

Meat replacer? No thanks! The clash between naturalness and processing: An explorative study of the perception of plant-based foods

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ABSTRACT

A shift towards a plant-based diet is desired to promote sustainability, improve health, and minimize animal suffering. However, many consumers are not willing to make such a transition, because of attachment to meat and unwillingness to change habits. The present work explored the perception of Norwegian and French consumers' attitudes, barriers and opportunities to increase the likelihood of a shift in diet. Three creative focus groups (CFGs), using interactive tasks such as photo-collage, projective mapping, story completion and third person technique, were run with omnivorous adult consumers in each country. CFGs gathers undirected feedback, providing less biased responses than other exploration methods, related to e.g. social norms. In both countries, results were in general lines comparable. Nutritional knowledge was low regarding vegetable proteins; familiar sources of protein were mostly animal. There is a strong gap between respondents' desired behaviour (balancing nutrition, eating less meat) and their actual behaviour: meat is very important, and the menu is often organized around it. Consumers are curious about vegetable sources of protein, but major constraints were hedonics in France, and convenience in Norway. The main barrier to a shift in diet is the lack of knowledge on how to prepare plant-based meals. Many participants find a conflict between health & sustainability in industrial products, perceiving them as highly processed and suggesting that meat replacers might not be a straightforward way to drive omnivorous consumers to shift to a more plant-based diet.

1. Introduction

Food choices can have a big impact on the environment. The production of meat and other animal products like dairy, have a large environmental impact compared to plant-based proteins (Poore & Nemecek, 2018). A shift towards a more plant-based diet can be endorsed to promote sustainability, but also to improve public health, and minimize animal suffering. However, as Hartman & Siegrist (2017) highlight in their systematic review, "consumer awareness of the environmental impact of meat production is surprisingly low", more research is needed, particularly on the factors that increase willingness to reduce or to substitute meat. Many consumers are not willing to make such a transition, because of attachment to meat and unwillingness to change habits (Graça et al., 2015; de Boer et al., 2016; Hielkema & Lund, 2021). Those ready for the change may consider health, ethical and environmental concerns; vegetarianism and veganism have been highlighted as growing trends in the last years (IPSOS, 2018 & 2021; North at

al., 2021). However, for the green shift to be significant from health and sustainability perspectives, it is omnivore consumers, the majority, that should be on board (Gonera et al., 2021).

Barriers hindering increased consumption of plant-based food are identified as meat enjoyment, eating routines, fear of protein deficiency, lack of vegetarian options, and difficulties in preparing grain legumes and other vegetarian foods, in particular lack of practical knowledge (Wyker et Davidson, 2010; Pohjolainen et al., 2015; Jallinoja et al., 2016; Melendrez et al., 2019; Melendrez et al., 2020). But the focus should be not only on breaking barriers, but on increasing availability and attractiveness of vegetarian foods for those consumers willing to change, as further factors limiting consumption in Europe include low level of innovation, lack of attractive food products and an old-fashioned image of grain legumes (Schneider, 2002; Graça et al., 2015). Given the sensory barriers against plant-based foods, communication of health benefits may be a better route (Tucker, 2014). However, counting on consumer willingness to compromise on taste for health could be a risky

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strategy (Verbeke, 2006). Attaining health and sustainability goals for consumers entails individual vs collective trade-offs (Aschemann-Witzel, 2015), and product sustainability communication is not easy. Some authors propose “meat substitution” should not be used in communication, as it “seems like the second-best option” (Scenoprot, 2016). In a European market that has evolved (Bryant & Sanctorum, 2021), and with a varied offer of plant-based foods of good sensory quality, could it be that good taste and convenience are not enough of a reason to shift?

In the present study, we look at attitudes, barriers and opportunities to increase plant-based protein consumption in Norway and France. Consumption patterns, motives underlying food choice, and sustainability related food practices have commonalities and interesting differences in these two countries. Regarding meat consumption, there has been a steady increase in meat consumption in Norway in the last three decades (change in consumption 1990-2017: +16%), while in France there has been a steady reduction in the same period (change in consumption 1990-2017: -17%). However, levels of consumption per capita are still higher in France (83.04 kg/year per capita vs 67.46 kg/year in Norway), but they are higher than recommendations in both countries (source: FAO, 2020). Meat is of high cultural status in both countries, significant in the agricultural sector, but production systems are quite different. France is first in cow meat production in EU, second in cow milk production and third in pig meat production, reorganization of the agriculture after WWII led to less and bigger farms (Ministere de l’agriculture et de l’alimentation (2015). In Norway, however, producers are small and local meat production is at its highest level in history (Statistics Norway, 2018). With regards to the consumption of plant-based foods, both countries in their nutritional recommendations advise the consumption of pulses, dried fruits and legumes, which are more specific and clear in France, where the *Haut Conseil de la Santé Publique* (2017) explicitly highlight the benefits of pulses and dried fruits and recommend the consumption of legumes at least twice a week. The consumption of beans, peas and grains has remained almost constant in the last 20 years in Norway (Helsedirektoratet, 2018), and decreased dramatically from the 1920s in France (Hebel, 2019). Fish is encouraged to be eaten twice a week in France and three times in Norway.

Regarding motivations underlying food choices, Norway and France are quite different. Main reasons underlying food choices in Norway are taste and convenience, followed by health and price, while sustainability related motives are bottom in the list (Markovina et al., 2015). In contrast, taste and health were the main motives for French consumers, followed by local and traditional production, price, ethics and environment, while convenience came later in the list (Alles et al., 2017). Norwegians have the lowest sustainable food practices among the Nordic countries (Niva et al., 2014), and just a few are motivated to change dietary habits for climate- or environmental reasons (Austgulen et al., 2018). This suggests that sustainability motives may be more important for French consumers than Norwegians (also see Baudry et al., 2017).

The aim of this work was to better understand the perception of Norwegian and French consumers towards increased utilization of high protein plant-based foods, their underlying attitudes, the barriers and opportunities and concrete needs with regards to products, in order to increase the likelihood of a shift in diet towards a more plant-based diet.

2. Materials and methods

Three creative focus groups (CFGs) were run in each country with the same procedures, in each one, four creative tasks were utilized to drive the discussion, details are given below. The discussion guide was elaborated in English by both research teams in collaboration and translated to the local language, some details were adjusted to align with the local culture, details below.

2.1. Consumer recruitment

Groups (approx. n = 10 each) were balanced in gender. Consumers were omnivorous, 25-60yo, in charge of food shopping and cooking or having 50-50 split with a partner and were recruited based on their willingness to participate and having positive attitudes towards sustainability and health, to try and understand motivations and barriers for omnivorous consumers that could be more ready to make a change. This was checked with a short questionnaire before recruitment (see supplementary material), with selected items from: Health, Convenience, Sensory appeal and Ethical concern factors from FCQ (Steptoe et al., 1995); Ecological Welfare factor from ethical food choice motives questionnaire (Lindeman & Väänänen, 2000); Ethics and Environment part from the questionnaire on motives for choosing foods including sustainability concerns (Sautron et al., 2015). Selected Items were extracted from the translated and validated questionnaires, when available from previous studies, or translated and back translated by a bilingual speaker (Norwegian or French) until the meaning of the original questionnaire was attained. Consumers recruited were deemed eligible if displaying positive attitudes as per the attitudinal questionnaire rejecting those that scored low in more than one item (1, 2 or 3 in a 1-7 scale). When invited, the objective of the focus groups was not disclosed to participants and the invite was communicated as to “discuss about their food habits”. Participants received a monetary compensation for participation. Ethics and data protection approval was requested and granted before the study was run (NSD, Norsk senster for Forskningdata).

2.2. Creative focus groups

A 10-min general conversation covered the introduction of the moderator, information about audio and video taping and GDPR compliance, and the introduction of each participant (age, profession, household composition, hobbies etc.). After that, four creative tasks were used to drive the discussion and fulfil the study objectives.

2.2.1. Photo collage

Participants were instructed to take four pictures of their own family dinner plate during the previous week to be sent in advance, a photo collage placard was created for each participant as stimulus for the discussion. The moderator started with the question “How do you design the menu for the main meal at home?”, discussion starting by the first person who wanted to explain their placard, then asked the others if they do the same or different, then they can explain their own placard, going around the table. This part of the discussion focused on better understanding their menu design and food habits, nutritional knowledge and the role of proteins in diet, and underlying attitudes towards meat and plant foods. Topics either came up naturally, or were introduced by the moderator, based on the photo collages. This exercise took up 20-25 min.

2.2.2. Projective mapping

This task focused on different categories of products rich in proteins from different sources. The objective was to explore consumers’ beliefs, attitudes and barriers or drivers towards the consumption of the different product categories. Projective Mapping collects bi-dimensional perceptual maps for each participant. Originally derived from psychology, it was proposed by Risvik et al. (1994) to obtain associations between products from consumers, and has been used in consumer science since, particularly in quantitative tests (Varela & Ares, 2012; Valentin et al., 2012). Its use in focus groups has not been extensively reported, King et al. (1998) suggested it could be well suited as exploratory tool in focus groups. Projective and creative techniques have been suggested as great tools to involve consumers in product creation and development of ideas (Banovic et al., 2016).

Each consumer was handed an A2 blank sheet and 34 preselected

pictures of protein rich foods covering raw, cooked and processed animal products (beef, chicken, pork, fish, dairy, eggs, cold cuts, sausages) and vegetable-based products (beans, pulses, vegetable “milks”, tofu, hummus, porridge, quinoa, bulgur), including meat analogues (raw minced-meat analogue, vegetable burgers, vegetable-based cold-cuts). The products were selected before the test by the project team according to their availability in both countries and based on a compromise between products similarity in the two countries and consumers familiarity. Most pictures were common in the two countries representing the same products, but changes were made to reflect local brands and products (e.g. porridge, very typical in Norway and not consumed in France was substituted by muesli).

Consumers were instructed to build their individual map with the pictures, thinking that pictures closer in the map were more similar to each other, and pictures farther away were more different, based on their own criteria, with no rights or wrongs. When all were done, the first participant that wanted to explain their map started and the discussion went around looking into the different maps and approaches. The moderator probed their motivations and barriers for the consumption of plant proteins as compared to animal-based ones, addressing availability, preparation, environmental concerns, health concerns, taste.

2.2.3. Future products. Story completion

The objective of this task was to explore concrete plant-based, meat-free product ideas that consumers would like to have. The group was divided in two smaller subgroups and worked in teams. This exercise took 20 min for the group work plus 10 min of general discussion. Instructions were given based on an imaginary context: “*Imagine a future where there was no meat available and you had to eat products 100% based on plants, try to come up with ideas of products that you would be tempted to consume*”.

2.2.4. Third person technique

The third person technique is an expression-based projective technique where the respondents are presented with a verbal or visual situation and they are asked to associate beliefs, feelings and attitudes with a third person in a specific situation. This reduces the social pressure of protecting oneself by projecting themselves as someone else and relaxing self-defence mechanisms (Mesias & Escribano, 2018). The exercise based on “*What would this (famous/stereotypic person) choose and why?*”. Stereotypic person pictures were selected by the research team to represent different approaches to food, sustainability, politics views and lifestyle. In both countries some common international people were used, and locals were chosen to be comparable as per the stereotypes they represented (e.g. “sporty person” was the ski champion Marit Bjørgen in Norway while the Biathlon champion Martin Fourcade in France).

Three representative picture placards were used as food category stimuli, as explained by the moderator, to represent examples of well-known plant-based products one can now find in the market: **Placard 1, meat replacers:** picture of meat-free minced meat replacer; meat-free cold cut; chicken replacer based on mycoprotein; vegetarian burger; **Placard 2, vegetable products with added protein:** protein enriched fresh bread; a mix of rice, quinoa and beans, claimed on pack to be “high in protein” “high in fiber”; pasta with 30% white beans; protein rich oats for making porridge; **Placard 3, vegetable products naturally high in protein:** porridge; quinoa salad; chickpea salad; bean and mushroom pie.

The moderator went around the table asking the participants to choose a stereotypic person and describe what kind of plant-based food they would choose from the placards, and why.

2.3. Data analysis

2.3.1. Analysis of the discussion verbatim

A verbatim transcription of the focus groups in France and Norway was performed. To analyse the transcriptions the corpus was separated in six separate topics following the moderator guides: 1) How do respondents design their menus? 2) What is their representation of a balanced diet? 3) How do respondents categorize food products (Projective mapping)? 4) What could push respondents to change their food habits? 5) Ideas of plant-based/meat free products, and 6) Food stereotypes (famous people exercise).

For each topic we used textual analysis. A triangulation process was used to address the issues of internal validity in which three independent researchers (in each country) performed the analysis. The analysis included the following steps: 1) familiarization with the data and identification of initial themes 2) agreement on themes by the three researchers within each country, 3) writing descriptive summaries, making initial interpretations, and clustering the themes within each country and 4) Comparison of the analyses carried out in the two countries. All analyses were carried out in the original language (French and Norwegian) of the focus groups and finally translated into English to allow the between-country comparison. For detailed info on textual analysis see for example Morgan et al. (1998), for more details on the present paper topic identification, please contact the authors.

2.3.2. Projective mapping

Projective mapping data were analyzed separately for both countries to get a representation of the products’ perception country. The position of all food items was measured in each individual map as x and y coordinates of the position of each picture, from all consumers, in all sessions, were pulled together and analyzed and running a Multifactor Analysis (MFA) (Escofier & Pagès, 1994). The discussion among consumers after this exercise was also used to understand their perception. The focus of his paper is not the detailed analysis of the projective mapping exercise, so the map will be used as an illustration during the discussion.

3. Results

3.1. How do respondents design their menus?

Based on the discussions around the pictures brought by the respondents to illustrate their last meals, five common themes emerged from the Norwegian and French focus groups.

3.1.1. Different strategies and reasons underlying meal composition

This theme is divided in two sub-themes in both countries. First, some respondents declared trying to associate foods from different food categories (e.g. meat, vegetable, starchy food, legumes and cereals, meat and side dish) or different types of dishes (appetizer, main dish and desert). Some French respondents tend to think their meals in terms of food items belonging to specific food groups: “*In general, yes, I make an appetizer and a salad or raw or cooked vegetables with meat, fish, or eggs, [...], always a vegetable and a “slow sugar” like rice or legume. If there is a raw vegetable in the appetizer, there is a cooked vegetable in addition*”. This was also observed in Norway: “*We try to have a proper dinner at least 2 or 3 times a week with potatoes, sauce and meat or fish*”; “*sometimes we have beans as extra – otherwise it’s the old-fashioned thinking, it’s meat or fish, potatoes, pasta or rice and vegetable*”. In both countries, this behaviour seems to rely on the traditional belief that “*a balanced diet contains proteins, starchy foods and vegetable*”. The motivation behind these associations is either health oriented or variety oriented (to avoid boredom), although most respondents mentioned this strategy, most of them also said that they do not always apply it.

Even if respondents declared to follow the same main meal composition principles in the two countries, the rationale behind is somewhat

different. In Norway, tradition seems to be very important, even if it implies a certain monotony in meal composition: “We try two or three dinners a week with potatoes, I’m used to it from home”; “I am from the coast and my grandfather was a fisherman, so I’m used to having fish 4-5 days a week”. In France, on the contrary, people try to avoid repeating the same specific foods in consecutive meals: “I do not have two meals with the same foods: I try to balance my meals.”. This seeking of variety is mostly based on pleasure: “It’s off-putting to always eat the same thing over and over again. It is the variety of our food that also makes it pleasant”. In Norway, however, the focus of variation was rather a rotation of the protein part of the meal (fish, chicken, red meat), and variety seeking was not highlighted as main reason underlying their menu planning.

In both countries, health motivations may arise from different reasons; nutritional recommendations: “because I read a lot about food and I try to follow the recommendations about food combinations” (French respondent), or family related: “I do feel that we are quite concerned about having a lot of vegetables, and our children are 17 and 18 years old, and then it is especially important that they get the right diet” (Norwegian respondent). In Norway, it was also stressed that menu is driven by what family members like to eat (e.g. fussy children, physically active children, meat-loving husband): “I have two very picky kids, so then we often eat fish sticks and pancakes” and to follow family habits: “On Friday, our food is as boring as many other homes – we make taco”; “we make pizza almost every Friday”. The importance of the family as a driver was also observed as a factor for the French respondents, “I make meat because my husband likes meat a lot, but personally, I don’t eat lots of meat”. Children were less often mentioned, but this could be due to the characteristics of the participants: in France there were not many parents of young children. When children preferences were mentioned, it was associated with criticism about healthiness of the food liked by children: “We may not be eating this [knaki] every day, because when you know how it’s made ...”; On the contrary, some parents also explained they rather try to favor healthy food for their children: “for children, even if they grow up, they need a healthy diet, vegetables, starches and all that”. “When they are kids, we try to introduce vegetables, but it’s always pasta, rice and fries”. “Other motivations mentioned in France but not in Norway, were the influence of weather and season on food choice (“depending on the weather outside”, or because “one will more easily buy zucchini in summer than in December”); and price: “if it’s the end of the month ... we take what is in the cupboard”, “It depends if there are special offers too”.

3.1.2. Spontaneous vs planned decisions about meal composition

Two main types of behaviours emerged from the discussions on meal composition. Some respondents in both countries cook based on what they have, not thinking in advance “We do not plan the whole week and shop once, it’s not like that”, eating what they feel like “we often have pasta with whatever we find in the fridge”. If they are alone, they might have a ready to eat meal. They declare acting in a rather affective way: “I eat what I feel like on the moment”. On the contrary, other respondents plan their meal carefully, shopping and sometimes cooking for several days: “we usually have a meeting on Sunday evening, where we distribute who will cook what during the week”; and preparing lunch boxes or frozen meals as illustrated by a Norwegian respondent: “I make such large portions, for example cabbage and lamb stew, all goes in the big pot, so we have it for two or three days ... and potatoes, boiled potatoes”. The main motivation behind this planning behaviour is convenience: “I prepare my meals in advance and then I freeze them and I quickly get them out when I leave in the morning”, said a French respondent. Those two behaviours are not mutually exclusive, some respondents act one way or the other depending on their state of mind, time availability, willingness to cook. Some respondents declare not having time to cook for lunch but to try to have balanced meals for dinners. Others indicate that they plan their meal according to their activity: “for example when I do some sport, I eat more starches and otherwise less”.

Added to this, some of the planning may focus around what has been bought for the week, based on the meat: “We try to have fish and meat and

so on and plan a bit around that” (Norway); or based on the fresh vegetable produce: “In general, when I buy fruits or vegetables for cooking, I try to think on how many different dishes I can do with these vegetables” (French consumer).

3.1.3. Intent to decrease the consumption of some foods

In both countries some respondents highlighted their willingness to reduce their consumption of some foods, for several reasons like, health: “With osteoarthritis and all that, I reduce gluten”; “when reaching an age such as mine, because of cholesterol, one should eat cheese in small quantity”; price: “meat, especially red meat is too expensive”, and ethical reasons: “we are having one vegetarian meal each week, because of the environment and health issue”. In France, reduction of meat consumption was a recurrent theme across focus groups: “I eat little meat, I am not vegetarian, but I don’t eat much of it”; “I try to reduce proteins ... I think eating too much meat may not be good for health”. In some groups respondents felt somewhat guilty of eating meat and kept coming back to the idea that they eat very little meat, but at the same time, meat remained something important in their meal representation (“For a good meal you need to have meat”). And some incoherence was highlighted by the respondents themselves (“I’m vegetarian but I eat foie gras”). For Norwegian respondents, however, references to meat reduction were mostly mediated by the willingness to increase fish consumption: “We try to have fish a few times a week, so we also think that we should not eat so much meat, both for environmental reasons that we rather have vegetables or fish”.

3.1.4. Intention-behaviour gap

An important point that emerged in both countries was the large gap between what respondents think they should do: balance their meal, associate different types of food, eat less meat or cheese, etc., and what they actually do. Their meals are rather guided by affective reactions (what they feel like eating: “Me, when I am cooking, it is guided by pleasure”), convenience and availability (at home or in the store: “I always try to put raw vegetables or green vegetables and meat or fish and starchy food, or not: it depends on what I have”), economic power (some foods are expensive), habits and traditions, and what the family members like and need. In particular for Norwegian respondents, even if some often mention the idea of reducing meat consumption, the organization of their meal remains mostly centered around meat or fish: “Fish two times a week, then there is chicken and meat”.

3.2. Representation of a balanced diet

Four main themes emerged from this part of the discussions with some interesting differences between Norwegian and French respondents.

3.2.1. A balanced diet is viewed as a combination of different elements

Many Norwegian respondents talked about associating different macronutrients: “we should have quite a lot of proteins, carbohydrates, yes ... simply a well composed meal every day really”, “Proteins are the largest part of our meals, carbohydrates are on the side. It must be plenty of proteins in a meal, otherwise, you get hungry again very quickly”. Nutrients and food groups were often mixed by respondents of both countries: “You should have one third with vegetables, and one with proteins and one with carbohydrate”. For most French respondents the notion of a balanced diet did not refer to a balance in terms of nutritional composition (only a few respondents mentioned a balance in protein, mineral, or vitamin, when prompted by the moderator), but more of a combination and variation of food groups (“A little bit of everything, in small quantities”).

3.2.2. A balanced diet implies controlling and balancing energy intake

Most of the French discussions were in terms of energy balance (calorie intake vs calories burnt) and for most respondents the balance of a diet is not at the level of the meal (the way you design your plate) but of the day or even of several days depending on their level of activity. “It

depends on the day. If I go to sport in the evening, well, I will eat more starchy food at lunch. On the contrary, if I am at work all day, I tend to favor vegetables at lunch because I know that I will not spend enough energy to spend the calories. So, I think of food balance like that, as a number of calories, rather than a balance in the plate”.

This did not appear as clearly among the Norwegian respondents, and the few mentions to energy intake were more in reference to having enough energy rather than controlling or restraining it: “then we add a lot of carbohydrates which my men need [they work as builders]”; “There is a lot of exercise in our family, so we must somehow have proper food”.

3.2.3. Autoregulation

For some French respondents a balanced diet is something natural that you do not even need to think about, one day you naturally eat more, the next you eat less, if you do sport you need to eat starchy food: “I attentively listen to my body, and I do what it tells me to do”; “I am mostly driven by craving. In case of a high activity, I feel hunger for some foods. I think craving is self-regulated ... but I don’t think about my meals over the day and all that”.

This topic was not mentioned by Norwegian consumers.

3.2.4. The question of proteins in general and meat in particular

For both Norwegian and French participants, the role of protein in the diet was an important topic, and the role of animal proteins, in particular meat, vs other protein sources, brought up interesting discussions.

French respondents discussed the role of meat in a balanced diet. Some respondents argued that to have a balanced/healthy diet, you need to eat a product of animal origin: “to have fish or meat, yes, it is important”. Other respondents think that meat and products of animal origin are not necessary because proteins can be found in other products, such as legumes: “we tend to think that protein is always meat, fish, ..., whereas in the end there are plenty of various legumes”; “I try more and more to reduce meat. I try to balance with legumes”. Some argued that it is possible to have a balanced/healthy diet with less or no meat: “Talking about sports, we have Olympic champions who are vegetarians, so it is possible”. Meat is even perceived as something that needs to be controlled in diet: “eating too much meat is not necessarily very good for your health”.

A participant mentioned the complementarity between legumes and cereals, which can be used to balance protein intake without eating meat “For me, balancing protein is having at least one legume during the day and, like, a cereal”. This is not always a reason to stop eating meat for these respondents, and some of them believe that “we don’t absorb proteins the same way if they are from plant or animal origin”. The solution could be to reduce meat rather than stop it “I try to eat less and less meat and to compensate with legumes”.

Norwegian respondents do not spontaneously bring up the topic of

vegetable proteins, rather highlighting the role of meat: “Maybe this is a habit, you know there are proteins in meat and fish, and they should be in a healthy good diet”. They move among different animal meat sources, even if conscious of red meat related issues: “over the last couple of years we have become more aware of the issues with red meat through news and media. But we replace it with white meat and fish, and then we might rather have a smaller instead of a larger piece”. When Norwegian respondents mentioned alternatives to red meat, it was mostly moving to fish – perceived as a healthier protein; the importance of the quality of the red meat was also discussed: “We try to get fish a couple of times a week, and then not too much minced meat and such. We try to eat real meat”.

3.3. How do respondents categorize food products? (Projective mapping)

Participants were undirectedly nudged to reflect about different protein sources from animal and vegetable origin through this task, opening the discussion to a potential shift towards a more plant-based diet.

Consensus projective mapping maps, per country are shown in Fig. 1. In France (1a) it showed an opposition on the first dimension between raw plant-based foods (vegetables and fruit), and animal products, either raw (e.g. chicken breast) or processed (e.g. sausages and cold cuts). The second dimension was characterized by processed plant foods (veggie “burger”, almond beverage ...) and unfamiliar plant-based products, such as quinoa and bulgur. Dairy products were located in the center of the map defined by the first two dimensions. In Norway (1b), the opposition between raw plant-based foods on one side, and raw and processed meat products on the other side, defined the first dimension. The second dimension opposed fish to dairy and eggs. Processed plant-based foods were spread on the map, located close to their animal counterparts, with vegan analogues located based on their use: ham and burger close to meat and cold-cuts, almond beverage and tofu were located next to milk.

These maps highlight major differences in the categorization between both countries: first, the position of fish was a major difference between France and Norway. For French people, fish was in the same group as meat, along with eggs, as a participant commented “Here are the meats and then in the meats we have the fish”. For Norwegian participants, on the contrary, fish and meat were located on independent dimensions, which highlights the specific position of fish in the Norwegian diet. The second main difference is that in France, the categorization depended mostly on two pillars, which are the opposition between animal based and plant-based products, and the level of transformation or processing. Whereas in Norway, four poles are formed, with traditional products categories (meat, fruits and vegetables, dairy and eggs, fish), “new” plant-based options were positioned according to these poles, in terms of their usage. Thirdly, it is worth noting that Norwegian consumers

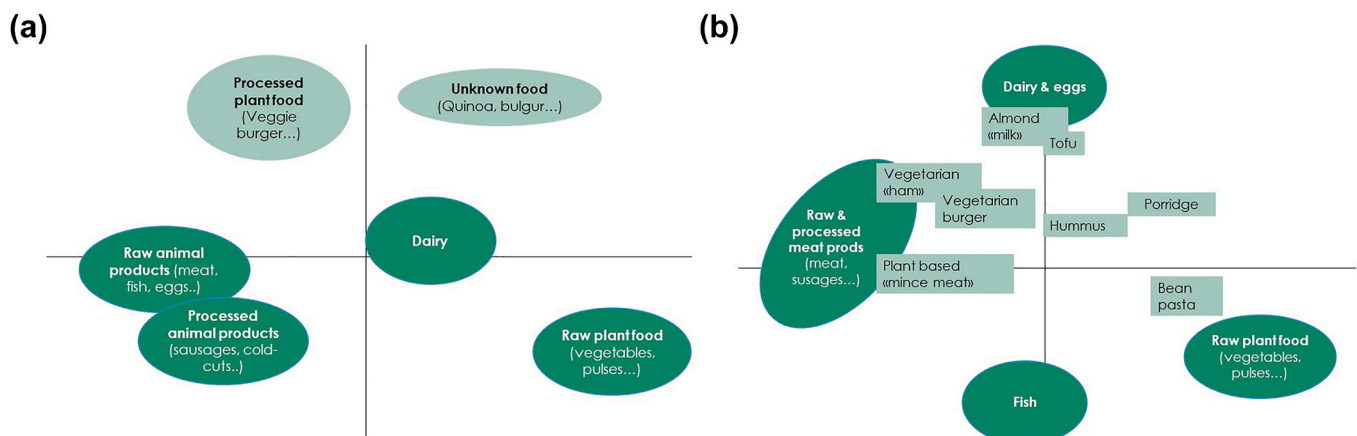


Fig. 1. Consensus maps obtained in France (a) and Norway (b) during the projective mapping task.

seemed to have given more weight to the preparation/utilization method when categorizing the foods (i.e. plant based analogues mapped together with their meat counterparts), focusing less on the composition, what could be in turn linked to their convenience-driven food choices. For French consumers however, plant-based analogues and meat-based products appeared as separate groups, which could reflect the fact of their increased interest in the sensory characteristics of the meat and being pleasure one of their main drivers of choice.

In the next sections, main topics coming from the moderated discussion are described, focusing on the associations to the different food categories mapped. Some food categories were already naturally discussed in the first part of the focus groups, so the new products presented were the ones consumers focused on while discussing the mapping.

3.3.1. Participants' opinion on the different plant-based food products

Legumes: Even if well-known, most respondents in both countries acknowledged the fact that they have little (or no) knowledge about legumes. The boundary between vegetable and legumes was blurred. From a nutritional perspective, they discussed their protein content with a lot of uncertainty (“I do not have scientific data, I'm not sure, I may say something wrong”) and main idea was that legumes contain proteins but not as much as meat. Among legumes, soy had a specific status and was discussed at length, it had a bad reputation, because of possible GMO and absence of taste. Another important barrier for their consumption is they are considered not convenient, difficult to cook, and participants were convinced they lacked preparation skills (e.g. “Chickpeas and beans, and so on, are much cheaper to buy in a bag, but they require so much planning”; “I feel that we have a lot of lentils in the closet, because you know it is good, it does not necessary take so long, but then I am not quite sure how to prepare it, and then it doesn't happen”). A few respondents finally said they never buy or eat legumes and have no interest in them.

Vegetarian options: Foods typically linked to classic vegetarian options like tofu, are not well known and are perceived as bland (“And then there is vegetarian (products) up here, it's really things I don't really know what to do with, don't know how to treat a tofu, even though I would like to try”; “The tofu itself is terribly dull”), even if some acknowledge the nutritional properties (“Tofu is not a favorite, but it is a good protein source”); newer options like quinoa or bulgur were perceived as “hip”, far from their habits, not at all familiar to some (“Bulgur and quinoa. What in the world is that? Hummus? Never heard of. They are foreign products for me”; “I don't quite know what to use it for. The safe way is often the best way.”).

Meat replacers: In general, respondents in both countries had a negative opinion of meat replacers, some even rejecting them completely. The main reasons were the high processing, the fear of additives and the fact of not knowing what they are eating (“These are processed products. They are proteins, but not meat. Me, I don't know what is inside.”). Another reason was the gap between expectations from the pack and the reality of the food (i.e., taste, texture). Among the processed foods, the plant-based meat analogues were discussed at length. For some respondents there is a dissonance between the word “steak” which refers to meat and the word vegetal or plant-based (“All that is plant-based, but “sounds like” meat, I do not eat. Because for me, it's an aberration”; “The name ‘plant-based steak’ is for vegetarians who are irritating: they do not want to eat meat, but they want something that looks like meat”). For others, the word “steak” creates some sensory expectations, which are not fulfilled (visual appearance, taste, texture) even though the nutritional content could be equivalent of that of a regular steak. However, French respondents also challenged nutritional composition of meat analogues, not necessarily from a well-informed standpoint, considering them not equal to meat (“Is it nutritious, is it satiating? ... it is not totally possible to substitute, because red meat provides things needed by certain people, it's about blood and all this, I don't really know the composition”; “I would feel that I am only eating vegetables” [if combining a plant-based steak and vegetables]). Despite a similar negative general reaction to meat analogues, some Norwegian respondents declared eating them

for convenience reasons, highlighting again the importance of function for them, and to “fool” others (“you can use the same pasta sauce with it, and then you can fool your kids at home to believe it is minced meat, and then they do not protest”; “If it looks like a meatball, I don't care what is it made of, then I can use it as meatball”). Some also mentioned that these products are not just for vegetarians but could help other consumers to decrease their meat consumption. French consumers did not refer to convenience and function as reasons to eat meat analogues.

In both countries, the biggest barrier against a possible consumption of more meat analogues, was the not natural, but highly processed perception (“all that is processed food, and I do not eat processed food”; “I wonder what they have mixed there to make it look like minced meat”), and many find no reason to shift to those products if they were to reduce meat, preferring to shift to other source of animal proteins (“There can be a lot of strange things in there that I do not want. I do not know such unknown substances and blends ... I would rather choose a clean fish or eggs”), or legumes (“The alternative meat products, they are “no-no” for my part. I prefer chickpeas and natural protein sources”).

3.4. What could push respondents to change their food habits to more plant-based foods?

At the end of the projective mapping exercise, respondents discussed the reasons that could push them to change their food habits to more plant-based.

French respondents discussed about taste and pleasure as very important drivers. Some mentioned that they would not eat food they do not like, that pleasure was too important and that they do not want to sacrifice taste for health or the environment (“If it's not good, I won't give it another chance. I would feel like I was punishing myself. I prefer to live a shorter life [referring to tofu and assuming it is good for health]). Norwegian consumers also mentioned bad taste or texture as potential barriers, but pleasure was not highlighted in the strong way French consumers did.

It was clear from the discussion in both countries, that change takes time, and that it cannot be expected to switch to plant-based foods over a few weeks (“For our generation, it is difficult”; “Telling you that next week I will switch to plant food is not possible. People have to get used to it, for 10, 20 or 30 years”). Curiosity may lead some of them to try new foods and so, new products should be both attractive and easily available (not just in specialty stores). For a few respondents, sustainability could be a key for changing food habits but they discussed the fact that the industry green washing is not compatible with a real improvement of food sustainability: “Sustainable food should remain natural and industry produces processed foods, which are not natural”.

Finally, participants discussed the need of external forces to help them break their food habits. These outside factors could take the form of medical or health issues, incentives from their partners, change of needs with ageing, economic reasons, or could be made possible by education.

Education around cooking skills and nutritional aspects of plant-based foods, especially peas and beans seems necessary to them. Many participants expressed in various ways their lack of knowledge, their lack of self-confidence about foods in general and plant foods in particular. Others lacked interest in those issues and declared not thinking about that.

3.5. Product ideas

The product idea generation part of the focus groups did not work well in any of the groups in neither of the two countries, consumers struggled to come up with suggestions; just few ideas came up, mostly classical home-made preparations in which they proposed to take out the meat. Instead, they spent most of the time allocated to the task discussing that this was a very difficult task, and the reasons why, which are briefly summarised here: *it is impossible to do, animal protein ingredient is difficult to replace, it would be boring, it would not be satiating, it would not*

respect seasons, it would not be new, it would not be balanced, it would not be tasty, it would be processed.

3.6. Food stereotypes

The third person technique was aimed to getting more in depth into the barriers and opportunities to increase plant-based consumption, by taking away the social pressure of consumers' responses by projecting themselves onto someone else. This part of the CFGs mostly revealed expected stereotypes related to the characters (e.g. American stars are associated with healthy diet and eat legumes and pulses, men prefer ready-to-eat foods, athletes would not eat fat, etc) and emphasized topics already discussed in the previous parts. "No meat diets" were generally associated to politicians of the pro-environmental party, young people, women (concerned about losing weight or staying slim), and sport people (needing protein without fat). However, some participants in France felt that athletes needed proteins from meat, especially red meat.

Most important positive and negative opinions about plant-foods are listed in Table 1. The results highlighted negative opinions mostly linked to meat replacers; on the contrary, products either enriched in plant-based protein or naturally rich in plant-protein, were positively considered.

4. Discussion

Results highlighted similarities and differences among countries on how consumers perceive the shift to a more plant-based diet. Some of the main differences reflect distinct food representations, culture and traditions, and link back to previous studies on reasons underlying food choices for Norwegian and French populations. Consumers' perception of plant-based foods is intertwined with health and sustainability perceptions as well as other motivations, making the interpretation interesting and complex. Some consumer motivations may promote sustainable food choices (e.g. animal welfare), while other may constitute barriers (e.g. legumes perceived as less tasty or less convenient),

Table 1
Most important beliefs and opinions about plant products emphasized during the stereotypes task.

	Meat replacers	Vegetable products enriched with protein	Products (naturally) high in protein
Positive	Environmentally conscious; Easy to replace meat with; Traditional use; Recognizable; Easy to "trick" the brain to believe it is meat; To trick children, children would like it	Healthy; Traditional; To get enough nutrients; To eat right; To use it daily; Additional to other products; Rich food; Extra boost, keep you going for a long time; Will keep your focus on top; Build muscles;	Looks tempting; Is healthy, Looks healthy; Gives energy; Raw food, "Clean food", Without artificial additives, Not "tampered" with; For health conscious; Kind to the environment; Satiating food; Avoids packaging; Creates an image;
Negative	Processed; Fast food; Artificial, Unnatural; Unknown, Looks strange; Disgusting, Not tempting; Prefer a portion of porridge instead (in Norway)		

making it important to study sustainability motives and their trade-offs with other food choice motives (Verain et al., 2021). Sustainability is a complex, multidimensional concept, associated by consumers to environment, health and nutrition, ethics, social, developmental and economic aspects, and somehow ambiguous for consumers (Barone et al., 2020; Verain et al., 2021).

Regarding consumer food practices, how consumers built their meal menus have many communalities among Norwegian and French consumers, but one main difference and potential driver for French consumers for the shift, is the enhanced variety seeking in menu planning, as opposed to the more traditional Norwegian style, which could hinder the shift.

Main reasons underlying food choices for Norwegians have been highlighted as taste and convenience, followed by health and price, while sustainability is among the least important (Markovina et al., 2015). The present study also points out to that, Norwegian consumers showed a strong focus on convenience when planning their menus, and intentions to eat more plants, or less meat, were considered mostly linked to health. Even if aware of food sustainability issues, those motives were not top of mind and not often mentioned. This is in line with Hanss and Bohm (2011), who described that for Norwegian consumers, the concept of "sustainability", comprises different dimensions but food-related associations were mostly linked to "food crisis" and a problem to be solved, rather than individual, food-related actions; suggesting a low awareness of how their own actions could contribute to sustainability.

For French consumers, motives underlying food choices have been highlighted as, in order of importance, taste, health and absence of contaminants, local and traditional production, price, ethics and environment, convenience, innovation and environmental limitations (Alles et al., 2017). Our results also reflect this, with pleasure and taste being mentioned as important drivers with regards to menu planning, and main barriers against the adoption of plant-based foods, as well as meat reduction. This shows an important reason not to consume meat substitutes, either because they enjoy meat and would not deprive themselves of the pleasure, or because they dislike plant-based meat substitutes. This was also observed in a European cross-cultural study: for French participants, liking the taste of meat was the main reason for not consuming meat substitutes (Weinrich, 2018). In the same lines, Bryant and collaborators (2020) found lower rates of meat avoidance in France as compared to Germany. A recent survey carried out in France, Germany and UK, indicated that participants' expectations regarding the taste of burgers was lower for pea and algae-based burgers than for a beef burger (Michel et al., 2021). Food pleasure seems to be a particularly important concern for French people. Rozin (1999) compared attitudes to food in USA, Japan, France and Belgium, and showed that among these countries, the most pleasure-oriented were the French, that were also the least health oriented. The relationships between food culture and eating behaviour, are in France highly characterized by commensality, social interactions, and pleasure from eating (Dao et al., 2021).

Convenience was not top of mind in the French focus groups, in line with Alles et al. (2017). Norwegian consumers have been highlighted as more critical than French to food innovation, particularly with regards to traditional food products (Guerrero et al., 2009). Our results point towards tradition as a barrier in both countries, in line with de Boer et al. (2017) who found that identity-incongruence hinders consumers from choosing vegetarian options; this was more often encountered in the Norwegian groups, particularly in relation to meat & fish as part of the traditional meal, and the planning of meals around them. Fish is very important in the Norwegian diet, and it was the first transitional product that Norwegian consumers think about when planning to reduce meat, for health reasons and nutritional recommendations, but in this work, consumers also referred to the less environmental impact of fish as compared to red meat.

It is interesting to note, as above highlighted in the behaviour-

intention gap section, that parameters driving actual behaviour (what they feel like, what is convenient, what is affordable, what they are in their habits) are consistent with the drivers previously identified via the Food Choice Questionnaire by other authors; on the contrary, considerations like health or environmental impact seem still not to be not main drivers of food choices.

4.1. The question of the reduction of animal protein

In both countries, participants showed some concern about the negative impact of meat on the environment, and in France, about animal welfare. Eating too much meat was considered unhealthy by many participants in France, but not so often in Norway. In both countries, some participants spontaneously mentioned their intention or attempt to reduce meat in their diet, revealing some cognitive dissonance: they are eating more meat than they would like to. This has previously been identified as the “meat paradox” creating discrepancies between behaviour and consumers ideals (Rothgerber, 2020). In this sense, participants’ verbatims revealed a clear intention-behaviour gap, also described by previous studies (Stubbs et al., 2018; Hielkema & Lund, 2021); highlighting techniques utilized by meat eaters consumers as “distancing devices” to separate themselves from the ethically questionable consequences of eating meat (Rothgerber, 2020). Even if they seemed open to the idea of reducing meat consumption, participants in our study mentioned a shift to high-quality meat (e.g., meat bought from local producers; avoidance of cold cuts, minced meat, highly fatty or processed meat), rather than reducing overall meat consumption or totally avoiding meat. Added to this, there is a big support of farmers and local food producers of meat products in both countries. Paradoxically enough, Bryant and van der Weele (2021) showed higher rates of meat avoidance in Germany and France among meat industry workers as compared to the rest of the population, as well as reporting that moral concerns among farmers are growing but remain veiled. In Norway, farming in the mountains is considered important for maintaining and preserving the landscape. A recent study with Danish consumers, whose meat-eating culture is close to Norwegians’, reported that social influence and raised awareness through social ties could be an important first step in progress from intention to action, and that the focus should be on meat reduction, not exclusion, as completely removing meat from the diet was unpopular (Hielkema & Lund, 2021). Consumers in our study seem to share this point of view, they think it will take time (“several years”), to adjust habits to base their diets on plant-based products. Many feel that the food culture and food traditions are barriers: their food habits and representations, with a strong emphasis on meat (and fish in Norway), determine their current food behaviour.

4.2. To mimic or not to mimic? The issue of food processing in plant-based products

Most participants in our study were against the idea of mimicking meat products with plant-based analogues. They were more inclined to consume unprocessed plant-foods, or fish instead. Many participants have tasted meat replacers but almost none of them consume them frequently. For meat substitutes, consumer acceptance has been largely determined by attitudes, beliefs, food neophobia, key barriers being unfamiliarity and lower sensory attractiveness (de Boer et al., 2017; Hielkema & Lund, 2021; Hoek et al., 2011). But our study unveils an extra dimension to this issue, the clash in consumers’ minds of the expected status of “natural and healthy” of plant-based foods, with the high processing of creating a meat analogue, and this brings the question of “why replacing meat?”. Rather than consuming meat analogues, some participants consider that they would prefer to reduce or stop eating meat: “A vegetarian cold-cut? Why would I eat it?”; “If I am not going to eat a meat, I just don’t eat a meat”. But again, this rises a contradiction, since they also claimed not being ready to stop eating meat; raising again the cognitive dissonance phenomenon described at length in Rothgerber

review (2020): the existence of meat alternatives reminds some people of uncomfortable reasons why they should avoid meat, instinctively trying to find “distancing devices”, via motivated reasoning, constructing pro-meat justifications.

Another aspect of consumers lack of trust was reflected in the intertwined perception of naturalness and sustainability, some consumer believing that a processed meat analogue, being less natural, is also less sustainable (“Sustainable food should remain natural, and industry produces processed foods, which are not natural”). The contrary has been demonstrated in several publications focused on LCA, where meat analogues have smaller environmental burdens than their animal counterparts and may in many cases have added health benefits as increased fibre content (see for example Saget et al., 2021).

The question of processing was a major concern for the participants. At the same time, they recognized not knowing how to prepare raw legumes or vegetarian dishes (“Making vegetarian dishes that are full of flavor and nutritive is in some way another way of cooking, I would have to learn it from scratch.”), and they refuse to include in their diet ready-to-eat plant-based products. Nevertheless, it should also be noted, at the light of sales numbers, that the meat analogue category has been steadily increasing in Europe, showing that, at least, part of the meat reducers are resourcing to this offer.

The identified mistrust towards processed products by some consumers, added to the lack of practical knowledge on how to cook plant-based foods are probably the main barriers to the consumption of plant-based foods.

In summary, the results of this work show a strong gap between respondents’ desired behavior and their actual behavior, revealing some cognitive dissonance and the constructions of “distancing devices” to maintain their meat consumption. Consumers are curious about vegetable sources of protein, but major constraints were hedonics in France, and convenience in Norway, added to the lack of knowledge on how to prepare plant-based meals. Enhancing the culinary knowledge through education and communication could be a good opportunity in both countries. Many participants find a conflict between health & sustainability in industrial products, particularly meat and dairy analogues, perceiving them as highly processed and not natural. The exposure to more and new products based on legumes, grains and cereals, not based on imitating meat, and culturally appropriate in each country could promote the transition to more sustainable and healthier diets.

4.3. Methodological considerations

Our focus group methodology was based on the use of four different tasks (photo collage, projective mapping, story completion and third person technique). Some of these tasks were less informative than others. In particular, during the story completion, participants did not come up with new ideas, and some of the participants even refused to do the task. This apparent absence of result is in fact very informative: it gives us insights about participants’ incapability to find new ways to reduce meat or be creative with plants. Participants’ refusal to do the task can be explained by no need to replace meat, but also by poor cooking skills, or by the inability to come up with ideas to replace meat without considering food ultra-processing, which is considered negative. Participants can also have felt they had already discussed this question during previous tasks. Anyway, participants’ reaction was not due to shyness or a low participation in the discussion, because they were widely involved in the discussion during the first two tasks. The relative poorness of the discussion during the “third person” task can also result from participants having expressed all their ideas in the first two tasks, or because the profiles provided were maybe too stereotypical.

4.4. Limitations and future work

This study was carried out in cities of different size and

characteristics, which could influence somehow the results. In particular, Dijon is not located in the coast, which can be one of the reasons that fish was barely mentioned in the focus groups carried out in Dijon.

The data collection in this study was prior to the Covid-19 crisis that has modified consumers' attitudes and food habits during the crisis. One consequence of the crisis has been that environmental and health concerns may be converging (IPSOS, 2020). In the past, health has been considered as an individual responsibility while environment was a wider, shared issue. Other behaviours enhanced by Covid-19 lockdowns have been the rise of cooking at home (see for example Marty et al., 2021 or; Janssen et al., 2021). These two behavioural changes could help towards the transition to more plant-based diets, with more consumers linking health and sustainability in their food choices, and more consumers experimenting with new recipes and ingredients cooking at home. We yet don't know which Covid-19 changes would be lasting in our societies, but this may have consequences on the topic of this paper, which future work would need to revisit.

5. Conclusion

This study allowed us to observe that proteins occupy a specific position in the menu for most participants, who are aware of certain meat drawbacks – for the environment, animal welfare, or health. However, they face much uncertainty when it comes to replacing meat. Norwegian participants generally consider replacing meat by fish, and French more spontaneously mentioned plant proteins. In both countries, even when plant-based foods are considered an option, how to consume them is not straightforward. Participants reported not knowing how to cook raw plant-products and they reject ready-to-eat meat substitutes, which are perceived as too processed, and not natural enough.

The main differences highlighted between French and Norwegian participants were the importance of taste and pleasure in France and of convenience in Norway. A difference in the categorization of plant-based food was also observed in the two countries: French people categorizing food products according to the animal or plant origin and the level of processing, and Norwegian people categorizing products according to their practical usage. In Norway, convenience could be a lever for people to switch to plant-based food, because of being one of their main motivations and their focus on practical aspects when categorizing foods. Taste is a priority of most French participants, who are not ready to sacrifice food-pleasure, even if they may be convinced about the need to switch to plant foods.

Many participants find a conflict between health & sustainability in industrial products, perceiving them as highly processed and suggesting that meat replacers might not be a straightforward way to drive omnivorous consumers to shift to a more plant-based diet. The importance of taste as barrier and the general lack of culinary knowledge suggests that effort should be placed in giving consumers opportunities for culinary learning, facilitating cooking from scratch with legumes (e. g. cooking kits), offering convenient but minimally processed options and trying to make plant foods the familiar choice.

Author statement

Paula Varela: Conceptualization, Methodology, Data analysis and interpretation, writing of original draft. **Gaëlle Arvisenet:** Conceptualization, Methodology, Data analysis and interpretation, writing of original draft. **Kristine S. Myhrer:** Preparation of discussion guide, moderation, data analysis. **Viridiana Fifi:** Preparation of discussion guide, moderation, data analysis. **Antje Gonera:** data analysis and interpretation, review of manuscript draft; **Dominique Valentin:** Conceptualization, Methodology, Data analysis and interpretation, writing of original draft.

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Data availability

The corresponding author has access to the complete data and should be contacted.

Ethical statement

The authors declare that the research in this paper comply with ethical principles and Applicable international, EU and national law (in particular, EU Directive 95/46/EC).

Experiments conducted on humans are set up in agreement with Norwegian ethical requirements on research activities and personal data protection. Thus, protocols are sent for approval to the Data Protection Official for Research (NSD, Norsk samfunnsvitenskapelig datatjeneste, <http://www.nsd.uib.no/nsd/english/pvo.html>) which is responsible for granting licenses on behalf of the Data Inspectorate in relation to the Personal Data Act and Health Register Act.

All participants signed an informed consent and were free to withdraw from the studies at any time without providing a reason for withdrawal and without penalty. No sensitive data was collected (for example, on religion, sexual orientation, race, ethnicity, etc.). Data was used only for scientific purposes only (no commercial purposes). Security Strategies for personal data, confidentially and protection were adopted through codification system procedures. Storage and handling of such data guaranteed the anonymity of the participants: in all result files, there was no nominative data. This means, recruitment data (with personal data) and results data are all times separated and never stored together.

Declaration of competing interest

None.

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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.2021.105793>.

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