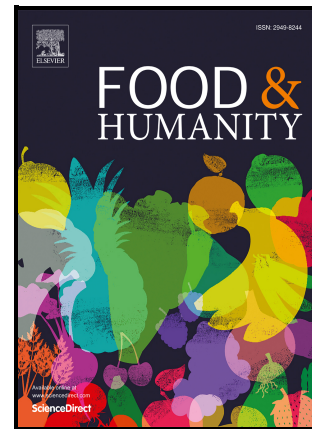


Evaluations of meat and dairy substitute products:
Exploratory insights on mental shortcuts and
similarity

Geraldine Holenweger, Bettina Höchli, Aline
Stämpfli



PII: S2949-8244(26)00543-4

DOI: <https://doi.org/10.1016/j.foohum.2026.101535>

Reference: FOOHUM101535

To appear in: *Food and Humanity*

Received date: 2 April 2026

Revised date: 24 August 2026

Accepted date: 26 September 2026

Please cite this article as: Geraldine Holenweger, Bettina Höchli and Aline Stämpfli, Evaluations of meat and dairy substitute products: Exploratory insights on mental shortcuts and similarity, *Food and Humanity*, (2026)
doi:<https://doi.org/10.1016/j.foohum.2026.101535>

This is a PDF of an article that has undergone enhancements after acceptance, such as the addition of a cover page and metadata, and formatting for readability. This version will undergo additional copyediting, typesetting and review before it is published in its final form. As such, this version is no longer the Accepted Manuscript, but it is not yet the definitive Version of Record; we are providing this early version to give early visibility of the article. Please note that Elsevier's sharing policy for the Published Journal Article applies to this version, see: <https://www.elsevier.com/about/policies-and-standards/sharing#4-published-journal-article>. Please also note that, during the production process, errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Evaluations of meat and dairy substitute products: Exploratory insights on mental shortcuts and similarity

Geraldine Holenweger^a, Bettina Höchli^a, Aline Stämpfli^b

^a University of Bern, Institute of Marketing and Management, Department Consumer Behavior & Behavior Change, Engehaldenstrasse 4, 3012 Bern, Switzerland

^b Agroscope, Research Group Human Nutrition, Sensory Analysis and Flavor, Consumer Science, Schwarzenburgstrasse 161, 3003 Bern, Switzerland

Corresponding author: Geraldine Holenweger (geraldine.holenweger@unibe.ch)

Acknowledgments

We would like to thank the Swiss Foundation for Technology Assessment TA-SWISS for its financial support. We would also like to thank Mélanie Douziech, Anna Morf, Victoria Habermacher, Daniela Knup, and Jana Tschopp for their support in conducting and transcribing the interviews.

Abstract

This study aims to gain exploratory insights into how consumers evaluate meat and dairy substitute products (MDSPs). One focus is on the mental shortcuts consumers apply when evaluating the healthiness and sustainability of MDSPs, and a second focus is on how different

consumer groups evaluate the similarity of MDSPs to their conventional animal-based reference products (ABRPs). Eight individual interviews with adult consumers and seven with adult non-consumers of MDSPs were conducted in a Western European country to explore how evaluations of MDSPs are formed. Participants who evaluated the healthiness and sustainability of MDSPs used mental shortcuts that are specific to the substitutive framing of MDSPs: the reference halo effect, ambiguity, and dilution. Further, interviewees used the natural-is-better and the familiarity heuristics. Additionally, the degree of processing, ingredient list, and packaging served as cues that triggered mental shortcuts. Regarding the evaluation of similarity between MDSPs and their ABRPs, the similarity of dairy substitutes was rated almost exclusively positively, whereas evaluations of meat substitute similarity varied considerably. Based on the interview data, a preliminary conceptual model with four consumer groups emerged, defined by the dimensions of *meat attachment* and *perceived need for change in the food system*. Preserving meat lovers and plant-based diet-oriented individuals evaluate similarity negatively; progressive meat lovers evaluate it positively; and for nondogmatic omnivores, similarity is irrelevant. The present study points to the relevance of considering consumer segments and mental shortcuts when marketing MDSPs. Further research is needed to validate these exploratory findings.

Keywords: Meat substitutes, Dairy substitutes, Consumers, Interviews

1. Introduction

Consuming animal-based foods can negatively affect human and planetary health. Animal-based foods cause nearly 60% of global food-related greenhouse gas emissions (Poore & Nemecek, 2018). Overconsumption of red and processed meats can reduce life expectancy (Fadnes et al., 2022) and increase the risk of noncommunicable diseases (Schwingshackl et al.,

2017). Reducing meat and increasing plant-based food consumption are therefore required to mitigate these impacts (Willett et al., 2019).

One way to reduce animal-based food consumption is to substitute conventional animal-based foods with alternative products. Recently, an increasing number of products intended as substitutes for conventional animal-based food products have entered the market (The Good Food Institute, 2024). Since meat and dairy products are the animal-based food categories with the highest production values in the country under study (Federal Statistical Office, 2022; Mehner et al., 2024), this study focuses on meat and dairy substitute products (MDSPs). In this study, MDSPs refer to products that, from the consumers' perspective, serve to replace conventional meat or dairy products in a meal. These include long-established, minimally processed plant-based products that have recently expanded in variety (e.g., tofu, plant-based drinks), new highly processed plant-based products designed to mimic traditional animal-based products (e.g., plant-based chicken chunks, cheese alternatives), and two novel animal-based substitute product categories, namely insects and cultured meat. Unprocessed products such as lentils or peas are not included.

Shifting toward consuming less conventional animal-based food requires not only offering MDSPs but also understanding how consumers evaluate them. Several quantitative studies examine how consumers evaluate MDSPs in terms of health and environmental friendliness (Giacone et al., 2024; Granato & Wassmann, 2024; Hartmann et al., 2022; Lazzarini et al., 2016). However, such studies often rely on predetermined, closed-ended constructs, potentially overlooking unprompted considerations consumers draw on when evaluating MDSPs. Therefore, fewer studies explore how these evaluations are formed in consumers' own words and

reasoning processes (Adamczyk et al., 2022; Elzerman et al., 2022; Varela et al., 2022).

Consequently, consumers' considerations when evaluating MDSPs remain underexplored.

To examine these underexplored considerations, this study adopts a pragmatic qualitative approach within an experiential framework (Aronson, 1995; Braun & Clarke, 2022). This framework is suited for exploring how evaluations of MDSPs are formed because it enables researchers to understand and interpret people's socially embedded experiences, behaviors, and views, including how they make sense of them (Braun & Clarke, 2022). The collected experiential interview data allow for analyzing various aspects of MDSP evaluations. Because MDSPs are often positioned as healthy, sustainable, and similar to their conventional animal-based reference products (ABRPs), topics discussed in scientific literature (Granato & Wassmann, 2024; Greis et al., 2023; Siddiqui et al., 2024) and society (European Parliament, 2025; Leialohilani & de Boer, 2020), the analysis focuses on the considerations consumers apply when evaluating the healthiness, sustainability, and similarity of MDSPs to their ABRPs.

1.1 Healthiness and sustainability evaluations

Exploring the considerations consumers apply to form their health and sustainability evaluations of MDSPs is particularly relevant, as these attributes are often used as selling points (e.g., protein claims, climate footprints). Yet, consumers remain skeptical, and MDSPs are not generally perceived as healthier or more sustainable than meat and dairy (Giacone et al., 2024; Hartmann et al., 2022).

When forming evaluations about food healthiness and sustainability, consumers often rely on mental shortcuts (Gomez, 2013). Time constraints and missing information typically drive this reliance, prompting consumers to use external cues like packaging (Bettman et al., 1998; Olson & Jacoby, 1972). Based on such cues, consumers may use heuristics to reduce the

complex task of forming evaluations to simpler judgmental operations. Applying heuristics can, but need not, lead to errors or biases in judgment (Tversky & Kahneman, 1974). Because related terms such as heuristics, biases, cognitive effects, and beliefs are used inconsistently across research contexts (Nadurak, 2026), this study uses “mental shortcuts” as the superordinate term.

Previous research has identified several mental shortcuts consumers might use when evaluating food healthiness and sustainability, which could potentially be relevant for MDSPs. For example, the *natural-is-better* heuristic (Meier et al., 2019) predicts a preference for foods perceived as natural, which are also seen as healthier and more sustainable (Li & Chapman, 2012; Román et al., 2017; Siegrist & Hartmann, 2020a). Because many MDSPs are perceived as unnatural (Etter et al., 2024; Haas et al., 2019; Hartmann et al., 2022), this mental shortcut could be important for evaluations of the healthiness and sustainability of MDSPs (Höchli et al., 2026). Similarly, the *familiarity* heuristic (Kamas & Reder, 1995) suggests that individuals hold more positive attitudes toward familiar foods, perceiving them as healthier and more sustainable than unfamiliar ones (Gomez, 2013; Orquin, 2014; Wassmann et al., 2023). Because many MDSPs are either new to the market or are being newly incorporated into diets, this shortcut could also be important for consumers’ evaluations of MDSPs. For instance, frequent consumers seem to evaluate plant-based dairy substitute products more positively than infrequent consumers do (Collier et al., 2023; Jaeger et al., 2024; Philippi Rosane et al., 2026; Pointke et al., 2022).

Since consumers often lack complete information about food healthiness or the time to evaluate such information, they may use the perceived *degree of processing* as a cue, triggering a “less processed = healthier” shortcut (Bolhuis et al., 2022; Hässig et al., 2023). This could be relevant for MDSPs, as consumers often perceive them as highly processed, raising concerns about their healthiness (Höchli et al., 2026; Lemken et al., 2019; Pointke et al., 2022).

Consumers may also infer that extensive processing requires more energy and resources, making these products seem less sustainable (Lazzarini et al., 2016) and triggering a “less processed = more sustainable” shortcut. Similarly, the *ingredient list length* could serve as a cue triggering a “shorter ingredient list = healthier” shortcut (Plasek et al., 2020). Consumers tend to prefer shorter ingredient lists (Asioli et al., 2017), and this preference also seems to apply to MDSPs (Aschemann-Witzel et al., 2021; de Castro Carvalho et al., 2025).

Packaging-related cues may trigger mental shortcuts in sustainability evaluations. Consumers may use a “paper = good, plastic = bad” shortcut, perceiving paper-packaged products as more sustainable than plastic-packaged ones (Sokolova et al., 2023). For plant-based milk substitute products, a few studies indicate that packaging material seems to be important for sustainability evaluations (Schiano et al., 2020; Vaikma et al., 2025). Consumers may also use packaging colors as cues, triggering shortcuts like “green color = more sustainable” (Ketelsen et al., 2020; Scott & Vigar-Ellis, 2014). A few studies on meat substitutes indicate that packaging color can be important for healthiness and sustainability evaluations (Califano et al., 2023; da Fonseca et al., 2023; Sucapane et al., 2021).

However, these mental shortcuts have mainly been studied for food in general. Therefore, it is unclear whether they also apply to MDSPs and whether other mental shortcuts play a role in healthiness and sustainability evaluations of MDSPs.

1.2 Similarity evaluations

Besides being marketed as healthy and sustainable, MDSPs are often positioned as direct replacements for conventional animal-based foods to ease consumers’ shift to plant-based options. Therefore, researchers sometimes argue MDSPs should mimic the sensory properties of their ABRPs (Elzerman et al., 2015; Harris et al., 2026; Hoek et al., 2011; Jaeger et al., 2023,

2024). There is also debate over whether MDSPs should use names resembling their ABRPs, like ‘plant-based chicken chunks’ or ‘plant-based milk’ (Elzerman et al., 2013, 2022; European Parliament, 2025; Feltz et al., 2025; Siddiqui et al., 2024).

Not all consumers evaluate the similarity between MDSPs and their ABRPs positively. For plant-based dairy substitute products, consumers seem to expect sensory comparability to their ABRPs (Harris et al., 2026; Jaeger et al., 2023, 2024). In the case of plant-based cheese, however, a recent study segmenting consumers by sensory preference identified four distinct groups: those who prefer a dairy-like taste and texture, those who prefer a dairy-like taste but are open to plant-based textures, those who prefer dairy-like textures but are open to new flavors, and those who are open to new flavors and textures (Schimmel et al., 2025). For the evaluation of the similarity of meat substitute products to their ABRPs, previous research shows that infrequent consumers of meat substitutes tend to prefer more meat-like products (Hoek et al., 2011; Michel et al., 2021), whereas frequent consumers prefer non-meat-like products (Hoek et al., 2011; Kerslake et al., 2022). A common explanation is that individuals who eat little or no meat are deterred by meat’s sensory properties and therefore avoid meat-like substitutes (Kerslake et al., 2022).

Existing research therefore suggests similarity preferences differ among consumers. However, this distinction is often based on a simple segmentation by consumption frequency or sensory preferences. Consequently, a deeper typology incorporating psychological and ideological drivers could provide a more nuanced understanding of which consumer groups value or reject similarity between MDSPs and their ABRPs.

2. Method

2.1 Participants

Flyers containing a link to a screening survey were distributed in grocery stores, restaurants, and via a mailing list to find interview participants who rarely or never (non-consumers) or regularly (consumers) consumed MDSPs. The survey collected MDSP consumption frequency, age, gender, and residential area. From the responses, 15 interview participants were selected to balance consumers and non-consumers and to achieve variation in generation, gender, and residential area, thereby ensuring diverse coverage of the population.

In September and October 2023, 15 adult participants from the screening survey participated in individual interviews. The interviewees included eight consumers and seven non-consumers of MDSPs from different generations ($M_{\text{Age}} = 45.6$, $SD_{\text{Age}} = 19.3$; see Table 1). Nine interviewees were male and six were female. Five lived in urban, six in suburban, and four in rural areas. Thirteen of the interviews were conducted in German and two in French. Each interviewee received a *[local currency equivalent to approx. USD 55]* shopping voucher as compensation.

After the 15 interviews were conducted, the authors assessed data saturation, considering whether statements and evaluations expressed in the interviews had begun to repeat and if additional interviews were expected to contribute information that would change the results of the data analysis related to the research aims (Rahimi & Khatooni, 2024). Additionally, the authors considered the study to have relatively high information power because the interviews were extensive, followed a structured interview guide, and involved participants with topic-specific relevance (Malterud et al., 2016). Based on these considerations, additional interviews were not expected to substantially increase the information relevant to the exploratory research aims.

Table 1. Characteristics of the 15 interviewees.

Interviewee	(Non-)Consumer	Generation	Gender	Residential area
Interviewee 1	Consumer	Generation Z	Male	Rural
Interviewee 2	Consumer	Generation Y	Female	Rural
Interviewee 3	Non-consumer	Generation Y	Male	Rural
Interviewee 4	Consumer	Generation Z	Female	Urban
Interviewee 5	Non-consumer	Generation Y	Male	Suburban
Interviewee 6	Non-consumer	Generation X	Male	Urban
Interviewee 7	Non-consumer	Boomer	Female	Suburban
Interviewee 8	Non-consumer	Boomer	Male	Suburban
Interviewee 9	Consumer	Generation X	Male	Suburban
Interviewee 10	Consumer	Generation X	Female	Suburban
Interviewee 11	Non-consumer	Generation Z	Male	Urban
Interviewee 12	Consumer	Generation X	Female	Urban
Interviewee 13	Non-consumer	Generation Z	Female	Suburban
Interviewee 14	Consumer	Silent Generation	Male	Urban
Interviewee 15	Consumer	Boomer	Male	Rural

2.2 Data collection

An interview guide was developed (see Supplementary Material A) and applied as follows: After getting to know the interviewee, participants completed a free-association task for the terms “meat substitute products” and “dairy substitute products”. Afterwards, interviewees talked about their experiences with MDSPs. The main part of the interviews involved classifying

images of 15 MDSPs on five scales: “do not consume–consume,” “disgust–pleasure,” “unnatural–natural,” “unhealthy–healthy,” and “unsustainable–sustainable.” The purpose of this task was not to provide ordinal data but to encourage participants to share their thoughts out loud during the classification process, allowing insights into why, for example, one MDSP was classified as healthier than another.

The 15 MDSPs were selected to include established products (e.g., tofu, plant-based drinks) and newer, highly processed ones (e.g., plant-based chicken chunks, cheese alternatives). The selected products represent different production types (autotrophic vs. heterotrophic), processing technologies (physical, biochemical, and biotechnological), and processing stages (Mehner et al., 2024; Monteiro et al., 2019). Since the present study understands MDSPs as all products intended to replace *conventional* animal-based products, two novel animal-based products, insect balls and cultured meat, were also included. The final product set comprised the following: plant-based burger, plant-based chicken chunks, plant-based cold cuts, cultured meat, falafel, insect balls, Quorn® pieces, plant-based sausage, plant-based schnitzel, seitan mince, tofu, cheese alternative, soy-based alternative to cream, oat drink, and soy-based alternative to yogurt (see Supplementary Material B). Except for cultured meat, all products were available in [country name blinded for review] retail stores at the time the study was conducted.

The last interview section addressed reasons for and against consuming MDSPs, potential conflicting goals, and identity-related questions. On average, the interviews lasted 75 minutes. Each interview was conducted by two interviewers, one asking questions and the other taking notes, and was audio-recorded.

2.3 Data analysis

The audio recordings of all interviews were transcribed in German. The two interviews conducted in French were translated into German during transcription by a native German speaker proficient in French. The authors translated all used quotations into English. The interviews were transcribed, coded, and analyzed using MAXQDA (version 24.0.0, VERBI Software, Berlin, Germany, 2023). The coding and analysis of the transcripts followed a codebook approach of thematic analysis (Aronson, 1995; Braun & Clarke, 2006) and were undertaken by the authors who also conducted the interviews.

As the first analysis step, a code system was developed based on the interview guide. In the second step, the three coders independently coded the same transcript and suggested additions to the code system. In the third step, they compared their coded passages to ensure a shared understanding of the codes, discuss additions, and refine the code system (see Supplementary Material C). In the fourth step, one coder coded each transcript while a second reviewed it. During this review, the second coder added codes to ensure that relevant passages were not overlooked and marked coded passages with which she disagreed. The author team resolved any disagreements through discussion until consensus was reached.

In the fifth step, based on the interview data and coded passages, the coders defined four themes: 1) initial experiences and repeated consumption of MDSPs; 2) evaluations of naturalness, healthiness, sustainability, and similarity of MDSPs; 3) reasons for and against MDSP consumption and conflicting goals; and 4) compatibility of MDSPs with social identity. In the sixth step, *Questions-Themes-Theories* worksheets were compiled in MAXQDA for each theme.

In the seventh step, the worksheets were discussed. Because the interview data were extensive and covered multiple themes, the authors decided that further analysis should focus on

the theme of the evaluation of MDSPs. One focus was set on consumers' mental shortcuts when evaluating the healthiness and sustainability of MDSPs, and a second focus was on how different consumers evaluate the similarity of MDSPs to their ABRPs.

In the eighth step, notes from the worksheets were used to identify mental shortcuts shaping interviewees' healthiness and sustainability evaluations, as well as individual characteristics shaping their evaluations of the similarity of MDSPs to their ABRPs. The identified mental shortcuts and individual characteristics did not represent codes but higher levels of data abstraction emerging from the worksheets. Therefore, neither the shortcuts nor the characteristics were coded in the transcripts. Shortcuts and characteristics originated across multiple questions, codes, and the *Questions-Themes-Theories* worksheets.

2.4 Reflexivity

All three authors have an academic background in food-related consumer research and share an interest in how consumers perceive the healthiness and sustainability of food products, as well as how consumer behavior can become healthier and more sustainable. Accordingly, the authors consider healthy and sustainable diets important for individuals and society. The study was conducted as part of a larger multidisciplinary project examining the healthiness and sustainability of MDSPs, and the authors did not approach the interview study with the assumption that MDSPs are necessarily healthier or more sustainable than their ABRPs. While the authors were aware that conventional animal-based food production contributes substantially to environmental emissions, they held no predefined assumptions about the extent to which individual MDSPs differ from conventional animal-based products in terms of healthiness and sustainability. The study aimed not to promote MDSPs but to explore consumers' experiences and evaluations of them. At the time of data collection, analysis, and interpretation, all three

authors had previous experience with some, but not all, of the MDSPs included in the interview study. The authors acknowledge their own experiences with MDSPs and conceptual understandings of healthiness, sustainability, naturalness, and the food system may have shaped the interviews and the analysis and interpretation of the data.

3. Results

3.1 Mental shortcuts in MDSP health and sustainability evaluations

Seven mental shortcuts for evaluating MDSP healthiness and sustainability were identified in the interview data. The last four have already been described for food generally, and the interview data indicate that they are also at play in the evaluation of MDSPs. Conversely, the first three are specific to a defining feature of MDSPs. Unlike conventional foods, MDSPs are relational products: They are defined in relation to an ABRP they are meant to substitute. This substitutive framing appears to activate these three shortcuts, thereby playing a role in how each one unfolds.

3.1.1 *The reference halo effect*

The first mental shortcut identified in the interview data is the reference halo effect. When evaluating MDSPs, consumers sometimes transfer their ABRP impressions to the substitute product. Whereas general food health-halo effects involve a transfer within a single product, from one attribute or label to another (Besson et al., 2020; Schuldt et al., 2012), the reference halo effect operates between products: ABRP impressions are transferred onto the substitute. This cross-product transfer is possible only because MDSPs are defined in relation to an external reference.

This reference halo effect may influence healthiness evaluations. For example, if the ABRP is high in fat, this trait may also be attributed to the substitute product. One interviewee

stated: *“If it’s meant to replace an original—for example, the cold cuts here—then it’s also quite greasy.”* [Interviewee 4] Dairy products are often seen as healthy, a perception that can potentially be transferred to dairy substitute products. One interviewee explained: *“I just feel like anything with cheese, milk, butter, cream, or anything like that, those things are healthy. [...] it’s healthy because it’s cheese, even if it’s a [plant-based] substitute.”* [Interviewee 14]

The reference halo effect may also influence sustainability evaluations. If the ABRP is perceived as nontransparent and unsustainable, this perception may be transferred to the substitute product. One interviewee explained: *“[I perceive the plant-based cold cuts as less sustainable than the plant-based burger.] Because here [with the burger], I know what else is in it. [...] Even normal cold cuts have so much stuff in them.”* [Interviewee 10]

The reference halo effect may also affect the general liking of an MDSP. If someone dislikes the ABRP, they will likely reject the substitute product. One interviewee said: *“I associate that with the animal-based original. I have no desire for cold cuts.”* [Interviewee 4] If someone likes the ABRP, it may be easier for them to imagine liking the substitute product. One interviewee said: *“My favorite food is meatloaf, and it looks similar, so I can imagine that it tastes very good.”* [Interviewee 14]

Lastly, feelings may also be transferred from the ABRP to the substitute product. For example, one interviewee described how a substitute product evokes childhood memories: *“I consume plant-based cold cuts [...] because I ate the original product very often as a child. And then sometimes, the feeling of childhood habits comes up.”* [Interviewee 12]

3.1.2 Ambiguity

The second mental shortcut derived from the interview data refers to ambiguity. Ambiguity means that people dislike uncertainty and prefer options where the probability of a

favorable outcome is known (Frisch & Baron, 1988). Under ambiguity, consumers tend to fall back on the more established, better-known option (Muthukrishnan et al., 2009). What makes this shortcut relevant to MDSPs is again the substitutive framing: Because many MDSPs are either new to the market (e.g., plant-based chicken chunks or cheese alternatives) or newly incorporated into consumers' diets (e.g., tofu or oat drink), the outcome of choosing them, whether the product will taste good, be healthy, or prove harmless in the long run, is comparatively unknown, whereas the ABRP represents the established option with a well-known outcome. The ABRP thus functions as the low-ambiguity reference against which the MDSP appears uncertain. One interviewee expressed the perceived ambiguity of substitute products as follows: *"Sometimes, there are substitute products that are super-tasty; others are not so good. Especially if I don't know them or am on vacation, I wouldn't be sure what to expect."*

[Interviewee 4]

Uncertainty about the ingredients in substitute products can lead to uncertainty about their healthiness. When evaluating the healthiness of MDSPs, one interviewee explained with regard to plant-based schnitzel, burgers, and sausage: *"I don't know what's in them. They're probably high in fat. I also think these products contain a lot of flavor enhancers. It's mainly the unknown factor."* [Interviewee 7] Another source of uncertainty in healthiness evaluations may be the unclear long-term health effects of consuming novel MDSPs. One interviewee explained: *"Especially with completely new things, you don't know how they will affect your health in the long term. [...] it's possible, especially with highly processed products, that you only realize after 20, 30, or 50 years that it's not so healthy."* [Interviewee 10]

People who rely on MDSPs due to a vegetarian or vegan diet reported addressing this uncertainty through a trial-and-error strategy. One interviewee said: “*We then found the right [plant-based] drink that was good for us by testing different ones.*” [Interviewee 15]

3.1.3 Dilution

The third mental shortcut derived from the interview data refers to the dilution model (Zhang et al., 2007). As the number of goals served by a single means increases, the perceived instrumentality of that means for each individual goal decreases, and especially when those goals seem distinct. Novel, often highly processed MDSPs such as plant-based meat substitutes or cheese alternatives characteristically serve several such goals: They should resemble the ABRPs while also being healthy and sustainable. Consistent with the dilution model, interviewees appeared to treat these as distinct goals served by a single product, with much of the effort assumed to go into achieving similarity to the ABRPs, making healthiness and sustainability seem secondary.

Regarding healthiness, one interviewee explained: “*I can imagine that the price of making it look like something else is that it’s not any healthier.*” [Interviewee 6]

Regarding sustainability, another interviewee explained: “*And then there’s also the fact that the cold cuts look like this. That means the process requires more energy.*” [Interviewee 4]

Explaining why plant-based cheese alternatives seem unsustainable, another interviewee said: “*Maybe it’s the idea of an imitation. That you have to go the extra mile to make it like something else.*” [Interviewee 6]

3.1.4 The natural-is-better heuristic

While the first three mental shortcuts are specific to MDSPs’ substitutive framing, the data also revealed shortcuts known from general food research. For instance, interviewees

employed the natural-is-better heuristic (Meier et al., 2019). MDSPs that interviewees evaluated as natural were often evaluated as healthier and more sustainable. One interviewee noted:

“[Naturalness] is relevant, because it’s a simple measure of what I classify as healthier and unhealthier for my diet. For me, the more natural [products] tend to be healthier than the others.” [Interviewee 12] Another considered soy yoghurt sustainable because *“I just find it natural.”* [Interviewee 14]

3.1.5 The familiarity heuristic

The interview data also indicate a familiarity heuristic (Kamas & Reder, 1995). Familiar foods were rated as better, for example healthier, as this quote illustrates: *“And seitan is also in the healthy category for me, [...] because I am reasonably familiar with it.”* [Interviewee 3] Regarding plant-based yoghurt and naturalness, another interviewee explained: *“Because I don’t eat it, it feels less natural to me. What I’m used to is more natural.”* [Interviewee 1]

According to the interviewees, familiarity with food, and thus positive naturalness, sustainability, and healthiness evaluations, can arise in various ways. First, when consumers can visually recognize ingredients, they tend to evaluate the substitute product as natural. One interviewee defined naturalness as *“if, for example, I can still recognize vegetable pieces as they occur in nature in a vegetable patty.”* [Interviewee 2]

Second, when consumers understand how a product is made, they similarly tend to evaluate it as more natural, sustainable, or healthier, whereas a lack of understanding can harm these evaluations. One interviewee stated: *“To me, oat milk is not unnatural at all. Because it actually consists of exactly two ingredients.”* [Interviewee 1] Another interviewee explained: *“For the products that I know how they are made, [...] I can say that they are more sustainable.”* [Interviewee 15] A similar relationship seems to apply to healthiness: *“I would*

describe [cultured meat] as unhealthy because I have no idea how it is produced [...].”

[Interviewee 15]

Third, finding a product in cookbooks can support naturalness evaluations. One interviewee defined naturalness as: *“[It is natural if] it’s an ingredient in a cookbook. It is always written in the cookbook that you need tofu, falafel, or Quorn. [...] And milk and cream can also represent ingredients in a cookbook [...].”* [Interviewee 1]

Fourth, products that have been on the market for a long time tend to be evaluated as natural. As one interviewee said: *“Traditional and natural; I have now cheekily parallelized them.”* [Interviewee 6]

Unfamiliarity can also influence evaluations of MDSPs. Aversion to unfamiliar, novel foods, known as *food neophobia*, is related to disgust (Hoek et al., 2011; Pliner & Salvy, 2006). Consistent with other studies, the interviews showed that food neophobia is particularly pronounced toward insect-based foods and cultured meat (Lammers et al., 2019; Siegrist & Hartmann, 2020b). This is evident in the following quote: *“Only the two on the left [insect balls and cultured meat] are disgusting.”* [Interviewee 12] These two novel animal-based products thus stood out from the plant-based substitutes, provoking the strongest neophobia and disgust reactions and appearing to be categorized differently by consumers. However, disgust was not limited to insect-based foods and cultured meat. Interviewees who had not eaten meat for a longer period also expressed disgust toward plant-based meat substitute products that closely resembled meat, such as the plant-based burger, cold cuts, and sausage. One interviewee said: *“There’s the sausage, the insect stuff, the lab-grown meat, and the cold cuts—all of which disgust me. I wouldn’t eat them, and on top of that, they disgust me both visually and in terms of taste.”* [Interviewee 4]

3.1.6 Less processed = better and shorter ingredient list = healthier

The interview data indicate that the perceived processing degree can act as a cue triggering mental shortcuts for other MDSP evaluations. Interviewees reported that they evaluate a less-processed MDSP as healthier (*“the less processed, the healthier”* [Interviewee 10]), more sustainable (*“I have the impression that all industrially processed and prepared products are not really sustainable.”* [Interviewee 7]), and more natural (*“I would define ‘natural’ as ‘processed as little as possible.’ In the sense of ‘harvested and eaten.’”* [Interviewee 2]).

The interview data also indicate that the ingredient list can act as a cue triggering the mental shortcut “shorter ingredient list = healthier.” Accordingly, a small number of ingredients were used as a reference point for healthiness: *“A long list of ingredients often includes additives or preservatives. And I sometimes have the impression that I’m eating mini drug doses that aren’t good for my health if I eat too many processed products. So, it also depends on the length of the ingredient list.”* [Interviewee 4]

3.1.7 Cardboard and green = sustainable

In cases of uncertainty about the sustainability of MDSPs, the interview data indicate that packaging can act as a cue triggering mental shortcuts. Plastic packaging was perceived as “bad,” while cardboard packaging was viewed as “good.” One interviewee said, based on reflections on a plant-based burger and animal-based alternatives to it: *“If the packaging has a lot of cardboard and little plastic, I tend to choose it.”* [Interviewee 1]

Regarding packaging colors, the interview data indicate that green packaging evokes positive associations with sustainability. One interviewee said: *“They use green colors, and that evokes associations with nature for me, and I would be more likely to buy it because of that.”* [Interviewee 4]

3.2 How different consumer groups evaluate the similarity of MDSPs to ABRPs

The interview data indicate that consumers' evaluation of the similarity of MDSPs to their ABRPs differs between meat and dairy substitutes. While meat substitutes' similarity was often evaluated negatively, the similarity of dairy substitutes, except cheese alternatives, was evaluated positively. Regarding cheese alternatives, one interviewee stated: *"I can't imagine that you could make cheese with a substitute."* [Interviewee 14] Generally, interviewees expected dairy substitutes to have a similar appearance and properties so they could be used as an ingredient in the same way as their ABRPs. One interviewee said: *"If you were to cook something with the [plant-based] cream, then you could use it more or less as a one-to-one substitute."* [Interviewee 11]

Dairy substitutes' visual similarity to their ABRPs also triggered less psychological reactance because "milk" was less strongly "occupied" by animal-based products than meat-related terms like "sausage." One interviewee explained: *"With meat, I get the feeling you're trying some imitation. And with milk, many things are called milk. [...] By definition, milk is simply something white and liquid."* [Interviewee 6]

However, the similarity of meat substitutes to conventional meat products was not always viewed negatively; interviewees expressed considerable variation in their evaluations. This raised the question of which individual characteristics might explain these differing evaluations. Because the variation in the evaluation of similarity of meat substitutes to conventional meat products was considerably greater than that of plant-based dairy substitutes to animal-based dairy products, the following findings refer to meat substitutes only.

One important attitude that emerged from the interview data seem to be the concept of *meat attachment*. Meat attachment can be defined as a positive bond with meat consumption

(Graça et al., 2015). This concept goes beyond a simple dichotomy of meat eaters and non-meat eaters and captures meat eaters who have reduced or want to reduce their meat consumption as well as non-meat eaters who would still enjoy eating certain meat products but consciously choose not to. A vegetarian interviewee said: *“I never stopped because I don’t like meat, but for other reasons. And sometimes I still feel like eating it.”* [Interviewee 1]

Another important attitude seems to be whether a person actively thinks about changes in the food system (e.g., reducing meat production and consumption for sustainability or animal welfare reasons) and how important these considerations are to them. For some, sustainability plays little role: *“I don’t generally think about it [the sustainability of food choices].”* [Interviewee 5] In contrast, other interviewees expressed clear concerns about the future food system: *“The future of agriculture is an important concern for me, namely that it should be sustainable. Things cannot continue as they are now.”* [Interviewee 9]

Based on the two attitudinal factors, *meat attachment* and *perceived need for change in the food system*, the authors developed a preliminary conceptual model to classify consumers into groups. Crossing the two factors yields four quadrants and thus four consumer groups (see Fig. 1). The authors reread each transcript to classify interviewees into one of these four groups by determining whether each person’s meat attachment and perceived need for food system change were low or high. It must be considered that this preliminary conceptual model is a significant simplification of reality. It results from an exploratory study and presents a framework that requires validation through quantitative research on a representative sample.

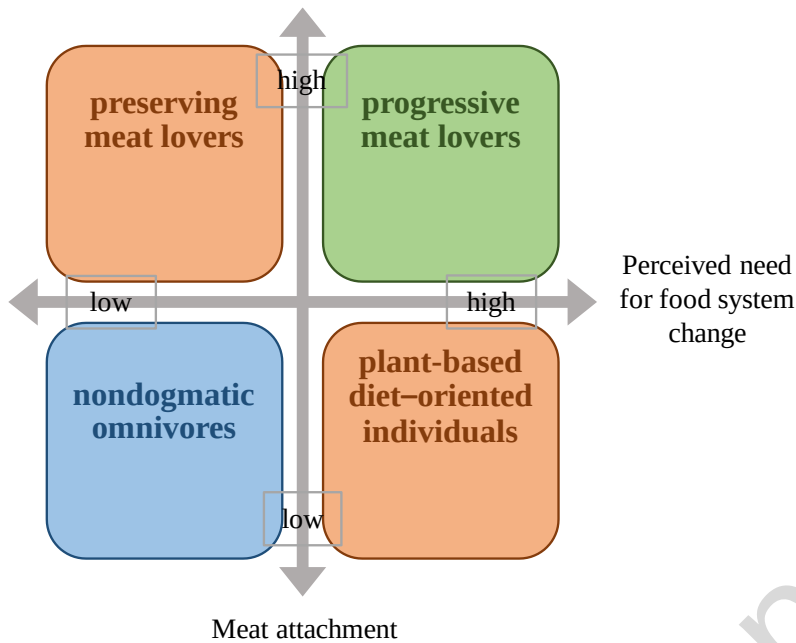


Fig. 1. The four consumer groups with different similarity evaluations.

3.2.1 Preserving meat lovers: Similarity is negatively evaluated

Preserving meat lovers have high meat attachment and see little or no need for food system changes. They focus primarily on the enjoyment of meat and see no reason to replace something that tastes so good to them. If they were to reduce their meat consumption, they would do so by eating more vegetables rather than using substitute products. A few interviewees ($n = 2$) shared this perspective. One said: *“If I want to eat meat, I eat meat. If I don’t want to eat meat, I don’t eat meat. But I don’t look for a product that is similar to meat or is supposed to replace it.”* [Interviewee 8]

Substitute products that are very similar to meat products are sometimes met with strong disapproval. The other preserving meat lover said: *“For me, it is simply something that should not look the way it looks if it is the original.”* [Interviewee 3]

3.2.2 Progressive meat lovers: Similarity is positively evaluated

Progressive meat lovers have high meat attachment and enjoy the taste of specific meat products, yet they also see a need for food system changes. They view technological innovations as potential solutions and are open to innovative products such as cultured meat. One progressive meat lover said: *“If we want to tackle climate change, it has to work on an industrial scale.”*

[Interviewee 6]

The closer substitute products come to the taste and sensory properties of the ABRPs, the more positively they are evaluated. One progressive meat lover noted: *“I buy that [plant-based chicken chunks] regularly and it’s important to me that it’s similar to meat. Especially in terms of consistency, how it feels when you bite into it, and its moisture content.”* [Interviewee 10]

Substitute products that closely imitate the ABRPs allow progressive meat lovers to reduce meat consumption without major lifestyle adjustments. One progressive meat lover said: *“I think it’s actually quite clever that there are products like this, where you can satisfy your meat cravings in an ethically clean way.”* [Interviewee 15] The progressive meat lovers represent a prominent perspective among the interviewees ($n = 6$).

3.2.3 Nondogmatic omnivores: Similarity is not relevant to them

Nondogmatic omnivores see no need for food system changes but do not have a high meat attachment either. Taste and enjoyment are their main priorities when choosing food. This perspective is shared by a few interviewees ($n = 2$). One of these interviewees said: *“Taste is generally more important [than replacing meat].”* [Interviewee 5]

Similarity to the ABRP is secondary for nondogmatic omnivores. Depending on the situation and context, they choose a menu with meat or a substitute product, suggesting that their substitute product consumption is often driven by external factors such as canteen offerings. The other nondogmatic omnivore explained: *“[I would try a meat substitute product to] see what it’s*

like. And then simply because it's the best menu, for example, because of the side dishes or vegetables." [Interviewee 11]

3.2.4 Plant-based diet-oriented individuals: Similarity is negatively evaluated

Plant-based diet-oriented individuals do not have a high meat attachment but see a clear need for food system changes. Strong resemblance to conventional meat products can quickly evoke disgust: *"I once bought a plant-based burger that [...] remained pink inside. It reminded me too much of meat and I was disgusted by it."* [Interviewee 4] Consequently, they prefer substitute products that do not imitate an ABRP, such as tofu or vegetable patties: *"I now prefer vegetable patties and eat far fewer meat substitute products."* [Interviewee 1]

Substitute products that closely resemble the ABRPs are consumed at most in social settings. One plant-based diet-oriented individual said: *"I probably bought the [plant-based] burger because I was invited to a barbecue, and everyone had meat with them. Then I also bought something 'meat-like.'"* [Interviewee 2] The plant-based diet-oriented individuals express a recurring perspective among the interviewees ($n = 5$).

4. Discussion

For human and planetary health, reducing meat and increasing plant-based food consumption is important (Willett et al., 2019). As a way to support this shift, many new MDSPs have entered the market (The Good Food Institute, 2024). To understand how consumers form their evaluations of these products, this study explores their considerations through individual interviews. Because MDSPs are often positioned as healthy, sustainable, and similar to their ABRPs, the analysis focused on the mental shortcuts consumers apply when evaluating the healthiness and sustainability of MDSPs, and how different consumers evaluate the similarity.

While much research has explored the mental shortcuts consumers apply when evaluating the healthiness and sustainability of food in general (Gomez, 2013; Hässig et al., 2023; Wassmann et al., 2023), fewer studies address mental shortcuts for novel foods (Machín et al., 2020). The interview data suggest mental shortcuts that can be applied specifically to MDSPs because their operation is shaped by the substitutive nature of these products: (a) the reference halo effect; (b) ambiguity; and (c) dilution. However, their relevance is not exclusive to MDSPs: Ambiguity may extend to food innovations more generally, and dilution to any product marketed on multiple goals, such as high-protein foods. What is particular to MDSPs is that each shortcut is anchored to the ABRPs against which these products are defined. The interview data also indicate general food evaluation shortcuts applied to MDSPs: (d) the natural-is-better heuristic; (e) the familiarity heuristic; (f) the “less processed = better” and “shorter ingredient list = healthier” shortcuts; and (g) the “cardboard and green = sustainable” shortcut.

Regarding similarity to ABRPs, the interview data indicate that dairy substitutes elicit less reactance than meat substitutes. While previous research suggests infrequent consumers of meat substitutes prefer meat-like substitutes and frequent consumers prefer less meat-like options (Hoek et al., 2011; Kerslake et al., 2022; Michel et al., 2021), the interview data point to additional individual characteristics that may influence the similarity evaluations. One is the concept of meat attachment, and the other is whether a person actively thinks about changes in the food system or not. Intersecting these two attitudinal factors creates a preliminary conceptual model with four quadrants or consumer groups differing in whether they view the similarity between MDSPs and their ABRPs positively, negatively, or neutrally: (1) preserving meat lovers; (2) progressive meat lovers; (3) nondogmatic omnivores; and (4) plant-based diet-oriented individuals. These groups indicate that there is no single best practice for designing

meat substitutes; instead, products should be designed based on the target group one aims to reach (Etter et al., 2024).

As the results presented here are based on an exploratory interview study and not on a representative sample, the findings are not suitable for generalization. For example, the participants seemed to be interested in the topic of nutrition. Beneficially, the topic-specific relevance of the interviews contributes to the information power of the data (Malterud et al., 2016). However, some of the participants, those with high meat attachment, perceived need for change in the food system, or both, may have held more polarized or ideological views. Future studies on MDSPs could validate the findings of the present study and quantify consumer groups using a representative sample. To mitigate self-selection bias, attention should be drawn toward study design and recruitment strategies. A second limitation concerns the image-classification task. To explore considerations guiding healthiness and sustainability evaluations, participants were asked to evaluate the products on specific scales. While this study does not claim to capture all possible mental shortcuts, these scales may have directed attention toward these dimensions, so that some shortcuts may partly reflect the task rather than fully spontaneous reasoning. The naturalness scale, for instance, may have activated the natural-is-better heuristic. One feature mitigates this limitation: The task was preceded by an open free-association task. Still, whether these shortcuts operate in unprompted reasoning cannot be established here.

4.1 Proposed implications of the identified mental shortcuts

Based on the preliminary findings of the present study, the authors suggest implications for how the identified shortcuts may inform commercial strategies and future research (see Table 2).

Because the *reference halo effect* implies that consumers may transfer attributes of ABRPs to MDSPs (see Results section 3.1.1), producers could mitigate resulting misperceptions by avoiding imitating ABRPs with strong positive or negative connotations. Instead, they could market non-imitating MDSPs as stand-alone products, emphasizing ingredients rather than similarity. Future research could examine how visual and verbal similarity to ABRPs influences the proposed reference halo effect.

As MDSPs are often novel products *relative to* the familiar ABRPs with varying ingredients and sensory properties, consumers may experience *ambiguity* toward them (see Results section 3.1.2). To reduce this, distributors could offer low-threshold product tastings, for example, in supermarket settings to reach broad audiences, or experiential tastings to foster positive experiences. Additionally, the long-term effects of a diet including MDSPs remain unclear; thus, long-term health studies on diets high in MDSPs are needed.

The interview data offer one account of why highly processed MDSPs may raise health and sustainability concerns (Hässig et al., 2023; Pointke et al., 2022). Consumers assume that considerable processing and energy are required to make MDSPs look similar to their ABRPs, thus reducing perceived healthiness and sustainability (see Results section 3.1.3). This aligns with dilution: As the number of goals to be achieved with a product increases, the perceived instrumentality for each individual goal decreases. Marketers could mitigate dilution by de-emphasizing similarity and emphasizing, where appropriate, health and sustainability benefits. Future research could investigate whether MDSPs similar to ABRPs are genuinely evaluated as less healthy and sustainable than non-imitating products.

However, it remains an open question why interviewees treated these goals as competing in the first place, assuming that effort spent on sensory similarity comes at the expense of

healthiness and sustainability. A potential explanation lies in the natural-is-better heuristic, which the interview data also reflect: MDSPs evaluated as *natural* are also evaluated as *better* (see Results section 3.1.4). Although there is no universal definition of food naturalness, consumers associate it with minimal processing (Hartmann et al., 2022; Román et al., 2017). Because MDSPs are often seen as highly processed and therefore unnatural (Hartmann et al., 2022), the technological effort of replicating an animal-based product may be read as a marker of artificiality and, in turn, of reduced healthiness (Meier et al., 2019). This suggests that the goal competition underlying the dilution pattern may itself stem from the natural-is-better heuristic. To avoid biases caused by this heuristic, marketers could emphasize counter-claims where appropriate (e.g., “natural,” “few processing steps”).

Familiar foods are rated as better than novel, unfamiliar foods (Gomez, 2013; Orquin, 2014; Wassmann et al., 2023). Interviewees described that familiarity with MDSPs and the resulting positive health, sustainability, and naturalness evaluations depend on knowing or seeing the ingredients, understanding how they are produced, seeing them in cookbooks, and on how long they have been on the market (see Results section 3.1.5). To increase familiarity, marketers could integrate MDSPs into cooking classes and cookbooks. Familiarity may also improve if the main ingredient (e.g., beans) remains visible or is depicted on the packaging, and if the production process is communicated.

Perceived *processing degree* (Hässig et al., 2023; Lazzarini et al., 2016) and *ingredient lists* (Asioli et al., 2017) seem to be important cues that can trigger mental shortcuts for MDSP healthiness and sustainability evaluations (see Results section 3.1.6). Because consumers often do not seem to know how MDSPs are produced or what ingredients they contain, where

appropriate, claims such as “few processing steps” and “100% bean-based” may help. Short ingredient lists may further support positive evaluations.

Packaging cues seem to trigger shortcuts for sustainability evaluations of both general foods (Ischen et al., 2022; Ketelsen et al., 2020) and MDSPs. MDSPs packaged in cardboard rather than plastic, especially with green elements, were, in the interviews, perceived as more sustainable (see Results section 3.1.7).

Table 2. Suggested implications of the identified mental shortcuts.

Mental shortcut	Actors	Suggested implications
Reference halo effect	Producers	Avoid imitating ABRPs with particularly positive or negative connotations
	Marketers	Focus on ingredients rather than similarity
	Researchers	Investigate the influence of appearance and naming
Ambiguity	Distributors	Offer tastings to reach a wide consumer base or to foster positive experiences
	Researchers	Conduct long-term health studies on diets high in MDSPs
Dilution	Marketers	De-emphasize similarity and, where appropriate, emphasize health and sustainability benefits
	Researchers	Investigate whether MDSPs similar to ABRPs are perceived as less healthy and sustainable
Natural-is-better heuristic	Marketers	Integrate naturalness claims where appropriate

Familiarity heuristic	Marketers	Offer tastings by integrating the MDSPs into cooking classes
	Producers /	Make the main ingredient visible
	Marketers	Explain the production process
	Marketers	Integrate MDSPs in cookbooks
Less processed = better and shorter ingredient list = healthier	Marketers	Integrate low-processing claims where appropriate
	Producers	Keep ingredient lists short
Cardboard and green = sustainable	Marketers	Use cardboard instead of plastic for sustainable MDSPs
	Marketers	Use green colors for sustainable MDSPs

4.2 Implication: Following a target group-oriented approach

The practical contribution of the preliminary conceptual model with the four consumer groups lies in pointing toward the implications for designing MDSPs for each group (see Table 3).

Preserving meat lovers see no need to replace animal- with plant-based products. MDSPs that closely resemble ABRPs in name or appearance triggered reactance and feelings of deception (see Results section 3.2.1). This contrasts with studies suggesting meat substitute products should be as similar as possible to the ABRPs for non-consumers of MDSPs (Hoek et al., 2011; Michel et al., 2021). Rather than promoting meat substitutes to this group, the focus could be on traditional meatless dishes and on non-meat-like substitutes (e.g., falafel).

Progressive meat lovers consume few meat substitutes but view the similarity to their ABRPs positively, believing this helps satisfy meat cravings sustainably (see Results section 3.2.2). This aligns with studies showing that individuals who consume few meat substitute products prefer products similar to the ABRPs (Hoek et al., 2011; Michel et al., 2021). These consumers could replace conventional animal-based products (e.g., a beef burger) with plant-based substitutes (e.g., a plant-based burger). It may also be important that they learn how to prepare these novel foods.

Nondogmatic omnivores are indifferent to the similarity between MDSPs and their ABRPs. They are more likely to choose “simply the best menu,” which largely depends on the situation and context (e.g., side dishes; see Results section 3.2.3). This makes them a rewarding target group. They could be offered a range of MDSPs and are receptive to environmental influences, such as the available options and eventually to further influences like communicative measures. When targeting this group, it is important to focus on indulgence. This could be accomplished by hedonic tasting sessions that highlight the sensory appeal of the products, for instance, as part of an event rather than in the context of a conventional product trial in the supermarket. Previous research relying solely on consumption frequency showed that non-frequent meat substitute product consumers prefer meat-like products, whereas frequent consumers prefer products dissimilar to the ABRPs (Hoek et al., 2011). However, this approach failed to reveal a group that is indifferent to similarity.

Plant-based diet-oriented individuals eat few or no animal-based products and are therefore open to plant-based products. They view meat negatively and may feel disgusted by it, so for them, MDSPs should not look or be named similarly to meat (see Results section 3.2.4). This aligns with studies showing frequent meat substitute product consumers prefer non-

imitating substitutes (Hoek et al., 2011; Kerslake et al., 2022). This group is already far along in transitioning to a plant-based diet. For them, more MDSPs dissimilar to ABRPs could be desirable. Providing recipes for plant-based dishes may also support them.

Table 3. Suggested implications for the identified consumer groups.

Consumer group	Actors	Suggested implications
Preserving meat lovers	Producers	Offer non-meat-like substitutes
	Marketers	Provide recipes for traditional meatless dishes
Progressive meat lovers	Producers	Offer meat substitutes similar to meat
	Marketers	Include preparation suggestions on the packaging of novel foods
Nondogmatic omnivores	Producers	Offer a variety of meat substitutes (similar or dissimilar to meat) and prioritize indulgence
	Distributors	Offer tastings emphasizing the experience and sensory appeal of the products
Plant-based diet-oriented individuals	Producers	Offer non-meat-like substitutes
	Marketers	Provide plant-based recipes

5. Conclusion

This exploratory qualitative study suggests understanding consumer evaluations of MDSPs and their similarity to the ABRPs requires moving beyond consumption frequency or sensory preferences. In the present study, while the similarity of dairy substitutes to their ABRPs was evaluated positively, except in the case of cheese substitutes, evaluations of meat

substitutes' similarity were often negative and varied considerably. Building a preliminary conceptual model with the psychological factors of *meat attachment* and *perceived need for change in the food system* resulted in four consumer groups, one of which valued similarity, one for which similarity was not relevant, and two of which did not value similarity. Furthermore, similarity can have, in addition to positive effects, negative consequences on the evaluation of MDSPs through mental shortcuts consumers apply. Dilution or negative halo effects might undermine the perception of other product characteristics such as health or sustainability. The present study represents a first step toward the conclusion that, when marketing MDSPs, consumer segments and mental shortcuts should be considered. Further research is needed to validate these findings.

1 Ethics declaration

1.1 Informed consent and patient details

Written informed consent to take part in the study and to publish the article has been obtained from all participants or their legal representatives. The privacy rights of participants have been observed.

1.2 Studies in Human

This study was performed in compliance with relevant laws, regulatory frameworks and guidelines where the research took place.

This study was approved by the Ethics Committee of the University of Bern, Faculty of Business, Economics and Social Sciences.

(Approval No. 242023)

Ethical statement

The Ethics Committee of the *[Faculty and University name blinded for review]* granted ethical approval for the study (serial no. 242023). Each participant signed a consent form before participating.

Funding

This study received funding from *[funding source blinded for review]*. The funding source was not involved in designing the study; in the collection, analysis, and interpretation of the data; in writing the report; or in the decision to submit the article for publication. The report on the funded work is available at *[URL blinded for review]*

Declaration of generative AI and AI-assisted technologies in the manuscript preparation process

During the preparation of this work the authors used Microsoft Copilot, ChatGPT, Gemini, and Perplexity in order to improve the language and grammar and to shorten the text. After using these tools, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

References

- Adamczyk, D., Jaworska, D., Affeltowicz, D., & Maison, D. (2022). Plant-based dairy alternatives: Consumers' perceptions, motivations, and barriers—Results from a qualitative study in Poland, Germany, and France. *Nutrients*, 14(10).
<https://doi.org/10.3390/nu14102171>
- Aronson, J. (1995). A pragmatic view of thematic analysis. *The Qualitative Report*, 2(1), 1–3.
<https://doi.org/10.46743/2160-3715/1995.2069>
- Aschemann-Witzel, J., Gantriis, R. F., Fraga, P., & Perez-Cueto, F. J. A. (2021). Plant-based food and protein trend from a business perspective: Markets, consumers, and the challenges and opportunities in the future. *Critical Reviews in Food Science and Nutrition*, 61(18), 3119–3128. <https://doi.org/10.1080/10408398.2020.1793730>
- Asioli, D., Aschemann-Witzel, J., Caputo, V., Vecchio, R., Annunziata, A., Næs, T., & Varela, P. (2017). Making sense of the “clean label” trends: A review of consumer food choice behavior and discussion of industry implications. *Food Research International*, 99, 58–71. <https://doi.org/10.1016/j.foodres.2017.07.022>

- Besson, T., Bouxom, H., & Jaubert, T. (2020). Halo it's meat! The effect of the vegetarian label on calorie perception and food choices. *Ecology of Food and Nutrition*, 59(1), 3–20.
<https://doi.org/10.1080/03670244.2019.1652820>
- Bettman, J. R., Luce, M. F., & Payne, J. W. (1998). Constructive consumer choice processes. *Journal of Consumer Research*, 25(3), 187–217. <https://doi.org/10.1086/209535>
- Bolhuis, D., Mosca, A. C., & Pellegrini, N. (2022). Consumer awareness of the degree of industrial food processing and the association with healthiness—A pilot study. *Nutrients*, 14(20), 4438. <https://doi.org/10.3390/nu14204438>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- Braun, V., & Clarke, V. (2022). Conceptual and design thinking for thematic analysis. *Qualitative Psychology*, 9(1), 3–26. <https://doi.org/10.1037/qup0000196>
- Califano, G., Furno, M., & Caracciolo, F. (2023). Beyond one-size-fits-all: Consumers react differently to packaging colors and names of cultured meat in Italy. *Appetite*, 182, 106434. <https://doi.org/10.1016/j.appet.2022.106434>
- Collier, E. S., Harris, K. L., Bendtsen, M., Norman, C., & Niimi, J. (2023). Just a matter of taste? Understanding rationalizations for dairy consumption and their associations with sensory expectations of plant-based milk alternatives. *Food Quality and Preference*, 104, 104745. <https://doi.org/10.1016/j.foodqual.2022.104745>
- da Fonseca, C., Sá, A. G. A., Ribeiro Gagliardi, T., dos Santos Alves, M. J., & Ayala Valencia, G. (2023). Understanding the packaging colour on consumer perception of plant-based hamburgers: A preliminary study. *Packaging Technology and Science*, 36(6), 495–503. <https://doi.org/10.1002/pts.2725>

- de Castro Carvalho, G., Carneiro, J. de D. S., Rocha, R. A. R., & Pereira, E. (2025). Plant-based trends: Consumer's perception and factors that influence the purchase of plant-based products. *British Food Journal*, 127(9), 3396–3426. <https://doi.org/10.1108/BFJ-08-2024-0830>
- Elzerman, J. E., Hoek, A. C., van Boekel, M. J. A. S., & Luning, P. A. (2015). Appropriateness, acceptance and sensory preferences based on visual information: A web-based survey on meat substitutes in a meal context. *Food Quality and Preference*, 42, 56–65. <https://doi.org/10.1016/j.foodqual.2015.01.010>
- Elzerman, J. E., van Boekel, M. A. J. S., & Luning, P. A. (2013). Exploring meat substitutes: Consumer experiences and contextual factors. *British Food Journal*, 115(5), 700–710. <https://doi.org/10.1108/00070701311331490>
- Elzerman, J. E., van Dijk, P. E. M., & Luning, P. A. (2022). Substituting meat and the role of a situational context: Exploring associations and motives of Dutch meat substitute-users. *British Food Journal*, 124(13), 93–108. <https://doi.org/10.1108/BFJ-09-2021-1051>
- Etter, B., Michel, F., & Siegrist, M. (2024). Which are the most promising protein sources for meat alternatives? *Food Quality and Preference*, 119. <https://doi.org/10.1016/j.foodqual.2024.105226>
- European Parliament. (2025, October 8). *MEPs back changes to strengthen farmers' position in the food supply chain*. Retrieved October 9, 2025, from <https://www.europarl.europa.eu/news/en/press-room/20251006IPR30735/meps-back-changes-to-strengthen-farmers-position-in-the-food-supply-chain>

- Fadnes, L. T., Økland, J.-M., Haaland, Ø. A., & Johansson, K. A. (2022). Estimating impact of food choices on life expectancy: A modeling study. *PLOS Medicine*, 19(3), e1003889. <https://doi.org/10.1371/journal.pmed.1003889>
- Federal Statistical Office. (2022, October 4). *Gesamtproduktion der Landwirtschaft. Zu laufenden Preisen—1985-2022 | Data—Table*. Retrieved August 23, 2026, from <https://www.bfs.admin.ch/asset/de/23425406>
- Feltz, A., Feltz, S., Hoang, U., & Holt, J. (2025). The myth of misleading labels: Examining consumer understanding of plant-based meat and milk analogues. *Journal of Consumer Policy*, 48(4), 539–562. <https://doi.org/10.1007/s10603-025-09601-5>
- Frisch, D., & Baron, J. (1988). Ambiguity and rationality. *Journal of Behavioral Decision Making*, 1(3), 149–157. <https://doi.org/10.1002/bdm.3960010303>
- Giacone, L., Siegrist, M., Stadelmann, A., & Hartmann, C. (2024). Consumers' perceptions of healthiness and environmental friendliness of plant-based and dairy product concepts. *Food and Humanity*, 2, 100288. <https://doi.org/10.1016/j.foohum.2024.100288>
- Gomez, P. (2013). Common biases and heuristics in nutritional quality judgments: A qualitative exploration. *International Journal of Consumer Studies*, 37(2), 152–158. <https://doi.org/10.1111/j.1470-6431.2012.01098.x>
- Graça, J., Calheiros, M. M., & Oliveira, A. (2015). Attached to meat? (Un)Willingness and intentions to adopt a more plant-based diet. *Appetite*, 95, 113–125. <https://doi.org/https://doi.org/10.1016/j.appet.2015.06.024>
- Granato, G., & Wassmann, B. (2024). To imitate or not to imitate? How consumers perceive animal origin products and plant-based alternatives imitating minimally processed vs

ultra-processed food. *Journal of Cleaner Production*, 472, 143447.

<https://doi.org/10.1016/j.jclepro.2024.143447>

Greis, M., Nolden, A. A., Kinchla, A. J., Puputti, S., Seppä, L., & Sandell, M. (2023). What if plant-based yogurts were like dairy yogurts? Texture perception and liking of plant-based yogurts among US and Finnish consumers. *Food Quality and Preference*, 107, 104848.

<https://doi.org/10.1016/j.foodqual.2023.104848>

Haas, R., Schnepps, A., Pichler, A., & Meixner, O. (2019). Cow milk versus plant-based milk substitutes: A comparison of product image and motivational structure of consumption. *Sustainability*, 11(18), 5046. <https://doi.org/10.3390/su11185046>

Harris, K. L., Collier, E. S., Norman, C., van Huyssteen, G., & Normann, A. (2026). Great expectations: How experience, exposure, and product performance shape the perceived normality of plant based dairy alternatives. *Future Foods*, 13, 100939.

<https://doi.org/10.1016/j.fufo.2026.100939>

Hartmann, C., Furtwaengler, P., & Siegrist, M. (2022). Consumers' evaluation of the environmental friendliness, healthiness and naturalness of meat, meat substitutes, and other protein-rich foods. *Food Quality and Preference*, 97, 104486.

<https://doi.org/10.1016/j.foodqual.2021.104486>

Hässig, A., Hartmann, C., Sanchez-Siles, L., & Siegrist, M. (2023). Perceived degree of food processing as a cue for perceived healthiness: The NOVA system mirrors consumers' perceptions. *Food Quality and Preference*, 110, 104944.

<https://doi.org/10.1016/j.foodqual.2023.104944>

- Höchli, B., Holenweger, G., Morf, A., Stämpfli, A., & Messner, C. (2026). The role of halo effects in consumer perceptions of meat and dairy alternatives. *Food Quality and Preference*, 143, 105934. <https://doi.org/10.1016/j.foodqual.2026.105934>
- Hoek, A. C., Luning, P. A., Weijzen, P., Engels, W., Kok, F. J., & de Graaf, C. (2011). Replacement of meat by meat substitutes. A survey on person- and product-related factors in consumer acceptance. *Appetite*, 56(3), 662–673. <https://doi.org/10.1016/j.appet.2011.02.001>
- Ischen, C., Meijers, M. H. C., Vandeberg, L., & Smit, E. G. (2022). Seen as green? Assessing the salience and greenness of environmentally friendly packaging cues. *Journal of Food Products Marketing*, 28(1), 31–48. <https://doi.org/10.1080/10454446.2022.2038757>
- Jaeger, S. R., Cardello, A. V., Jin, D., Ryan, G. S., & Giacalone, D. (2023). Consumer perception of plant-based yoghurt: Sensory drivers of liking and emotional, holistic and conceptual associations. *Food Research International*, 167, 112666. <https://doi.org/10.1016/j.foodres.2023.112666>
- Jaeger, S. R., Dupas de Matos, A., Frempomaa Oduro, A., & Hort, J. (2024). Sensory characteristics of plant-based milk alternatives: Product characterisation by consumers and drivers of liking. *Food Research International*, 180, 114093. <https://doi.org/10.1016/j.foodres.2024.114093>
- Kamas, E. N., & Reder, L. M. (1995). The role of familiarity in cognitive processing. In R. F. Lorch, Jr. & E. J. O'Brien (Eds.), *Sources of coherence in reading* (pp. 177–202). Lawrence Erlbaum Associates, Inc.

- Kerslake, E., Kemper, J. A., & Conroy, D. (2022). What's your beef with meat substitutes? Exploring barriers and facilitators for meat substitutes in omnivores, vegetarians, and vegans. *Appetite*, 170, 105864. <https://doi.org/10.1016/j.appet.2021.105864>
- Ketelsen, M., Janssen, M., & Hamm, U. (2020). Consumers' response to environmentally-friendly food packaging—A systematic review. *Journal of Cleaner Production*, 254, 120123. <https://doi.org/10.1016/j.jclepro.2020.120123>
- Lammers, P., Ullmann, L. M., & Fiebelkorn, F. (2019). Acceptance of insects as food in Germany: Is it about sensation seeking, sustainability consciousness, or food disgust? *Food Quality and Preference*, 77, 78–88. <https://doi.org/10.1016/j.foodqual.2019.05.010>
- Lazzarini, G. A., Zimmermann, J., Visschers, V. H. M., & Siegrist, M. (2016). Does environmental friendliness equal healthiness? Swiss consumers' perception of protein products. *Appetite*, 105, 663–673. <https://doi.org/10.1016/j.appet.2016.06.038>
- Leialohilani, A., & de Boer, A. (2020). EU food legislation impacts innovation in the area of plant-based dairy alternatives. *Trends in Food Science & Technology*, 104, 262–267. <https://doi.org/10.1016/j.tifs.2020.07.021>
- Lemken, D., Spiller, A., & Schulze-Ehlers, B. (2019). More room for legume – Consumer acceptance of meat substitution with classic, processed and meat-resembling legume products. *Appetite*, 143, 104412. <https://doi.org/10.1016/j.appet.2019.104412>
- Li, M., & Chapman, G. B. (2012). Why do people like natural? Instrumental and ideational bases for the naturalness preference. *Journal of Applied Social Psychology*, 42(12), 2859–2878. <https://doi.org/10.1111/j.1559-1816.2012.00964.x>

- Machín, L., Antúnez, L., Curutchet, M. R., & Ares, G. (2020). The heuristics that guide healthiness perception of ultra-processed foods: A qualitative exploration. *Public Health Nutrition*, 23(16), 2932–2940. <https://doi.org/10.1017/S1368980020003158>
- Malterud, K., Siersma, V. D., & Guassora, A. D. (2016). Sample size in qualitative interview studies: Guided by information power. *Qualitative Health Research*, 26(13), 1753–1760. <https://doi.org/10.1177/1049732315617444>
- Mehner, E., Ehlers, M.-H., Herrmann, M., Höchli, B., Holenweger, G., Mann, S., Messner, C., Nemecek, T., Reguant Closa, A., Schäfer, O., Stämpfli, A., Walther, B., & Douziech, M. (2024). *Fleisch- und Milchersatzprodukte – besser für Gesundheit und Umwelt?: Auswirkungen auf Ernährung und Nachhaltigkeit, die Sicht der Konsumentinnen und Konsumenten sowie ethische und rechtliche Überlegungen* (TA-SWISS, Ed.; 1st ed., Vol. 84). vdf Hochschulverlag AG. <https://doi.org/10.3218/4194-1>
- Meier, B. P., Dillard, A. J., & Lappas, C. M. (2019). Naturally better? A review of the natural-is-better bias. *Social and Personality Psychology Compass*, 13(8), e12494. <https://doi.org/10.1111/spc3.12494>
- Michel, F., Hartmann, C., & Siegrist, M. (2021). Consumers' associations, perceptions and acceptance of meat and plant-based meat alternatives. *Food Quality and Preference*, 87, 104063. <https://doi.org/10.1016/j.foodqual.2020.104063>
- Monteiro, C. A., Cannon, G., Lawrence, M., Costa Louzada, M. L., & Pereira Machado, P. (2019). *Ultra-processed foods, diet quality, and health using the NOVA classification system*. FAO.

- Muthukrishnan, A. V., Wathieu, L., & Xu, A. J. (2009). Ambiguity aversion and the preference for established brands. *Management Science*, 55(12), 1933–1941.
<https://doi.org/10.1287/mnsc.1090.1087>
- Nadurak, V. (2026). Heuristics and cognitive biases: A conceptual analysis. *Memory & Cognition*, 54(4), 1357–1372. <https://doi.org/10.3758/s13421-025-01814-w>
- Olson, J. C., & Jacoby, J. (1972). Cue utilization in the quality perception process. *ACR special volumes*.
- Orquin, J. L. (2014). A Brunswik lens model of consumer health judgments of packaged foods. *Journal of Consumer Behaviour*, 13(4), 270–281. <https://doi.org/10.1002/cb.1465>
- Philippi Rosane, B., Batalha, J., Botelho, R. B. A., Zandonadi, R. P., He, D., Li, Y., Zhao, H., Byrne, D. V., Bügel, S. G., & Andersen, B. V. (2026). Consumers' usage, preference and perceptions of plant-based drinks: A cross-country comparison among consumers from capitals of Brazil, China, and Denmark. *Food Quality and Preference*, 145, 106005.
<https://doi.org/10.1016/j.foodqual.2026.106005>
- Plasek, B., Lakner, Z., & Temesi, Á. (2020). Factors that influence the perceived healthiness of food—Review. *Nutrients*, 12(6), 1881. <https://doi.org/10.3390/nu12061881>
- Pliner, P., & Salvy, S. J. (2006). Food neophobia in humans. In Shepherd & M. Raats (Eds.), *The psychology of food choice* (Vol. 3, pp. 75–92).
<https://www.cabidigitallibrary.org/doi/abs/10.1079/9780851990323.0075>
- Pointke, M., Ohlau, M., Risius, A., & Pawelzik, E. (2022). Plant-based only: Investigating consumers' sensory perception, motivation, and knowledge of different plant-based alternative products on the market. *Foods*, 11(15), 2339.
<https://doi.org/10.3390/foods11152339>

- Poore, J., & Nemecek, T. (2018). Reducing food's environmental impacts through producers and consumers. *Science*, 360(6392), 987–992. <https://doi.org/10.1126/science.aag0216>
- Rahimi, S., & Khatooni, M. (2024). Saturation in qualitative research: An evolutionary concept analysis. *International Journal of Nursing Studies Advances*, 6, 100174. <https://doi.org/10.1016/j.ijnsa.2024.100174>
- Román, S., Sánchez-Siles, L. M., & Siegrist, M. (2017). The importance of food naturalness for consumers: Results of a systematic review. *Trends in Food Science & Technology*, 67, 44–57. <https://doi.org/10.1016/j.tifs.2017.06.010>
- Schiano, A. N., Harwood, W. S., Gerard, P. D., & Drake, M. A. (2020). Consumer perception of the sustainability of dairy products and plant-based dairy alternatives. *Journal of Dairy Science*, 103(12), 11228–11243. <https://doi.org/10.3168/jds.2020-18406>
- Schimmel, M. D., Junge, J. Y., Alexi, N., Andersen, G. B. H., Hammershøj, M., Løbner, M. H., & Kidmose, U. (2025). Drivers and barriers for plant-based cheese alternatives adoption: Insights from diverse consumer clusters. *Foods*, 14(7), 1162. <https://doi.org/10.3390/foods14071162>
- Schuldt, J. P., Muller, D., & Schwarz, N. (2012). The “fair trade” effect: Health halos from social ethics claims. *Social Psychological and Personality Science*, 3(5), 581–589. <https://doi.org/10.1177/1948550611431643>
- Schwingshackl, L., Schwedhelm, C., Hoffmann, G., Lampousi, A.-M., Knüppel, S., Iqbal, K., Bechthold, A., Schlesinger, S., & Boeing, H. (2017). Food groups and risk of all-cause mortality: A systematic review and meta-analysis of prospective studies. *The American Journal of Clinical Nutrition*, 105(6), 1462–1473. <https://doi.org/10.3945/ajcn.117.153148>

- Scott, L., & Vigar-Ellis, D. (2014). Consumer understanding, perceptions and behaviours with regard to environmentally friendly packaging in a developing nation. *International Journal of Consumer Studies*, 38(6), 642–649. <https://doi.org/10.1111/ijcs.12136>
- Siddiqui, S. A., Mehany, T., Schulte, H., Pandiselvam, R., Nagdalian, A. A., Golik, A. B., Asif Shah, M., Muhammad Shahbaz, H., & Maqsood, S. (2024). Plant-based milk – Thoughts of researchers and industries on what should be called as ‘milk’. *Food Reviews International*, 40(6), 1703–1730. <https://doi.org/10.1080/87559129.2023.2228002>
- Siegrist, M., & Hartmann, C. (2020a). Consumer acceptance of novel food technologies. *Nature Food*, 1, 343–350. <https://doi.org/10.1038/s43016-020-0094-x>
- Siegrist, M., & Hartmann, C. (2020b). Perceived naturalness, disgust, trust and food neophobia as predictors of cultured meat acceptance in ten countries. *Appetite*, 155, 104814. <https://doi.org/10.1016/j.appet.2020.104814>
- Sokolova, T., Krishna, A., & Döring, T. (2023). Paper meets plastic: The perceived environmental friendliness of product packaging. *Journal of Consumer Research*, 50(3), 468–491. <https://doi.org/10.1093/jcr/ucad008>
- Sucapane, D., Roux, C., & Sobol, K. (2021). Exploring how product descriptors and packaging colors impact consumers’ perceptions of plant-based meat alternative products. *Appetite*, 167, 105590. <https://doi.org/10.1016/j.appet.2021.105590>
- The Good Food Institute. (2024). *2024 state of the Industry report / Plant-based meat, seafood, eggs, dairy, and ingredients*. <https://gfi.org/resource/plant-based-meat-eggs-and-dairy-state-of-the-industry/>
- Tversky, A., & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. *Science*, 185(4157), 1124–1131. <https://doi.org/10.1126/science.185.4157.1124>

- Vaikma, H., Kern, M., Harwood, W., & Almlí, V. L. (2025). Consumer perceptions of sustainability towards ingredients, packaging, labelling, and storage conditions in milk, burger products, and plant-based alternatives: A study in Sweden and Italy. *Future Foods*, 11, 100635. <https://doi.org/10.1016/j.fufo.2025.100635>
- Varela, P., Arvisenet, G., Gonera, A., Myhrer, K. S., Fifi, V., & Valentin, D. (2022). Meat replacer? No thanks! The clash between naturalness and processing: An explorative study of the perception of plant-based foods. *Appetite*, 169, 105793. <https://doi.org/10.1016/j.appet.2021.105793>
- Wassmann, B., Siegrist, M., & Hartmann, C. (2023). The role of heuristics for composing an environmentally friendly meal. *Journal of Cleaner Production*, 402, 136818. <https://doi.org/10.1016/j.jclepro.2023.136818>
- Willett, W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S., Garnett, T., Tilman, D., DeClerck, F., Wood, A., Jonell, M., Clark, M., Gordon, L. J., Fanzo, J., Hawkes, C., Zurayk, R., Rivera, J. A., Vries, W. D., Sibanda, L. M., ... Murray, C. J. L. (2019). Food in the Anthropocene: The EAT–Lancet Commission on healthy diets from sustainable food systems. *The Lancet*, 393(10170), 447–492. [https://doi.org/10.1016/S0140-6736\(18\)31788-4](https://doi.org/10.1016/S0140-6736(18)31788-4)
- Zhang, Y., Fishbach, A., & Kruglanski, A. W. (2007). The dilution model: How additional goals undermine the perceived instrumentality of a shared path. *Journal of Personality and Social Psychology*, 92(3), 389–401. <https://doi.org/10.1037/0022-3514.92.3.389>

Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests. Bettina Hoechli reports financial support was provided by TA-SWISS. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Highlights

- Consumers use mental shortcuts to evaluate the health and sustainability of MDSPs.
- The halo effect, ambiguity, and dilution can specifically be applied to MDSPs.
- Evaluations of meat substitutes' similarity to their reference products varied.
- Variation may depend on meat attachment and need for food system change.
- Different consumer groups view similarity as positive, negative, or irrelevant.