products manufactured with the intention of mimicking aspects of meat – are one option available to achieve this. Defined this way, meat substitutes can be distinguished from other non-meat protein sources such as chickpeas and lentils by their intentional design as analogues to meat, whether in terms of sensory (visual, texture, taste etc.) or functional (e.g., similar preparation) aspects. In addition to the factors affecting meat consumption discussed above, a perceived lack of knowledge of what to replace meat with and of skills in preparing meat-free meals also impact people’s willingness and ability to change (Graça et al., 2019; MacDiarmid et al., 2016; Stoll-Kleemann & Schmidt, 2017). Indeed, it has been suggested that perceived difficulty of preparation may be a reason that French consumers tend not to use many pulses in cooking (Melendrez-Ruiz et al., 2019). Compared to other replacements for meat then, meat substitutes that retain salient similarities with meat may play an important role in reducing meat consumption by promoting incremental change (Schröter et al., 2012).

However, replicating the physicochemical and sensory qualities of meat in plant-based products is not trivial (Samard & Ryu, 2019). Meat substitutes often fail to satisfactorily replicate the taste and texture of meat (Hoek et al., 2011), and consumers rated meat substitutes as less appropriate than both meat and other alternatives such as nuts and chickpeas for use in a range of social and meal situations (Elzerman et al., 2021). Participants in a qualitative study by Elzerman et al. (2013) described meat substitutes as lacking a clear identity, being nutritionally dubious, and expensive. They also reported being unfamiliar with how to prepare meals with meat substitutes, making it more difficult and time consuming to make a satisfying, tasty meal using such products than using meat (Elzerman et al., 2013).

Nonetheless, the European market for plant-based substitutes for meat has changed dramatically in recent years. For instance, in the Netherlands, Sweden and the United Kingdom, Euromonitor reported annual growth of the market for meat substitutes of 5–10% in 2016 (Changing Markets Foundation, 2018). Further, at least within The Netherlands, consumer behaviour regarding meat substitutes may be a key driver for increased innovation and market transition (Tziva et al., 2020). Meat substitutes are thus not globally rejected among consumers. Indeed, some perceived positives of meat substitutes discussed by participants in Elzerman et al. (2013) included that they were lower in saturated fats and gave variety in the diet. Their participants seemed particularly positive to meat substitutes that closely resembled meat. This supports suggestions that in order to be recognised as legitimate alternatives to meat, substitute products should strive to share similarity with meat either in appearance, fulfilling a similar function in meals, or situational appropriateness (Elzerman et al., 2021; Hoek et al., 2011). Despite the barriers to acceptance, it has been suggested that products aiming to match the taste, texture, and ease of preparation offered by meat may still be the most likely to succeed as viable replacements (Michel et al., 2021).

1.4. The present study

Meat continues to play an important role in many people’s diet, and meat is often perceived as the central component of a meal (Christensen et al., 2020). Behavioural change is notoriously difficult and habits are difficult to break (Kelly & Barker, 2016; Klockner & Verplanken, 2018). Despite this, it is often seen as the responsibility of the consumer to make sustainable consumption choices rather than that of policy makers or companies (Austgulen et al., 2018). Better understanding of consumers’ perspectives on meat reduction and alternatives such as meat substitutes could contribute to the development and production of substitute products that are more accepted by consumers. Insight into how to communicate issues related to meat consumption and the environment in an effective manner could also be obtained. Indeed, understanding how to support consumers in making sustainable food choices have been identified as a key issue in the National Food Strategy for Sweden (Swedish Government Prop, 2016). Unfortunately, consumer attitudes to reducing meat consumption in Sweden have not been studied extensively. The present work therefore aimed to identify and explore the barriers and motivators for reducing meat consumption and increasing acceptance of meat substitutes among Swedish consumers.
2. Method

2.1. Participants

Thirty-three participants were recruited using an online recruitment system. To ensure a broad range of opinions, they were screened and grouped by applying a stage-of-change model (adapted from Kristal et al., 1999) which targeted their meat consumption behaviour. The screening and grouping questions can be found in the supplementary material. This procedure resulted in five groups of participants, whose demographics are shown in Table 1.

2.2. Data collection

Focus groups render a rich understanding of the topics discussed. This method also promotes interaction between participants, which can provide additional information that may otherwise be missed using other qualitative methods. As such, focus groups were used here. Prior to the focus group discussions, participants in all groups completed a Napping® task where they handled, but did not taste, a range of 19 commercially available (in Sweden) meat substitute products. This provided a common starting point for all participants and was intended to stimulate discussions around the acceptance of meat substitutes as well as participants’ willingness to reduce meat in their favour. A similar approach was used previously in a project regarding food waste (Rohm et al., 2017). Methodological details of the Napping® task can be found in the supplementary material.

During the focus group sessions, which were conducted in a quiet, odourless room equipped with recording devices at RISE Research Institutes of Sweden in Gothenburg, participants discussed a range of topics relating to meat substitutes and reducing meat consumption. Each group (see Table 1) completed the study on a different day. The discussions were semi-structured, such that a series of core topics were addressed but participants were also able to discuss the aspects that were most relevant for them. The core topics were: reducing meat consumption (general thoughts around this - why or why not, potential benefits, health and climate perspectives, ways to reduce meat in the diet e.g., meat substitutes vs other vegetarian alternatives, and their desire to eat more vegetarian generally), their experiences preparing and spicing health and climate perspectives, ways to reduce meat in the diet e.g., most relevant for them. The core topics were: reducing meat consumption (general thoughts around this - why or why not, potential benefits, health and climate perspectives, ways to reduce meat in the diet e.g., meat substitutes vs other vegetarian alternatives, and their desire to eat more vegetarian generally), their experiences preparing and spicing health and climate perspectives, ways to reduce meat in the diet e.g., meat substitutes vs other vegetarian alternatives, nutritional aspects, what the best things about meat are, which situations meat is chosen in, and what is important to consider when choosing what to eat more broadly. During the discussions, the packaging for the 19 meat substitutes used in the Napping® task was also shown to the participants to further stimulate discussion. Here, they were asked about what they think defines a burger, the important sensory qualities of burger products, and their feelings towards the products in general. The discussions, which were held in Swedish and lasted 2–3 h, were recorded and later transcribed.

2.3. Data analysis

Transcription was performed by three of the authors (AN, ESC & MS). After transcribing the recorded focus groups, thematic analysis (Braun & Clarke, 2006) was used to identify and investigate the underlying themes across all groups. Initially, it had been thought to assess each group separately but during the analytical process, it was noticed that several concepts and themes appeared across all groups, with variation mostly in the ways in which these were approached and discussed. Thus, it was decided to instead investigate underlying themes across all groups while paying specific attention to nuances and differences in the ways these were discussed by the different groups (where relevant). Transcription and thematic analysis were conducted by the same three authors. Two coders independently read and re-read the transcript for a given group and made an initial set of codes, which were then discussed. Inter-rater discrepancies were resolved during these discussions, and a common vocabulary for a further round of coding was decided upon. Emerging themes were identified independently by two of the coders (AN & ESC) during another round of coding and these were further discussed. The thematic structure was then generated.

The RQDA package in R (version 3.6.3, The R Foundation for Statistical Computing) was used for the thematic analysis. Data collected during the Napping® task were analysed using multiple factor analysis (MFA) in XLStat. Findings from this analysis are presented and discussed in the supplementary material.

3. Results

Within all the focus groups, the discussion was lively and, in general, the participants seemed willing to both voice their views and challenge the views of others if there was disagreement. For some topics, there were diverging opinions, whilst for others there was more consensus. The thematic structure is shown in Fig. 1. Four main themes (named Uncertainty, Scepticism, Health, and Identity) were identified, all of which were associated with sub-themes. These were sometimes represented in somewhat different ways and to different extents within each group. Some themes and subthemes seemed to create reinforcement loops (represented by bidirectional arrows). For example, familiarity informs expectations regarding sensory experience, while sensory experience creates familiarity and informs future expectations. In one case, between the ‘meat and the environment’ and ‘other behaviours’ sub-themes, a one-way arrow is used to show what seemed like a unidirectional relationship. The rationale for this is discussed where relevant.

Anonymised quotes (including gender and stage-of-change of the discussant) are provided to illustrate the themes, as well as the diverging discussions around them from the groups where relevant. The stage-of-change groups are denoted as: AM (action/maintenance), Prep-High (preparation, high meat consumption), Prep-Medium (preparation,
medium meat consumption), PreCont-High (pre-contemplation, high meat consumption), and PreCont-Medium (pre-contemplation, medium meat consumption).

3.1. Theme 1: uncertainty

Among the meat-eating participants, there was a general sense of uncertainty around several aspects of both reducing meat consumption and adopting meat substitutes in their diets. Some voiced having concerns about potential unanticipated consequences of reducing or rejecting meat at a larger scale (e.g., what would happen to animals currently living on farms) and stated that such issues are not discussed often enough in debates about meat consumption. It was also expressed that it is difficult as a consumer to know what the best purchasing choices regarding sustainability are:

“It’s really difficult to see the whole picture of what you’re doing, I think. It’s always difficult to get a full picture as a consumer. Even with new products that aren’t so established on the market. So that you can really understand the choices you’re making – is this good for the environment in the end?” (male, Prep-High).

Across the groups, there were several meat-eating participants who were curious about using more meat substitutes, particularly given the wider range of products available now than in the past, and others who thought that vegetarian options offered good variety in the diet. In general, products that contained familiar ingredients like mush rooms or other vegetables were perceived less negatively because people felt they were more able to anticipate the sensory experience. However, without having previously tried the products, participants were generally unwilling to buy them because they felt uncertain about the quality, taste, texture, and so on. Some were also worried that they may simply end up throwing the products away if they did not like them, or had concerns around the raw materials that meat substitutes contain (especially soy):

“...You always know what you’re getting when you eat meat, you know how it tastes and more than anything else, you know you’re investing in something that you recognise. It is a bit less certain, if you buy a vegetarian patty you end up throwing away 80% because you didn’t like it” (female, Prep-Medium).

Uncertainty generated from lacking familiarity with a substitute product in turn seemed to generate scepticism towards that product by virtue of not knowing what to expect. A link between the themes of Uncertainty and Scepticism is also exemplified by the following exchange in the PreCont-Medium group while discussing meat mimicry. Uncertainty and scepticism around the contents or composition of meat substitutes that visually resemble meat seemed to generate reluctance towards purchasing and consuming these products:

“...When you try to resemble meat too much it becomes strange” (female, AM).

Meat was often described as having a unique sensory profile, being comforting and familiar, and generally difficult to replace. Many participants believed meat substitutes fail to replicate the taste and texture of meat. Vegetarian meals were typically perceived as less satisfying sensorially, and as failing to provide the same overall experience as meals containing meat. For those who were less familiar with meat substitutes, there was a sense that visually similar products could be disappointing upon tasting:

“This I feel makes you think of a completely new dish. When I think of this, I think, oh how nice, a burger and then I know that I might be disappointed because it does not taste like I thought a burger should taste. But I would probably have liked to taste the patty and I would have chosen a different presentation. In my world, a burger should taste like it should” (female, Prep-High).

In general, products that contained familiar ingredients like mushrooms or other vegetables were perceived less negatively because people felt they were more able to anticipate the sensory experience. However, there was no consensus on whether or not meat substitutes should resemble meat visually. For some, vegetable-based substitutes were seen as replacements for the potatoes or vegetables that accompany meat in a dish, rather than a replacement for the meat itself. Some participants seemed to experience this sensory unfamiliarity as active deception, and perceived meat substitutes as being dishonest. It was voiced that meat substitutes should not be described as vegetarian meat products. Meat-eaters also commented that they did not feel full after meals without meat. It was discussed that this lack of feeling full may be primarily psychological, but it nevertheless promoted uncertainty around reducing meat and using meat substitutes:

“When you eat vegetarian, you need to eat much, much more, and I see that even with my [vegetarian] sister’s plate, that she eats like, so that you...
think ‘oh God, do you have room for all that?’ because otherwise she’s not full” (female, PreCont-Medium).

“They try to appease meat eating customers by making vegetarian alternatives and giving them meaty names, like vegetarian meatballs, but there is no meat anywhere. It should be called something else, vegetarian balls or something. It’s like you should feel, you will have meat (in your head) even if it’s not on the plate” (male, PreCont-High).

ii) Practicalities

Practical aspects such as handling and preparing meals are related to familiarity and expectations in that preparing familiar meals may be more appealing to some consumers than sourcing and learning new recipes. For some, substitution of meat in familiar recipes was more appealing than learning new vegetarian recipes from scratch. In particular for participants less familiar with non-meat proteins, there was concern about lacking knowledge of how to prepare, cook, and serve dishes without meat or using meat substitutes, which seemed to contribute to an unwillingness to do so. Some participants perceived meat substitutes and vegetarian food in general to be less convenient and more demanding in terms of time and effort to make.

“Because it’s hard to, because I don’t know the basic flavours in the processed vegetarian [products] it’s hard to prepare them in a tasty way. It’s not something you’ve grown up learning, it demands quite a lot of work to make it work” (female, PreCont-High).

“Meat is very easy, you don’t need to add so many spices and such, but when you make vegetarian food, you need more, like you need to add more” (female, PreCont-Medium).

However, others claimed it was both easier and safer to cook vegetarian food because they felt that meat cooked incorrectly is more dangerous than a plant-based product cooked incorrectly. Participants more familiar with using meat substitutes remarked that they preferred some products over others because they were more versatile in cooking and could be used in recipes that traditionally contain meat without much difficulty. It was also suggested by meat-eating participants that meat substitutes should be easier to find in supermarkets, possibly by placing them closer to, or in the same aisle as, meat. Some participants mentioned having family members who were vegetarian who were able to create tasty vegetarian meals, but they felt that they were unable to do so themselves. A perceived positive aspect of meat was that it is possible to cook it many different ways and use a wide variety of spices to create a dish. This was perceived as more difficult with meat substitutes and vegetarian food in general. This in turn gave rise to uncertainty around how to make vegetarian meals or use meat substitutes in ways that tasted as good as meat.

“I personally don’t feel that I need to eat meat, it’s more if I get a craving for a specific dish, particularly spaghetti and köttfärssås [meat sauce]. When I make it, it’s not as good if I make it with soy mince as when I make it with meat mince. I want to have it with meat mince, so I buy red meat and make it” (female, Prep-High).

iii) Price

The majority of participants believed the price could be a deterrent from buying and trying meat substitutes. There was some suggestion that offering smaller packages would be helpful as these would be cheaper and less wasteful if the consumer didn’t like the product and discarded it. There was uncertainty around why these products were so expensive, and they were generally not perceived as being value for money. Some participants were more willing to pay for meat as it was seen as luxurious and worth paying for, while vegetarian food and meat substitutes were not perceived this way.

“I think, anyway it’s vegetables, how expensive can it be like? Many people maybe think that they would pay a little extra for a nice piece of meat, but vegetarian maybe you think nah I don’t want to spend so much on vegetarian. I think many people think that way.” (female, PreCont-High).

The sub-theme of price was also associated with Scepticism, capturing the perceived expensive nature of meat substitutes relative to meat rather than uncertainty around their value for money. Vegetarian food and in particular meat substitutes were perceived as expensive compared with meat, although some participants also pointed out that meat can be expensive. It was suggested that the price may be related to an alleviation of effort in the preparation process. However, some participants were sceptical about this because they believed they could make their own vegetable-based burgers from scratch without too much effort, and that these would be cheaper and taste better.

“When I see those vegetarian products, many times they seem more expensive than meat, that’s what I mean – what are you paying for?” (female, PreCont-Medium).

3.2. Theme 2: Scepticism

Some level of scepticism to reducing meat and embracing meat alternatives was evident in most discussions, with the exception of the action/maintenance group. Some participants argued that eating meat is natural for humans, and this fostered scepticism to the need for meat substitutes or reducing meat consumption in general. For some, reducing meat consumption seemed to be interpreted as synonymous with eschewing meat entirely, which in turn enhanced their scepticism towards the idea of reduction. In some cases, this led to somewhat defensive justifications of current behaviour:

“We are also animals, we are made to eat meat and vegetables and other things. We shouldn’t only have one or the other. We are meant for it” (female, PreCont-High).

There was also scepticism around the consequences of switching to meat substitutes, as some were not convinced that they were as safe to eat as meat, observing that there may be as of yet unknown problems with these products.

“Even with a lot of soya products, they’re not fully researched, how they affect the body and stuff in the long run, because we aren’t used to eating so much of it. Gradually it will be seen that this, that reducing meat, was wrong” (female, PreCont-High).

The connection between the Scepticism and Health themes is drawn to highlight participants’ doubt that meat substitutes represent a good, healthy alternative to meat. In some cases, participants diverted the conversation around the potential of meat substitute products to replace meat to perceived health-related concerns. This is exemplified in the exchange below, where it is also implied that eating meat is preferable because it is perceived as natural.

Interviewer: “But you don’t really see the point of –”

Male, PreCont-High: “I don’t see the point with it being meat when it isn’t, or that it looks like meat or tastes like meat, and has a meat taste and such, it just feels silly”

Interviewer: “But you who likes the consistency and taste and juiciness, the experience when you eat meat, would you –”
Male, PreCont-High: “In one way, like I said, it wouldn’t matter if it had been like meat, tasted like meat and all that, but if it’s not natural there’s always risks, I mean there’s so many substances that they use in food that still aren’t researched in how they actually affect the body, so I don’t know if I would risk it in the end.”

Two sub-themes emerged within Scepticism: i) meat and the environment, and ii) other behaviours. It can be seen in Fig. 1 that these sub-themes are connected with a unidirectional arrow. An arrow was selected here since it seemed that lack of awareness of, or scepticism towards, the impact of meat on the environment promoted other behaviours such as sourcing locally produced meat rather than reducing meat consumption. Engaging in other behaviours, however, did not seem here to reinforce or affect participants’ belief in or awareness of the environmental impact of meat. Rather these seemed to fuel general Scepticism to the need to reduce or substitute meat, since these other behaviours were perceived as sufficient in themselves, and vice versa.

i) Meat and the environment

Although many participants were aware that meat consumption negatively impacts the environment, and this was a reason that some had already reduced their meat consumption, some degree of scepticism of this was expressed by a number of participants. This subtheme was especially prevalent among the pre-contemplation groups. One participant (female, Prep-High) commented that they believed that meat consumption cannot only be bad for the environment, because although cows produce methane gas, their manure helps vegetation grow which binds carbon. The idea that Sweden’s impact on global emission levels is too small to matter was discussed, with some suggesting that other countries should do more instead. Some participants seemed sceptical to the idea that changing their own behaviour could have much impact, since they had already reduced their meat consumption or do not perceive themselves as eating much meat in the first place.

“... I only buy Swedish meat as well, but preferably from, like directly from the farm… then I can even see how [the animals] live, that they have a good life” (female, PreCont-Medium).

“It’s with this that it’s made in Sweden, that can also be hard to find out. You want to reduce transport and so on for the environment, and so you don’t want to choose something that’s grown in Australia for example (male, Pre-High).

ii) Other behaviours

A number of alternative behaviours to reduce one’s environmental impact than reducing meat consumption or using meat substitutes were suggested and discussed. It was suggested, for example, that reducing meat consumption did not necessarily need to include the use of meat substitutes and instead people could reduce the portion size of meat when they do consume it. Others stated that they would prefer to be less wasteful with food more generally. Among those who ate meat, a strong preference for choosing locally produced animal products instead of reducing meat consumption was prevalent. One participant (female, Prep-High) commented that if a restaurant did not use Swedish meat that they would choose the vegetarian option instead. For many it was perceived that choosing foods sourced locally or at least from within Sweden is good enough to reduce environmental impact because this reduces emissions associated with the transport of imported meat or meat substitutes. Animal welfare and responsible antibiotic standards were also perceived as higher in Sweden than in other countries, which served to increase participants’ positivity to Swedish meat products. The majority of participants were concerned about animal welfare. They typically believed that choosing meat that was locally or nationally produced, and avoiding meat from overseas, both reduced their climate impact and increased their confidence that the animals had suffered less. Interestingly, more positivity was also shown towards meat substitutes from Sweden, and it was suggested by some that meat substitutes should carry labels stating where they were made so that consumers would know if it was made in Sweden or not straight away.

3.3. Theme 3: Health

The participants were generally health-conscious and cared about the impact of their food choices on their health. However, there was disagreement around how meat fits in with a healthy diet. For some, maintaining good health was a reason for continuing to eat meat as they currently do, some advocated for more meat in the diet for improved health, while for others health was a motivation for reducing, or attempting to reduce, their meat consumption. The idea of eating in a balanced manner was also discussed, namely that people should eat a little of everything for health reasons.

“But the body benefits from a mixed diet, it isn’t possible to just be single-minded in one direction” (female, Prep-Medium).

“I got an idea to stop eating meat, I stopped many years ago. Then it became gross with meat, the texture, taste and so on. First it was for health reasons, then it became a routine” (female, AM).

For many participants, the nutritional content was important, and they perceived the nutritional content of processed products to be generally poor. Worries around obtaining adequate nutrition from vegetarian meals were voiced, especially around obtaining enough protein. However, some participants were unconcerned by this, stating that there are plenty of vegetarian sources of protein and that people likely get enough protein regardless of eating little or no meat.
As long as you don’t go over completely maybe you don’t need to stay updated on the nutritional content and such. You know that as long as you eat a little meat, you get that nutrition.” (male, Prep-High).

“I’ve thought about it, but there isn’t much trustworthy research that says that it’s super important to get exactly the amount of protein that meat eaters tend to advocate for. That’s why I’m not so worried about it” (female, AM).

There were participants (mostly in the AM group) who had already reduced their meat consumption for health reasons. Some mentioned the health concerns they perceived with eating too much red meat, and that reducing meat consumption had helped ease their digestive and stomach problems. On the other hand, one participant (female, PreCont-High) claimed that a number of their health problems had improved when they started eating a more meat-heavy diet, following advice from their partner. In this way, the sub-theme of agency, as well as the theme of Identity, was also associated with the Health theme – showing participants’ sensitivity to the relationship between food choices and personal health and their desire to remain in control of this.

“and then you can figure out what it is that is good for your own body in some cases” (male, PreCont-High).

The theme of health was evident across all groups, and one sub-theme was identified, i) processed and artificial.

i) Processed and artificial

In general, there was negativity across all groups regarding products that appeared over-processed or synthetic, as well as a disdain for too many preservatives and artificial ingredients. A number of participants mentioned that they check the ingredients lists and nutritional information on food packaging, especially of processed foods. It was discussed that meat substitutes can contain seemingly unnecessary ingredients, which can give rise to health concerns and make people feel uneasy. One participant (female, AM) noted, however, that they thought that sometimes people over-react when it comes to avoiding additives.

“Not too artificial. Sometimes you read the ingredients and you think it feels almost uncomfortable. What is it you’re putting in yourself?” (female, Prep-High).

“At the same time, when you work [where I do], you get a bit like, people become hysterical towards additives.” (female, AM).

Some stated that if they were to eat vegetarian burger patties, they would prefer to make their own from scratch, so that they could avoid artificial ingredients or preservatives. It was also suggested that they would prefer to buy a product that contained fewer preservatives and freeze them at home so they would last longer, rather than have the manufacturer add seemingly unhealthy preservatives. One participant (female, AM) stated that too much processing and artificial ingredients was one reason they don’t purchase processed vegetarian products. However, they emphasised that their disdains for processed foods was not limited to meat substitutes and extended to processed meat products as well. On the whole, products that were perceived as containing too many strange or unfamiliar ingredients, as well as seeming over-processed or artificial, were seen as unhealthy or poor-quality options.

“That’s the hard thing, because it feels like they have put in so much other bad stuff in those [products] that are meat-like that I think that you don’t really need, but it is needed for the consistency and preservation and that is a shame, I think. That there is so much other bad stuff in them, you think ‘this is better for the environment but is it really better for your body?’” (female, AM).

“No, I’m interested in knowing what I’m eating, and I don’t want to eat chemicals for example, or preservatives, and now I don’t mean at all only that I will keep it as low as possible.” (female, PreCont-Medium).

3.4. Theme 4: Identity

Participants generally believed that the food choices one makes are related at some level to their identity, and control over what their food choices was generally highly valued. It was mentioned that younger people as well as women may have an easier time reducing their meat consumption, and this was discussed both as a barrier for changing one’s own behaviour and as a more general observation from the participants’ own lives. Some participants wished to make choices about what they ate without always needing to consider the wider implications or justifying their choices to others.

“Because I eat what I feel like, that’s just how it is, and it has nothing to do with this. Meat or fish or vegetables, vegetarian all week... like, I just go with what I feel for, nothing else” (female, PreCont-Medium).

Although more apparent in the pre-contemplation groups, the theme of Identity emerged across all groups. The connection between Identity and Health is drawn to reflect times where participants mentioned following a specific diet, e.g., keto, or avoiding specific ingredients, e.g., wheat, since these seemed tied to individual aspects of a person that guides at least some of their food choices.

Two sub-themes were identified, i) agency and ii) culture.

i) Agency

Participants believed that personal agency and choice was important when it comes to food, and in general perceived infringements on personal choice regarding food, in particular meat, were seen as negative. Some participants argued that instead of buying pre-packaged meat substitutes, they would prefer to make their own from scratch, so that they would be more in control of its contents. This was also perceived as a strategy to avoid preservatives and additives that were perceived as unhealthy or negative, again highlighting the connection between agency and Health. One respondent stated that their meat consumption had decreased, but not of their own choice, instead they put it down to an increase of vegetarian food being served in the workplace etc.

“It is very poorly cooked, and I don’t like to be forced into something I didn’t choose myself. I want to have the choice, I want to have options, I want to be able to choose myself” (female, PreCont-High).

For others, obtaining agency and control over one’s food purchases was a starting point for reducing their meat consumption, and there were also some participants who mentioned that their meat consumption had gone down due to other people in their lives becoming vegetarian or otherwise reducing their consumption.

“When I moved away from home and started buying my own and making food myself. Then I became more interested in food. From cookbooks, I became aware of where it actually comes from, which was an eye-opener” (female, AM).

ii) Culture

Most of the participants had grown up with meat in their diet, and so meat was sometimes perceived as difficult to reduce or cut out because of its presence for so much of their lives. The role of culture was also discussed in relation to meat products that participants perceived as having no adequate non-meat alternative option yet, with some participants noting that it is difficult to replace certain elements of the
4. Discussion

The results reveal several complex barriers to both reducing meat consumption and increasing use of meat substitutes among Swedish consumers. Justifications for continued meat consumption have been previously encapsulated by the 4 N’s (Piazza et al., 2015) namely that meat is Natural, Normal, Necessary and Nice. A number of the themes and sub-themes identified here seem conceptually similar to the 4 N’s: the ideas that humans are ‘supposed’ to eat meat was related to scepticism around reducing meat consumption (Natural); that meat is a staple in proper meals whilst meat substitutes are perceived as strange and unfamiliar (Normal); that meat is seen as healthy because it is perceived as containing nutrients that cannot be obtained from other sources (Necessary); and that meals without meat are unsatisfying because meat has a unique sensory profile (Nice).

Moreover, rather than reduce their meat intake in favour of meat substitutes, meat-eating participants here were generally more favourable to sourcing locally produced animal products or reducing portion size of meat in their meals. These actions seemed to be perceived as sufficient for environmental and animal welfare protection. This speaks to an underestimation of the impact of meat on the environment, which is consistent with previous findings (e.g., MacDiarmid et al., 2016). It has been suggested that the consumer segment that concurs that it is ethically justified to consume meat, as long as the animals enjoy decent animal welfare, may represent around a quarter of consumers in Denmark, Germany, and Sweden (Lund et al., 2021). Together, such patterns could be associated with moral disengagement surrounding meat, where people may recognise their personal responsibility around health, animal welfare, and the environment, but still do not wish to change their meat consumption (Graça et al., 2014). This is reminiscent of the “meat paradox” or meat-related cognitive dissonance (Bastian & Loughnan, 2017; Loughnan & Davies, 2019; Rothgerber, 2020) where morally conflicted omnivores who are distressed thinking that their meat, where people may recognise their personal responsibility around traditional Swedish Christmas meal, such as Christmas ham. Another situation where meat was seen as important was summer barbeques, which are very popular social events in Sweden during summer vacation. The influence of cultural norms on what is perceived as ‘proper’ food was discussed, and that this can make it more difficult to reduce meat since meat is still commonplace in the majority of people’s diets. Food culture and norms was given as an explanation by a participant (female, Prep-Medium) as to why their husband and daughter, who were described as training often, eat meat rather than non-meat proteins such as chickpeas. Another participant (male, Prep-High) mentioned that in the past their family ate a meat-heavy diet due to the role of meat in traditional dishes, but that in recent years they had also cut down for health reasons, generally choosing chicken or vegetarian options over red meat.

“With my daughter being vegetarian, what I miss is the grill smell during the summer” (female, PreCont-Medium)

4.1. Tackling the barriers: communication

It was voiced here that it is difficult as a consumer to make sustainable consumption choices, and some participants also noted that they felt that information regarding the impact of meat on the environment is scant or communicated poorly. Increasing consumers’ ability to make sustainable food choices is a key area of interest in the first National Food Strategy for Sweden (Swedish Government Prop, 2016). The results thus support the need for better communication of the environmental impact of food within Sweden. Although it would be difficult to make strong suggestions regarding communication strategies to tackle this based only on these results, some possibilities can be considered. Some suggestions could be to provide climate impact information directly on food packaging, or through public dissemination and increased active discussion of this issue in public spaces e.g., newspapers and social media. It has been suggested that communication through social connections and social media could effect change by encouraging people to reflect on their current habits (Kemper, 2020).

However, simply providing information may be insufficient (McBey et al., 2019). It was found, for example, that information provision was only effective in changing behavioural intentions among individuals who already believed that meat consumption has negative consequences (Vainio et al., 2018). Complicating the situation further, providing climate information can sometimes have an opposing effect to that intended, leading instead to a decrease in willingness to engage in behavioural changes to reduce GHG emissions (Palm et al., 2020). Moreover, a study conducted in Sweden indicated that around 33% of participants did not wish to know the impact of their food habits on the environment (Edenbrandt et al., 2021). However, Edenbrandt et al. (2021) also noted that providing information about the carbon footprint of meat products did change the subsequent choices of those who did not wish to see it, albeit to a lesser extent than those who did wish to have the information. This implies that although providing information may not be sufficient in of itself, information access could still facilitate change for at least some consumers. Indeed, use of a carbon labelling system showing the GHG emissions associated with different meals at a university catering facility influenced meal choices in favour of more sustainable options (Brunner et al., 2018).

Poore and Nemecek (2018) noted that communicating the environmental impact of food products to consumers would not only facilitate comparisons between different product types (e.g., meat and meat substitutes) but also between producers of the same product. This also provides a clearer role for producers regarding emission reduction, who would become more responsible for communicating environmental information to consumers and may be more motivated to take note of the impact their own and similar products have. There is a general perception that making sustainable choices is the responsibility of the consumer rather than that of policy makers or companies (Austgulen et al., 2018). However, a system of carbon labelling may help balance the scale and encourage more sustainable actions at both the supply and demand ends of the food industry.

In principle, such information could be more impactful if a traffic light system were implemented (McBey et al., 2019; Osman & Thornton, 2019). This idea was discussed in a focus group study on communicating carbon footprint information through labels on packaging, where participants generally seemed positive to the concept (Upahm et al., 2011). However, Upham et al. (2011) also cautioned that constructing such a system could be challenging. This is because quantifying the guidelines and boundaries for greenhouse gas emissions could be difficult (in contrast to, for example, nutritional information where widely accepted guidelines regarding the quantity of different macronutrients a typical person should consume daily already exist). Röös et al. (2014) generated a “meat guide” for Swedish consumers, using a traffic-light system to communicate indicators of the carbon footprint, biodiversity, use of pesticides, and animal welfare quality associated with different protein products. An identified benefit of this guide for consumers was that it facilitated comparison of the impact of both different food categories as well as products within a given category. However, the authors were concerned that the system was too complex, and reiterated the need for a standardised way to quantify environmental impact (Röös et al., 2014).

Further, evidence from behavioural economics indicates that traffic light labelling may not offer consistent benefits over grey-scale or plain-text labelling (Carlsson et al., 2020). For example, regarding choosing vegetarian over meat burgers, it was found that traffic-light versions influenced behaviour more than the greyscale when communicating use of antibiotics and health information, but not animal welfare aspects or climate impact (Carlsson et al., 2020). The authors suggested that different labelling systems may affect behaviour and willingness to
purchase through varying combinations of normative and cognitive influences, depending on what information is being communicated. Advances in methods successfully combining life-cycle and nutritional analysis (e.g., Hallstrom et al., 2019) could generate new ways to communicate environmental and nutritional information simultaneously. Although such methods are still relatively new and unstandardised (Bianchi et al., 2020; Strid et al., 2021), these may offer new forms of communication with consumers, possibly through packaging and labelling, in the future.

Information about meat consumption should be disseminated in varied ways and designed in different formats (Kemper, 2020). Herrewnjn et al. (2021, p. 105455) compared the efficacy of showing the poor conditions suffered during the life cycle of factory farmed animals to consumers in video or virtual reality (VR) formats. As anticipated, the VR medium increased perceived presence and empathetic concern, which were in turn related to greater intention to reduce meat consumption. However, when controlling for perceived presence, VR negatively impacted empathy, which was explained by speciesism (Herrewnjn et al., 2021). Thus, using VR to portray cruelty against animals in slaughterhouses as an attempt to change consumers eating behaviour could be counterproductive. The information provided may also benefit from being tailored to different consumer segments. Tailoring information on a website about how and why consumers should reduce their beef consumption according to the user’s stage of change accelerated their progress through the stages (Klöckner & Olstad, 2017). However, significant changes in consumption were not detected.

4.2. Tackling the barriers: behavioural intervention

Behavioural interventions offer another route to effecting dietary changes among consumers. For example, app-based digital interventions such as Vegethon (Mummah et al., 2016, 2017), which promotes self-monitoring of behaviour and goal setting while providing feedback and social comparisons, have shown success in increasing vegetable consumption among overweight adults. Regarding meat consumption, public campaigns such as Meat Free Monday (de Visser et al., 2021, p. 105463) and Meatless October (Pohjolainen & Jokinen, 2020) can promote behavioural change by repositioning individual action in a sharable and communal space. Indeed, normalisation of meat avoidance within socially connected groups can positively affect intention to reduce meat consumption (Cheah et al., 2020). Additionally, by being framed as either a relatively small (Meat Free Monday) or temporary (Meatless October, Vegunuary etc.) change, such campaigns may avoid the pitfall of consumers misinterpreting reductions in meat consumption as being asked to giving meat up completely, as occurred among some meat-eating participants in the present study. Further, longer engagement with such campaigns has been associated with an increased likelihood that individuals stop eating meat entirely (de Visser et al., 2021, p. 105463). These authors suggested that understanding ways to maintain active engagement with such campaigns is thus important to maximising their success, although we suggest that the potential role of habit formation should also be considered. Additionally, even short-term (7 days) adherence to a diet either eliminating meat, changing the types of meat consumed, or reducing all meat consumption can lead to subsequent reductions in overall meat consumption (Dakin et al., 2021).

Lacroix and Gifford (2020) tested the efficacy of targeted behavioural interventions on reducing meat consumption over 28 days. Three interventions were designed to specifically target different groups according to measures of their motivation (based on social norms and attitudes) and opportunity (based on personal skills, knowledge, and context) to change. A match-mismatch design was used to assess whether participants in the matched conditions (i.e., the intervention matched their group based on their personal motivations and opportunity) reduced meat consumption more than those in unmatched conditions. The results indicated that GHG-weighted meat consumption was significantly reduced only in the matched conditions (Lacroix & Gifford, 2020). In other words, targeted interventions were substantially more successful in changing meat consumption than untargeted interventions.

Lacroix and Gifford (2020) suggested that encouraging substitution of red meat in meals was a more promising approach for strong-hindrance consumers, i.e., those with higher food neophobia and likely in a pre-decisional or pre-contemplation stage-of-change than the other groups (see Lacroix & Gifford, 2019). Note that this does not specifically refer to the use of plant-based meat substitutes, and could instead include replacing beef with, for example, chicken, which although still an animal product carries a lower environmental toll. We also observed differing arguments and motives for meat consumption among our groups here, as well as differing attitudes to meat substitutes as a product category. Our results support the need to consider stage-of-change and individual differences in interventions designed to support consumers reduce their meat consumption (see also Hielkema & Lund, 2021). Targeted interventions for changing meat consumption remain under-researched, however the results of Lacroix and Gifford (2020) are highly promising. Evaluating the effects of targeted interventions on the substitution of animal products with plant-based alternatives, as well as assessing their longer-term efficacy, would be fruitful future directions.

4.3. Tackling the barriers: improving practical knowledge and skills

Meat-eaters experimenting with preparing more vegetarian dishes tend to worry about their ability to do so successfully (Pohjolainen & Jokinen, 2020), and ease of access to meat-free recipes can be important in motivating individuals to reduce their meat consumption in both the short- and long-term (de Visser et al., 2021, p. 105463). Similarly, our results highlight the importance of addressing uncertainty around the preparation and cooking of meat-free meals, including the use of meat substitutes. This issue was also raised in Elzerman et al. (2013) where participants described using meat substitutes as more difficult and time consuming than using meat in meal preparation. Decreasing the unfamiliarity associated with these products and normalising their use in comforting and familiar recipes may increase acceptance among uncertain or sceptical consumers. It has been found that repeated use of meat substitutes in an at-home test improved likeability, suggesting that more exposure affects hedonics, at least for some consumers (Hoek et al., 2013). It thus seems that more exposure could be one aspect to consider in improving likeability and acceptance of meat substitutes.

This may be further strengthened through active education on how to spice, cook and serve meat substitutes, or – depending on the product – convincing consumers that similar cooking methods to those they currently use can be employed. Participants in the present study also valued feeling in control of their food choices and exerting agency in meal choice and preparation. Including recipes on product packaging could promote learning new or adapting current cooking knowledge and methods which in turn could take advantage of this desire for agency. Until relatively recently, the importance of cooking skills and food literacy in explaining why some people have difficulty reducing their meat consumption was generally underestimated (Stoll-Kleemann & Schmidt, 2017). Michel et al. (2021) suggested that products aiming to match the most likely to succeed as viable replacements. Given the lack of consensus among participants here regarding the extent to which substitute products should aim to mimic meat sensorially, it may be that for at least some consumers, similarity in preparation and empowerment through increased skills and knowledge may offer more salient routes to behavioural change than sensorial mimicry.
4.4. Price

Consumers may not always have time or the necessary knowledge to assess a product’s quality and so price may become a proxy index of quality, although the nature of this price-quality heuristic is not entirely linear (Gneezy et al., 2014). Many participants here believed that it is more expensive to eat a diet without or low in meat. If they have internally conflated low-meat or vegetarian diets with healthiness, it is possible that their conclusion that such diets are expensive reflects the Healthy = Expensive intuition (Haws et al., 2017). Although price may be posited by consumers as a barrier to changing their food habits, this may occur in the absence of a strong relationship between cost and their current behaviour. For example, in one study it was found that although price was noted by Finnish participants as a key barrier to purchasing climate-friendly foods, price was only weakly related to their self-reported food choices (Mäkinen & Vainio, 2014). Rather, habit and not believing the impact that food choice has on the environment were found to be the greatest barriers. One interpretation of this might be that people may believe that price is an important barrier, but it may not always be as strong a predictor of their food choices as they think. Indeed, some of our participants pointed out that meat is often also expensive. The impact of price and value-for-money on food choice can also be affected by socio-economic status (Ares et al., 2017). Nonetheless, it seems that more competitive pricing and offering smaller packages of products – as far as this is possible for manufacturers – should be considered. Such actions may be encouraging for consumers who are curious to try substitutes for meat but worry about being wasteful if they do not enjoy them.

4.5. Limitations

The present study is not without limitations. First, although the Napping® task was valuable in providing a common starting ground for the focus group discussions and offered participants the possibility to explore a range of meat substitutes that they may otherwise be unfamiliar with, this focused the discussions somewhat disproportionately around burger products. This potentially limits the extent to which the results and their interpretations can be generalised. Note, however, that the discussions were generally broader than this and so we do not consider this a major limitation, in particular given the similarity between our results and observations in previous studies. Second, the predominantly female sample may also be a limitation. Since meat-eating behaviour, as well as the motives and reasons around it, can vary strongly with age, gender, and socio-economic status (Stoll-Kleemann & Schmidt, 2017) a more varied sample may have been beneficial.

A more rigorous method of determining meat consumption among participants would also have been advantageous, e.g., using a food frequency questionnaire. Although we aimed to recruit a broad group of participants, using their stage-of-change and current levels of meat consumption as a method to achieve this, a more objective method for quantifying the latter could have been implemented.

5. Conclusions

The barriers to reducing meat consumption and increasing intake of meat substitutes among this sample of Swedish participants were associated with the following: scepticism towards the need to reduce, uncertainty around the sensory quality and added value of meat substitutes compared to meat, a perceived lack of skills and knowledge preparing meals without meat, the familiarity and pleasurable experience associated with meat, health concerns, and a desire to maintain control and agency regarding food choices. Our results largely mirror the barriers to reducing meat consumption reported among consumers in other studies and countries.

Resistance to reduce meat consumption for environmental reasons was sometimes justified through engaging in other behaviours such as sourcing local or ecologically produced animal products. For some consumers, the preference for Swedish-produced food extended to meat substitutes. The impact of meat consumption on the environment was not clear to all participants, showing that more work is needed to increase awareness of this. However, it is not yet clear that increasing awareness in itself would be sufficient, nor what the optimal manner to convey such information might be. Based on the present and previous results, it may be that encouraging small, manageable reductions in meat consumption for other reasons (e.g., health reasons, trying new and novel foods, expanding cooking knowledge etc.) may need to precede rationales for meat reduction for larger-scale but less immediately tangible reasons (e.g., climate change). These small actions may lead to longer-term dietary change, possibly after consumers feel in control of their choices or when eating less – or no – meat feels uncontroversial. They may also be more open to larger narratives around meat consumption after making smaller, more personal changes in their own lives.

There was no consensus about whether meat substitutes should mimic meat too much or not. Meat mimicry was perceived as strange or dishonest by some – meat-eaters and non-meat-eaters alike. In general, products that subverted expectations either by attempting to mimic meat but being perceived as failing to do so, or by not looking like the vegetables they claimed to contain, were perceived more negatively. For some consumers, similarity to meat in terms of functionality and ease of preparation in meals may be more important than visual mimicry. Increased exposure to meat substitutes through strategic placement in supermarkets as well as attempts to improve cooking literacy with these products may also be important steps in promoting their use by a wider consumer base. These may be beneficial for overcoming both sensorial uncertainty and uncertainty regarding preparation and cooking of non-meat proteins. Normalisation of non-meat proteins in meal applications through exploration of replacements may further effect change by challenging the idea that meat is a necessary component of meals. In practice, wide product variety appealing to a range of consumer segments, clear communication of preparation and cooking methods, and providing recipes could all promote behavioural change. This may appeal to consumers’ desire for agency in food choice and preparation. A combination of effective communication that generates curiosity and initial change, bolstered by empowerment through agency and knowledge regarding meat-free meals may be an effective route to reducing meat consumption. This may require a collective effort from governmental and industrial bodies, in the form of policies and campaigns, respectively, as well as consumers themselves who can encourage others in their social circles to make small changes to their meat consumption habits.

Author contributions

CN, L-MO and PB conceptualised and conducted the study. AN, ESC and MS transcribed the recordings and carried out the qualitative analysis. ESC, JN and L-MO analysed the Napping® data. ESC wrote the first draft of the manuscript. All authors were involved in writing and approval of the final manuscript. The lead author has full access to the data reported in the manuscript.

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Ethics statement

The study was conducted in accordance with the Declaration of Helsinki (1975) and its later amendments. All participants gave written informed consent to take part and to be recorded before the session...
started. No invasive methods were used, and no sensitive information was collected. Personal data was collected and processed in accordance with the General Data Protection Regulation (EU) 2016/679 (GDPR). The study was assessed for compliance with national research ethics standards through an internal process at RISE Research Institutes of Sweden and was approved by management at the Department of Material and Surface Design.

Declaration of competing interest

The authors confirm that they have no conflicts of interest.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.appet.2021.105643.

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