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Journal Article

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Publication date:
2023-05-20

Permanent link:
https://doi.org/10.3929/ethz-b-000606144

Originally published in:
Journal of Cleaner Production 402, https://doi.org/10.1016/j.jclepro.2023.136818

Journal of Cleaner Production 402 (2023) 136818

Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

The role of heuristics for composing an environmentally friendly meal

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ARTICLE INFO

Handling Editor: Maria Teresa Moreira

Keywords:
Sustainable food selection
Consumer behaviour
Alternative proteins
Fake food buffet
Decision-making
Food choice
Meat consumption
Plant-based diet
Meat substitutes

ABSTRACT

Our food choices have a large negative impact on the environment. To address this, it is necessary to understand consumers' environmentally friendly food selection behaviour. To this end, we investigated the role of heuristics (i.e. decision-making shortcuts) for a consumer's ability to compose an environmentally friendly meal. Participants ($N = 169$) were instructed to compose either a meal to their liking (control group) or an environmentally friendly meal (eco group) from a fake food lunch buffet while verbalising their thoughts ("Think Aloud" method). The groups' meals were compared concerning their environmental impact (LCA data), weight, calories, macronutrients, and food selection reasons. The eco group's meals were lower in environmental impact as compared to the control group. For this, they appear to have followed three approaches which one could interpret as heuristics. In comparison to the control group, the eco group chose (1) less meat and fish (in particular, steak), (2) more meat substitutes (in particular, falafel), and (3) foods that were regional, seasonal, and organic, instead of choosing foods based on perceived tastiness and visual appeal. A regression analysis showed that consumers' knowledge about the environmental friendliness of food significantly predicted the environmental impact of the meals. To further improve the environmental friendliness of their meals, the eco group could have selected less animal-based foods (including egg and dairy), and more plant-based foods (including novel meat substitute products) instead. Furthermore, they appear to overestimate the role of regionality, seasonality, and organic production method, as well as underestimate the role of food amount in the context of food environmental friendliness.

Our daily food choices have a strong impact on the environment and climate change. Even the ways in which we compose a single meal has a significant impact in this regard (Visschers and Siegrist et al., 2015). The scientific evidence hereby is unanimous: the best approach to reducing the environmental impact of one's diet is to eat less foods of animal origin. In turn, the consumption of foods of plant origin should increase (Aiking, 2011; Frehner et al., 2022; Lamb et al., 2016; Leip et al., 2015).

Even though the interest in improving dietary environmental friendliness has grown in recent years (Siegrist et al., 2015), it does not appear as though consumers have the necessary knowledge to translate this intention into behaviour. Specifically, consumers have repeatedly shown that they have very limited knowledge of the environmental impact of different foods (Hartmann et al., 2022; Hartmann et al., 2021; Kim and Schuldt, 2018; Kusch and Fiebelkorn, 2019; Tobler et al., 2011). Most importantly, their awareness about the unsustainability of animal products, as well as their acceptance of plant-based meat alternatives, is low (Estell et al., 2021; Hartmann and Siegrist, 2017; Hoek et al., 2011), even though the consumption of these products immensely impacts the environmental friendliness of one's diet.

1. Food choices in a "real-life" setting

While past studies have identified the general knowledge gaps and processes linked to a consumer's environmentally friendly eating, not much is known about consumer behaviour on this topic from a more practical perspective. Specifically, more research is needed on the consumer's environmental impact perceptions of individual food categories and products, how these perceptions interact, and how this translates into behaviour in real-life food choice settings. Gaining a deeper understanding of this is necessary for identifying the concrete barriers hindering consumers from environmentally friendly behaviour and developing corresponding targeted interventions. Thus, the current study aims to assess the consumer's environmental food choices in an experimental setting that imitates a real-life food choice situation: the selection of a lunch meal at a buffet. For this, a fake food buffet (FFB) was utilised, which is a reliable and valid method for assessing food

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https://doi.org/10.1016/j.jclepro.2023.136818
Received 11 June 2022; Received in revised form 25 February 2023; Accepted 15 March 2023
Available online 16 March 2023

choices under well-controlled conditions (Bucher, van der Horst and Siegrist, 2012). This means that the amounts of food served from such a fake buffet are comparable to the amounts of food served from a corresponding "real" buffet containing the same selection of foods, and that participants serve themselves portions in relation to their individual energy needs.

2. Food choice heuristics

So far, the FFB has been used to investigate the composition of a healthy meal. Consumers assembled healthier meals when they were presented with more (vs. less) vegetable options (Bucher, van der Horst and Siegrist, 2011), when they were tasked to compose a colourful (vs. a "typical") meal (König and Renner, 2019), and when they were tasked to compose a meal meant for themselves (vs. a meal meant for others) (Sproesser et al., 2015). Furthermore, participants reduced sweets and desserts in favour of fruits when they were trying to compose a healthy meal (Bucher et al., 2011).

However, participants did not share their thought processes during the meal selection in any of these studies. Thus, they give little insight into an important mechanism of human decision-making: simple heuristics. Humans tend to be frugal about the energy and time invested in decision-making. Thus, instead of taking all available information into account, they often base their choices on single cues that act as simple, yet reasonably effective "rules of thumb" (Gigerenzer and Goldstein, 1996; Kahneman et al., 1982). While these heuristics do not always lead to "the best" choice, humans are inclined to use heuristics because they facilitate making a choice that is "good enough" with minimum effort.

Heuristics guide many of our daily food choices (Schulte-Mecklenbeck et al., 2013). Scheibehenne et al. (2007) demonstrated this by presenting participants with pictures of meals, as well as the meals' attributes (e.g. price, calories, macronutrients, etc.). They found that, instead of aggregating the information of all the significant attributes, participants chose the meal that had the highest value on the attribute that was perceived most important. On average, this "most important" attribute was, in fact, the appearance of the meal, since the meal picture was the cue that received the most attention. Hereby, a consumer's reliance on sensory information for making choices is likely associated to appeasing their most dominant food choice motive: taste (Scheibehenne et al., 2007; Schulte-Mecklenbeck et al., 2013). Indeed, other sensory cues associated with finding the "tasty option" include the product name (Irmak et al., 2011), the packaging colour (Mai et al., 2016), or other inherent sensory attributes of a food, e.g. smell or perceived tastiness (Schulte-Mecklenbeck et al., 2013).

In certain situations, consumers will combine different heuristics, for example in a sequential manner (Leong and Hensher, 2012). Consider, for example, someone at a buffet. The first "mental shortcut" this individual is inclined to take is the use of a hedonistic heuristic, e.g. focusing solely on the visual (taste) appeal of the options while ignoring any other available information. The second shortcut taken may then be the use of a dichotomous heuristic, which involves a binary categorisation of foods as either "looking tasty" or "not looking tasty." Such binary classifications ("good" vs. "bad," "tasty" vs. "untasty," or "healthy" vs. "unhealthy") are principles guiding our food choice behaviour (Carels et al., 2007; Chernev, 2011; Rozin et al., 1996; Rozin and Holtermann, 2021). In a last step, the individual at the buffet may apply a prototype heuristic (Kahneman and Frederick, 2002) to further simplify the decision process. The mental prototype (i.e. the "best example") for tasty foods appears to be foods that are high in fats or sugar (e.g. cookies, junk food) (Locher et al., 2005), whereas a prototype for untasty foods appear to be plant-based, low fat foods (e.g. spinach, kale) (Locher et al., 2005).

While hedonistic motives and heuristics appear to be the "default" for most of our food choices, consumers apply different heuristics when they choose foods for utilitarian reasons (e.g. health and weight management, environmental conservation) (Botti and McGill, 2011). When consumers are trying to choose healthy foods, for example, findings suggest that consumers make use of heuristics like "tasty foods = unhealthy foods" (Mai and Hoffmann, 2015), "light foods = healthy foods" (Heuvinck et al., 2018), "colourful meals = healthy meals" (König and Renner, 2018), or "health labelled foods = healthy foods" (Fagerstrøm et al., 2021). Specifically, these studies show that consumers will use these cues as main indicators of the healthiness of foods. As Machín et al. (2020) note, some of these heuristics are not necessarily related to nutrition information relevant to the healthiness of foods.

Although there is extensive literature on heuristics for identifying supposedly healthy foods, not much is known about heuristics concerning environmentally friendly foods. There are certain food characteristics that consumers commonly associate with environmental friendliness, such as the use of organic production methods (Bosona and Gebresenbet, 2018; Petrescu and Petrescu-Mag, 2015; Siegrist and Hartmann, 2019), regionality (Annunziata and Mariani, 2018; Aprile et al., 2016), seasonality (Siegrist et al., 2015; Wallnoefer et al., 2021), perceived naturalness and healthiness (Hartmann et al., 2022), or the perceived level of excessive packaging (Tobler et al., 2011). It appears that some of these characteristics translate into "rules of thumb" that consumers use when aiming to select environmentally friendly foods (Lazzarini et al., 2017). To investigate this further, the current study utilises the FFB in combination with a "Think Aloud" methodology, a research method in which "participants speak aloud any words in their mind as they complete a task" (Charters, 2003, p. 68). Naturally, this tool is helpful for gaining insights to cognitive processes, such as food decision-making (Fink et al., 2021; Ogden and Roy-Stanley, 2020), and is thus suitable for identifying food choice heuristics.

3. Study aims

Although consumers express interest in eating more environmentally friendly foods, they are often unsuccessful in translating this intention into behaviour. To bridge this gap, it is first necessary to understand how consumers typically approach making more environmentally friendly food choices. For this, we analysed the participants' food selection and food selection reasons as they composed a meal from a FFB whilst they verbalised their thoughts. The aim of this study was to identify potential heuristics consumers use for selecting environmentally friendly foods, and the role these heuristics have for consumers' ability to compose an environmentally friendly meal.

4. Methods

4.1. Sample

Participants were recruited through the Consumer Behaviour Panel, different webpages, and e-mail. Participants had to be at least 18 years old, speak German fluently, and not suffer from any food allergies or intolerances. Each participant was rewarded with 20 CHF for their participation in this 30-min-long study. Overall, 169 participants took part, of which approximately half were female (52%), and had an applied university or university degree (48.5%), with a mean age of 33 years ($SD = 12$). The mean Body Mass Index (BMI) at 22.57 ($SD = 2.91$) fell within the "normal" range. Before the experiment started, each participant was informed about the tasks and gave their written consent. The Ethics Committee of ETH Zurich (EK, 2020-N-96) approved the study.

4.2. Experimental procedure

The experiment was conducted at ETH Zurich in late 2020. Participants ($N = 169$) were equally and randomly divided into two groups: a control group ($n = 85$) and an intervention group, also called the "eco" group ($n = 84$). Participants were individually invited into the laboratory room, where they were introduced to a FFB, which consisted of replica food items. The control group was asked to assemble a main meal (lunch or dinner) that they would normally eat from the given selections in the buffet, whereas the eco group was asked to assemble one which they considered "environmentally friendly". During this, they were asked to verbalise their thoughts (Think Aloud methodology) while being audibly recorded. Since the buffet did not include sauces, participants were asked to imagine these on top of their assembled meals. They were also asked to imagine that the current season was July/August. Participants answered a pencil-and-paper questionnaire with questions that included their demographics and attitudes regarding nutrition and ecology. After the experiment, the assembled meals were photographed and the foods were weighed by food category. The audio recordings were transcribed and encoded. Environmental friendliness for the selected foods/meal was determined by the use of eco-points based on life cycle assessment data, which is the result of a specific life cycle assessment method. Further methodological details are described in the following paragraphs and elsewhere (Bucher et al., 2011, 2012).

4.2.1. *Think Aloud methodology*

Participants were asked to verbalise their thoughts during the experimental task as proposed by the Think Aloud methodology (Charters, 2003). This method usually leaves participants to talk freely during the task; however, the researcher conducting the Think Aloud experiment can make use of a protocol containing questions that participants can be asked if they are struggling with thinking aloud. Such an approach was taken for the current experiment. Specifically, if participants struggled with verbalising their thoughts, the experiment conductor asked questions typical of Think Aloud protocols, e.g. "Why did you choose broccoli? Why did you choose wheat pasta instead of full grain pasta?" (Charters, 2003). The audio recordings of participants talking were transcribed and encoded. Specifically, participants mentioned reasons for choosing foods as well as the food selection sequence (i.e. which food was chosen in 1st, 2nd, 3rd, etc. place) of each participant was recorded. For this—based on all transcriptions—the 10 most frequently mentioned reasons for choosing foods were identified as taste, regionality (Swiss), healthiness, the use of an organic production method, seasonality, familiarity, colour, visual appeal, habit, and craving. Then, for each participant individually, the frequency of these reasons was counted and the sequence of the food selection was recorded. Only the mentioned reasons for choosing foods were recorded, whereas the mentioned reasons for *not* choosing foods—which were very rarely mentioned by participants—were left out of the analysis.

4.2.2. *The fake food buffet (FFB)*

The FFB method is a validated research tool that enables the investigation of food selection behaviour in a buffet setting in a standardised manner (Bucher et al., 2012). The FFB in this experiment (Fig. 1) contained 41 different food replica produced by the German company, Döring GmbH (https://attrappe.de). Since it was supposed to reflect a typical buffet that can be found in a Swiss canteen, foods from eight different food categories (starchy foods, vegetables, meat, meat substitutes, fish, dairy and egg, fruit, and dessert) were included, as these were shown to be components of an average lunch (Woolhead et al., 2015). The buffet contained foods with varying degrees of environmental friendliness, for instance, based on various food processing degrees (e.g. boiled potatoes vs. french fries), meat and meat-free options (e.g. chicken nuggets vs. tofu), and regional and imported food products (e.g. Swiss apples vs. bananas). Furthermore, it included plant-based meat substitutes from the brands Beyond Meat, Planted, and Quorn. Each food carried labels indicating the name, the origin, whether it was organic, and whether it was vegetarian or vegan. Fig. 2 shows an example of a selected meal. The assembled meals were photographed and the foods were weighed by food category.

The weight of the fake foods ("fake food weight") was used to calculate the theoretical weight ("real food weight"), as well as the calorie content, macro nutrient content, and environmental impact of

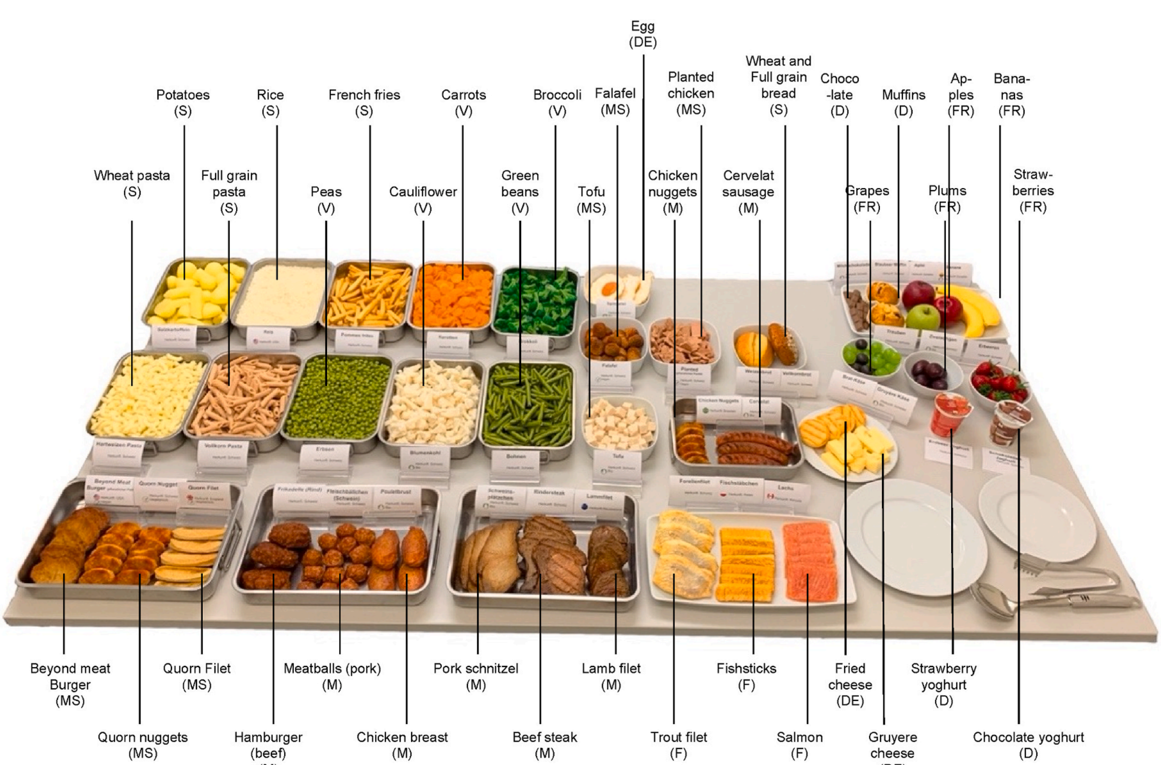

Fig. 1. The fake food buffet (FFB).
The FFB contains 41 foods, which each can be subclassified into one of eight food categories (S = Starchy foods, V = Vegetables, M = Meat, MS = Meat substitutes, F = Fish, DE = Dairy and egg, FR = Fruit, and D = Desert). Meat substitutes from the brands Beyond Meat, Planted, and Quorn are included.

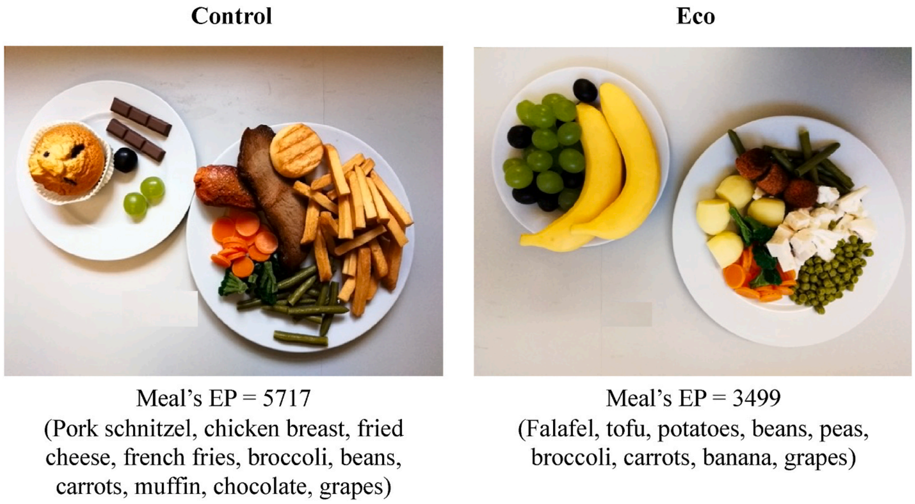

Fig. 2. Example meals and their environmental impact in eco-points (EP).
These meals were chosen as examples because their EP was close to the mean EP of the corresponding group (Control: M = 6359, SD = 6041; Eco: M = 3316, SD = 2647).

the "real" foods (i.e. the food that the fake food represented). For this, conversion factors needed to be multiplied with the fake food weight. These conversion factors were obtained through the nutritional information of the FFB foods on a food database (https://fddb.info).

4.2.3. *Life cycle assessment (LCA) and eco-points (EP)*

A life cycle assessment is the analysis of the potential environmental impact of products during their entire life cycle. Different LCA methods exist. For the current study, the ecological scarcity method was used, which aggregates a broad range of environmental impacts into an easily comparable, one-score impact value measured in eco-points (EP) per unit of quantity (Jungbluth et al., 2012). The more EP there are for a specific food, the more damaging it is assumed to be to the environment. The EP of the foods used in the present study (Fig. 3) were provided by the Swiss sustainability consulting company ESU Service Ltd. (https://esu-services.ch) and have been used in previous studies (Hartmann et al., 2021; Lazzarini et al., 2016).

The environmental impact of a meal was calculated as follows: first, the EP for each of the selected food categories was calculated. For this, the "real food weight" of a food (e.g. 50 g of rice) was multiplied by the EP per gram of this food (e.g. rice has 70 EP per 1 g), which are displayed in Fig. 2. Then, the EP of all the food in a meal were summed up.

4.2.4. *The questionnaire*

The questionnaire took approximately 15 min to fill out, was in German, and covered self-reported attitudes in relation to demographics, nutrition, and ecology. Next to age and gender, the educational level was measured and grouped into three categories: low (no education or primary and secondary school), coded as 1; medium (vocational school, high school), coded as 2; and high (applied university, university), coded as 3. The BMI was calculated as the quotient of self-reported body weight (in kilograms) divided by the square of height (in metres).

Knowledge about the environmental impact of foods (abbrev. "knowledge about food environmental impact") was measured with 16 items (Hartmann et al., 2021). Participants were asked 16 multiple choice knowledge questions. An example item is, "Which of the following causes the most environmental impact?" with the answer options being "storage", "packaging", "transport", "production" (the correct answer), and "do not know,". For each correctly answered item, a participant received one point. Thus, a total of 16 points could be achieved in the knowledge questionnaire.

Concern about health-related food issues (abbrev. "health concern") was measured with four items taken from the General Health Interest subscale (Roininen et al., 1999). Participants were presented with four statements, such as "It is important to me to have a healthy diet," and were asked to indicate their level of agreement on a 7-point scale from "I disagree strongly" (1) to "I agree strongly" (7).

The meal's perceived environmental friendliness was measured with one item constructed for this survey. Participants were asked, "How environmentally friendly do you perceive your chosen meal?" Responses were given on a 6-point scale from "not environmentally friendly at all" (1) to "very environmentally friendly" (6).

The meal's perceived tastiness was measured with one item constructed for this survey. Participants were asked, "How tasty would you perceive the chosen meal?" Responses were given on a 6-point scale from "not tasty at all" (1) to "very tasty" (6).

Participants' answers to the questionnaire are displayed in Table 1. Here, only the participants' demographic characteristics, and attitudes/behaviour related to nutrition and ecology (i.e. age, gender, education, knowledge about food environmental impact, health concern) are shown, serving as a randomisation check between groups. The groups did not differ regarding any of these constructs. The items related to the selected meals (i.e. the perceived tastiness and environmental friendliness of the assembled meals) were excluded, as these are discussed in the results section.

4.3. *Data analysis*

Analyses were performed using the SPSS statistics software package version 26 (SPSS Inc., Chicago, IL) and R software (RStudio Inc., Boston, MA). A significance level of alpha = .05 was used in the present study. In a first step, the weights of the fake foods were used to calculate various characteristics of the meal as described in previous sections. If a participant had not chosen a specific food, a value of zero was set. These zero values were included when the group means and medians were calculated. Due to the large variability in the environmental impact (Fig. 3) and calorie content of foods, there were some meals that had very large and very small values for these variables. In a second step, the data was checked for outliers. Due to the variability in our data, a value was not considered to be an outlier just because it was extremely high or low. Instead, only values that occurred by error were excluded, e.g. during data entry, data measurement, or during conversion between units. In a third step, assumption testing and corresponding appropriate statistical analyses were conducted. Visual inspection of the data revealed that, for analyses involving the meals' characteristics (e.g. the

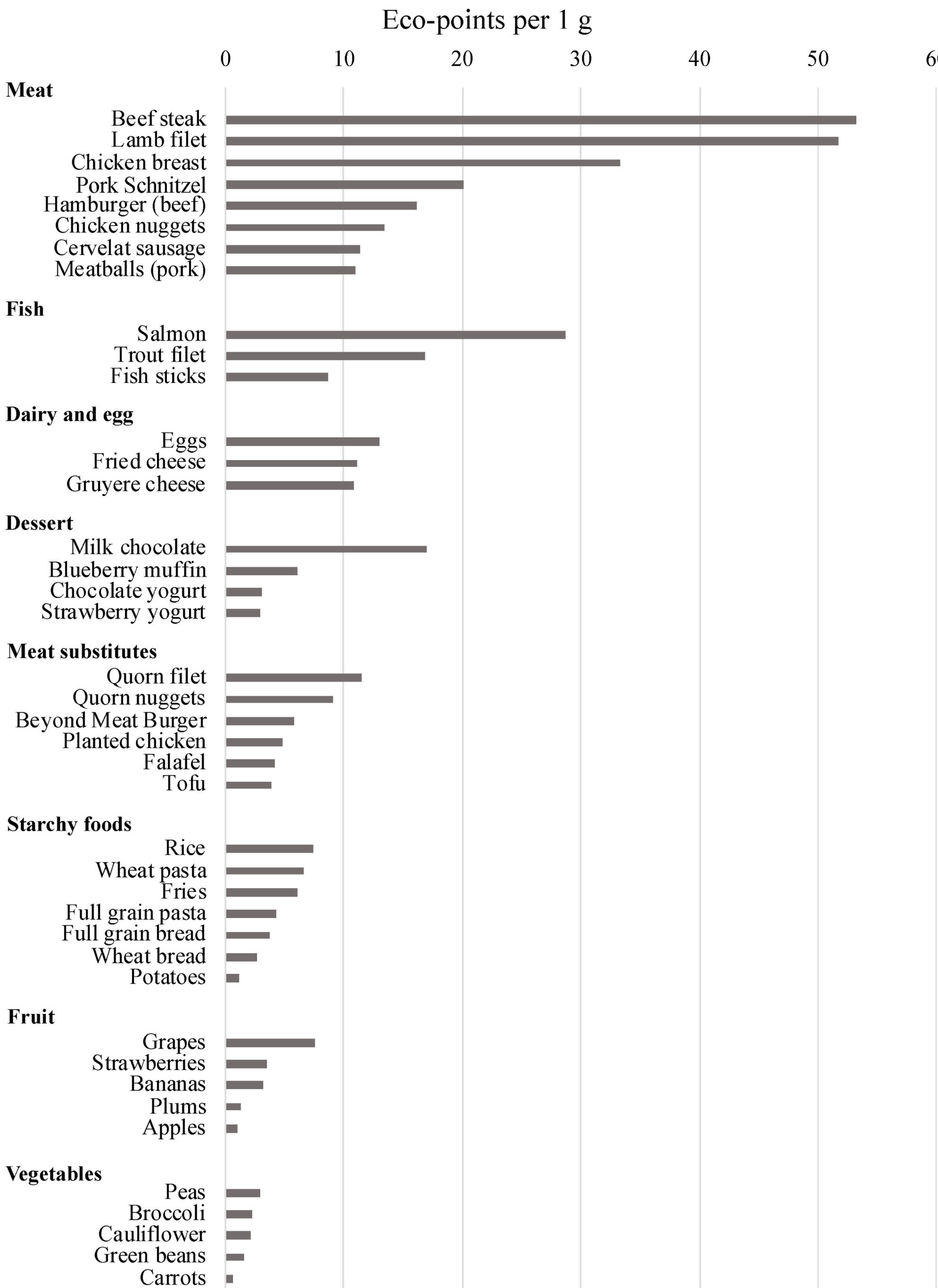

Fig. 3. Buffet foods' environmental impact in EP per 1 g.
Meat substitutes from the brands Beyond Meat, Planted, and Quorn are included.

Table 1
Characteristics of the study sample.

	Overall sample (N = 169)					Control (n = 85)		Eco (n = 84)		Control vs. Eco		
	Possible range	*M* or %	*SD*	No. of items	Al-pha[a]	*M* or %	*SD*	*M* or %	*SD*	t or X^2	*df*	*p*
Female (%)		52.00		1		49.00		55.00		0.49	1	.54
Age (years)	19–69	33.00	12.00	1		32.00	12.00	31.00	12.00	0.71	167	.48
Education	1–3			1						0.77	2	.68
Low (%)		14.40				17.00		12.00				
Medium (%)		37.10				37.00		37.00				
High (%)		48.50				46.00		51.00				
BMI	9–65	22.57	2.91	1		22.80	2.88	22.35	2.95	0.99	167	.32
Knowledge about food env. impact	1–16	10.72	2.51	16		10.05	2.66	10.68	2.39	1.41	167	.16
Health concern	1–7	5.55	0.95	4	.79	5.54	0.97	5.57	0.94	0.23	167	.82

[a] Cronbach's Alpha is referred to.

meal's EP, the meal's calorie content), assumptions for parametric testing were not fulfilled. Therefore, Spearman's rank correlations were used to estimate associations between study variables (Murray, 2013). Furthermore, to compare the meals' characteristics between groups, Mann-Whitney U tests were conducted (Table 2). In contrast, analyses involving variables of the questionnaire as displayed in Table 1 (e.g. age, BMI, health concern) fulfilled the assumptions for parametric testing. Therefore, t-tests and X^2-test were conducted for these variables to compare the groups. Additionally, X^2-test were conducted to compare the number of meat, fish, and meat substitute products between the groups (Table 3). Lastly, a regression analysis was performed for each group with the environmental impact of the meals in EP as dependent variable and gender, BMI, knowledge about food environmental impact, and health concern as independent variables. For this, the meals' EP data were logarithmically transformed to de-emphasise the impact of potentially influential cases and to obtain normal distribution and a constant variance of the model's residuals. This transformation produced values of Cook's $D < 1$ (Cook and Weisberg, 1982), and non-significant Kolmogorov-Smirnov and Shapiro-Wilk test results.

5. Results

5.1. Food selection

Table 2 summarises the food selection differences between groups. For the EP and calories, the results in this table are visualised in Figs. 4 and 5. Inter-correlations between the variables in Table 2 are displayed in the appendix (A1). In the following, the results of Table 2 are discussed in greater detail.

5.1.1. Environmental impact (in EP), calorie content (in kcal), and EP per kcal

The eco group's meals had a lower environmental impact than the control group's meals (Table 2, Fig. 4). Granted, the control group's

Table 2
Group differences regarding the meals (left) and the foods included in the meals (right).

	Meals			Food categories			
	Control *M (SD)*	Eco *M (SD)*	*U* value, *p* value		Control *M (SD)*	Eco *M (SD)*	*U* value, *p* value
Environmental impact (EP)	**6359.12 (6041.32)**	3316.21 (2647.45)	2288.5, $p <$ .001***	Starchy foods	**264.05 (251.48)**	155.11 (117.98)	2692.5, $p =$ .006*
				Meat	**3219.33 (5281.98)**	1118.42 (2354.56)	2950.5, $p =$ .028*
				Fish	**1305.58 (2183.77)**	559.22 (1222.25)	3021.5, $p =$ .028*
Calories (kcal)	**762.20 (483.91)**	552.25 (229.23)	2650.5, $p =$ .004*	Meat	**165.81 (286.65)**	51.24 (119.82)	2907.5, $p =$ .019*
				Fish	**90.14 (148.02)**	36.43 (79.71)	2907.5, $p =$ .019*
Environmental impact per calorie (EP per kcal)	**7.86 (3.69)**	6.21 (4.05)	2494.0, $p =$ .001*	Starchy foods	**3.32 (1.66)**	2.54 (1.06)	2295.0, $p =$ .010*
Weight (of the "real foods") (g)	589.81 (274.67)	522.12 (212.72)	3135.5, $p =$ .172	Meat	**73.69 (109.50)**	32.46 (54.72)	2951.5, $p =$ .028*
				Fish	**59.59 (94.75)**	30.70 (62.93)	2951.5, $p =$ .028*
				Dessert	**67.45 (78.61)**	38.11 (84.6)	2883.0, $p =$ .026*
Number of food items	9.13 (3.27)	9.38 (3.28)	3325.5, $p =$ .438				
Carbohydrates (g)	**65.94 (31.52)**	55.25 (25.87)	2842.5, $p =$ .022*	Starchy foods	**22.20 (21.63)**	11.82 (12.41)	2578.5, $p =$ .002*
				Meat-subst.	6.91 (9.75)	**11.70 (12.98)**	2938.0, $p =$ .040*
Fats (g)	**28.89 (22.37)**	20.46 (11.92)	2757.5, $p =$ .011*	Meat	**4.28 (8.25)**	1.36 (3.65)	2951.5, $p =$ .028*
				Fish	**5.56 (9.69)**	1.87 (4.68)	2953.5, $p =$ .013*
Proteins (g)	**54.26 (37.74)**	39.28 (19.15)	2586.5, $p =$ .002*	Meat	**17.25 (25.79)**	7.43 (12.66)	2954.5, $p =$ .029*
				Fish	**11.59 (18.5)**	6.10 (12.47)	3049.5, $p =$ .037*

Note. Mann-Whitney U values are referred to. If there was a group difference (control vs. eco), the greater mean was marked bold. "Number of food items" refers to how many of the buffet foods were selected. Only the food categories with significant group differences are shown. *$p < .05$, ***$p < .001$.

Table 3
Frequency of meat, fish, and meat substitute selection.

	Control (n = 85)	Eco (n = 84)	X^2 value (df = 1)
Meat	**44**	31	14.70*
Chicken breast	16	18	0.18
Beef steak	**11**	1	8.84*
Lamb fillet	9	2	4.68
Chicken nuggets	3	1	1.00
Pork schnitzel	3	8	2.50
Hamburger (beef)	2	1	0.33
Cervelat (sausage)	0	0	–
Meatballs (pork)	0	0	–
Fish	**35**	18	9.17*
Salmon	**17**	2	13.14***
Trout fillet	14	15	0.84
Fish sticks	4	1	1.82
Meat substitutes	83	**98**	12.95*
Falafel	21	**34**	4.79*
Quorn nuggets	17	25	2.16
Planted chicken	14	16	0.19
Tofu	12	18	1.55
Beyond Meat burger	**11**	3	4.88*
Quorn fillet	8	2	3.75

Note. If there was a group difference (control vs. eco), the greater value was marked bold. The frequencies refer to the number of products selected across the participants of a group (e.g. across all participants in the control group, 21 falafel balls were selected). *$p < .05$, ***$p < .01$.

meals were also higher in calories (Table 2, Fig. 5). This, however, didn't explain the EP differences, since the control group's meals also had a higher EP per kcal, i.e. they selected foods with a "better" EP/calorie ratio.

This group difference in terms of EP could be related to participants' meat and fish selection. Firstly, the groups differed in terms of *how much* meat and fish they selected: the eco group selected less meat and fish than the control group in terms of EP and kcal. For all other food categories (e.g., starchy food, vegetables, etc.), the groups did not differ in this regard (Table 2, Figs. 4 and 5). It was noteworthy that the control group gained the most calories from meat, whereas the eco group gained the most calories from their meat substitute selection. Secondly, the groups differed in terms of *how* they selected meat and fish: the control group was more likely to put meat and fish as the first food item on their plate, whereas the eco group was more likely to choose starchy foods and vegetables first.

5.1.2. *Weight and number of food items*

As can be seen in Table 2, the groups' meals did not differ in terms of weight and number of food items. Both groups selected meals that corresponded to 500–600 g of food and consisted of about nine food items. Nevertheless, there were group differences when looking at the food categories, with the control group selecting more meat and fish in terms of total weight (in g) than the eco group.

5.1.3. *Macronutrients*

As can be seen in Table 2, the control groups' meals had significantly more grams of carbohydrates, fats, and proteins. Again, these meal differences appear to be linked to the meat and fish selection, as the control group's meat and fish selection had more proteins and fat as compared to the eco group. Noteworthy was the fact that the meals of the eco group contained more carbohydrates from meat substitute products as compared to the control group.

5.1.4. *Meat, fish, and meat substitute selection*

Since the groups differed most strongly concerning their meat and fish selection (Table 2)—which are also the two food categories with the largest environmental impact (Fig. 3)—the selection frequency of these food products is displayed in more detail in Table 3. The table also includes the meat substitutes, since these can be used as alternatives to fish and meat. The table confirms that the control group selected more meat (X^2 (1, N = 169) = 14.70, p = .011) and fish (X^2 (1, N = 169) = 9.17, p = .010) products, while the eco group selected more meat substitutes (X^2 (1, N = 169) = 12.95, p = .022). However, these group differences only applied to specific products. Specifically, it was only the beef steak (X^2 (1, N = 169) = 8.84, p = .005) and the salmon (X^2 (1, N = 169) = 13.14, p = .001) of which the eco group chose significantly less of. Regarding the other nine fish/meat products, the groups did not differ. Regarding the meat substitutes, there were only two products for which there were significant group differences: while the eco group chose falafel more often (X^2 (1, N = 169) = 4.79, p = .033), the control group chose the Beyond Meat Burger more often (X^2 (1, N = 169) = 4.88, p = .047).

5.2. *Food selection reasons and evaluation*

Fig. 6 displays the most frequently mentioned food selection reasons. The control group chose foods most frequently for taste, whereas the eco group chose regional foods most frequently (i.e. foods labelled to have been produced in Switzerland). Group differences were observable for these variables: the control group chose foods more frequently for taste (U = 1626.0, p < .001) and visual appeal (U = 2729.5, p < .001) in comparison to the eco group. The eco group on the other hand chose foods more frequently because the foods were labelled as regional (U = 1228.5, p < .001), labelled as organic (U = 2148.0, p < .001), and were perceived to be seasonal (i.e. seasonal for July/August, since participants had been asked to imagine this being the current season) (U = 2520.5, p < .001) in comparison to the control group.

After participants assembled the meals, they rated the meals' environmental friendliness and tastiness. As displayed in Fig. 7, the eco group rated their assembled meals as being more environmentally friendly than the control group rated their meals, t(167) = 4.52, p < .001. There was no group difference regarding the perceived tastiness of the composed meals, t(167) = 1.90, p = .060.

5.3. *Consumer characteristics predicting the environmental impact of the selected meals*

Correlations between the study variables are displayed in Table 4. A meal's environmental impact was correlated to the participant's education (r = −0.18, p = .023), BMI (r = 0.22, p = .004), their knowledge of food's environmental impact (r = −0.20, p = .008), and their perception of their meal's environmental friendliness (r = −0.27, p < .001).

To further investigate these associations, a regression analysis for each group was performed with the environmental impact of the meals in EP as a dependent variable, and gender, BMI, knowledge about food environmental impact, and health concern as independent variables (Table 5). The meals' EP data was logarithmically transformed before running the analysis. The control group's model was significant (F(4, 80) = 3.68, p = .008), explaining 16% of the variance in the dependent variable, i.e. the meal's environmental impact (R^2 = 0.16). Hereby, meals with a high environmental impact tended to be created by participants with a higher BMI (β = 0.26, p = .018), and a lower knowledge of food environmental impact (β = −0.24, p = .028). Neither gender nor health concern were significant predictors. The eco group's model was not significant.

6. Discussion

Out of the various factors (e.g., biological, cognitive, social) that influence our food choices, heuristics are important because they allow us to make quick yet reasonable decisions. Thus, the current paper interprets participants' food choices in regard to these "rules of thumb" for decision making. The control group's behaviour highlighted that the human "default" meal selection behaviour appears to be to choose foods that are perceived as tasty (Scheibehenne et al., 2007;

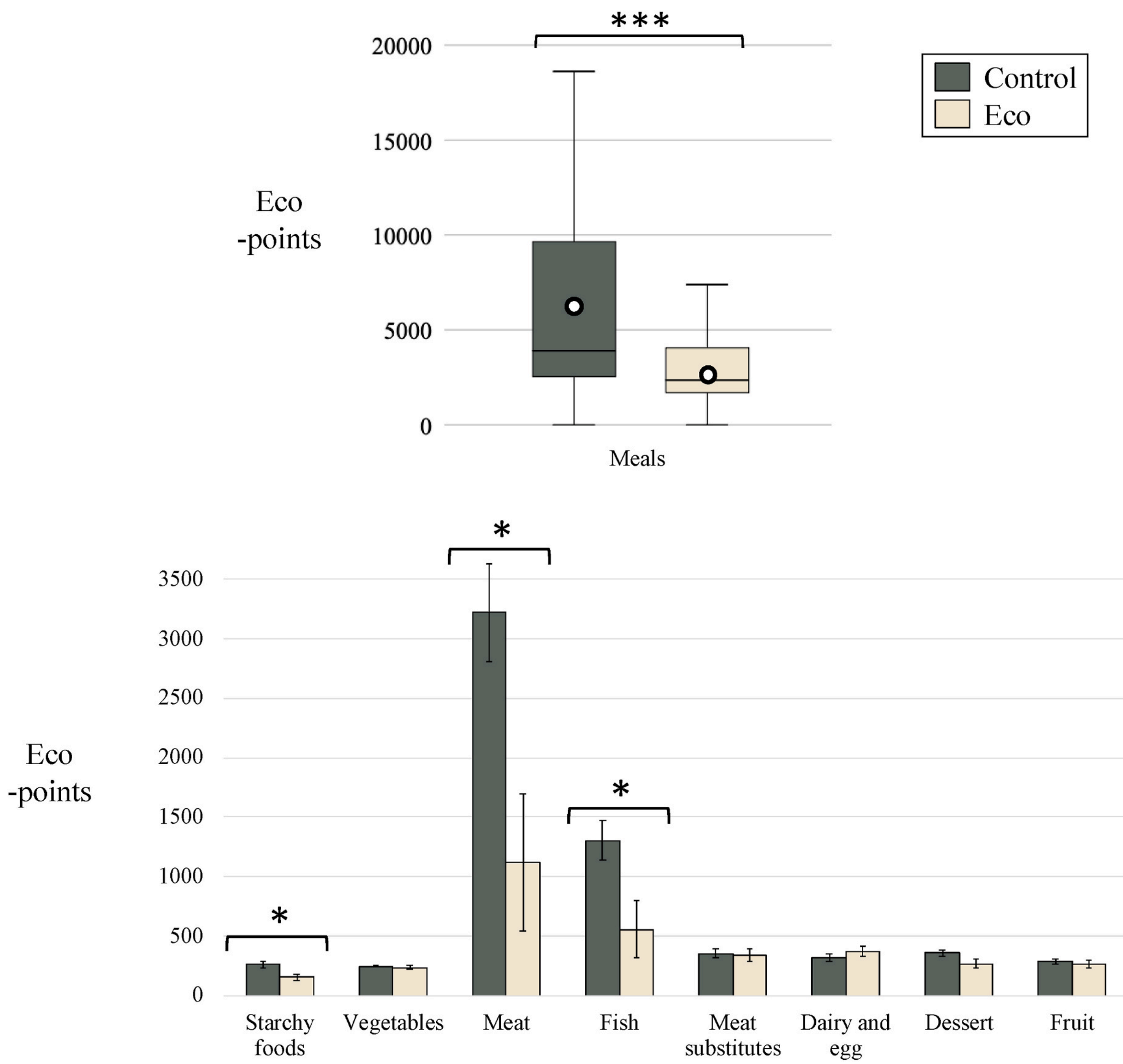

Fig. 4. Environmental impact of the meals (top) and the foods included in the meals (bottom).
Top: Line within the box represents the median, the circle represents the mean, the box represents the 25th percentiles, the whiskers represent the 95% *CI*. Bottom: Shown are *M (SE)*. *$p < .05$, ***$p < .001$.

Schulte-Mecklenbeck et al., 2013). In contrast, the eco group's behaviour suggests that, when consumers are trying to compose an environmentally friendly meal, they appear to follow three behaviours which one could interpret as heuristic principles: they seem to choose (1) less meat and fish, (2) more meat substitutes, and (3) foods that are regional, seasonal, and organic, instead of choosing foods based on perceived tastiness and visual appeal. Regarding (1) and (2), there were further aspects of the participants' behaviour that can be interpreted in the context of heuristic judgement. Specifically, the eco group appeared to have "singled out" specific products to include vs. exclude from their selection. Firstly, the eco group appears to have excluded mainly steak from their selection. Secondly, the eco group was more likely to select falafel (as compared to the control group), but not novel meat alternatives. The following section is a discussion of the extent to which these potential heuristics are effective in terms of increasing dietary environmental friendliness, how consumers could have acquired these heuristics, and how they could be refined and improved.

6.1. *The eco group composed an environmentally friendly meal*

Our first important finding was that the eco group's meals were more environmentally friendly than the control group's meals. This difference persists even when considering the calorie content of the meals, since the eco group's meal had a lower EP per kcal. It was positive to note that, even though the group's meals differed in terms of environmental impact, the groups perceived the tastiness of their meals as being equally high.

6.2. *The eco group's approaches for composing an environmentally friendly meal*

6.2.1. *Approach 1: The eco group selected less meat and fish than the control group*

Not only did the control group select more meat and fish as compared to the eco group, they also selected these products as the first food items on their plate, i.e. as the "anchors" of their meals (Marchiori et al., 2014). Since animal-based foods are highly associated with tastiness (Michel et al., 2021), these results are in line with findings that a consumer's most dominant food choice heuristic is hedonistic (Scheibehenne et al., 2007; Schulte-Mecklenbeck et al., 2013). It is possible that the eco group made less choices based on this heuristic since they chose less meat and fish than they would "normally" consume.

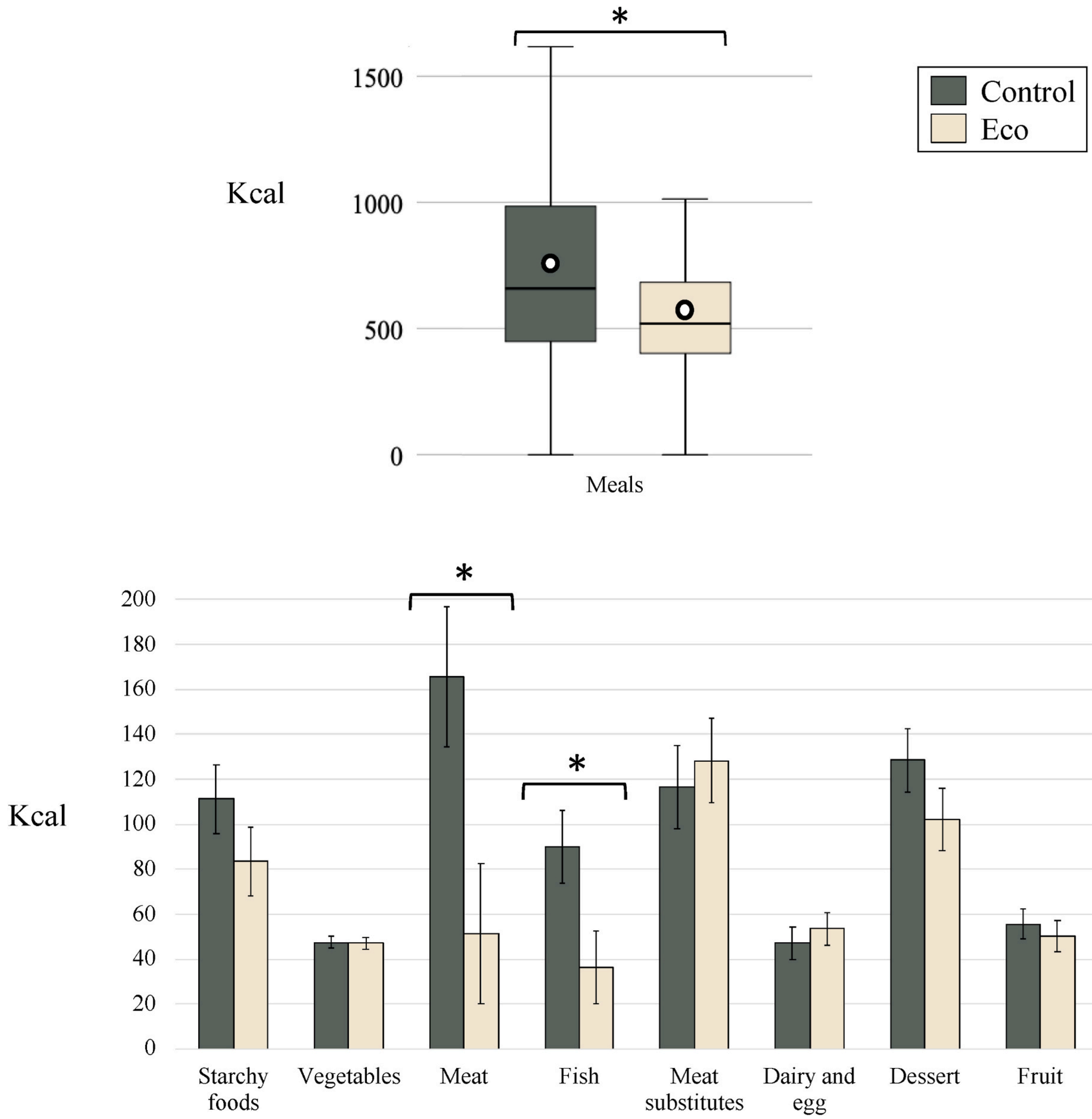

Fig. 5. Calorie content of the meals (top) and the foods included in the meals (bottom).
Top: Line within the box represents the median, the circle represents the mean, the box represents the 25th percentiles, the whiskers represent the 95% *CI*. Bottom: Shown are *M (SE)*. $^*p < .05$, $^{***}p < .001$.

However, a look at Table 3 indicates that the eco group seemed to identify two meat products in particular to include vs. exclude in their meals. They chose steak considerably less often than the control group ($n_{control} = 11$, $n_{eco} = 1$). In contrast, chicken was chosen by both groups in equally high amounts ($n_{control} = 16$, $n_{eco} = 18$). This is in line with other findings that steak and chicken are perceived as the meat products with the highest and lowest environmental impact, respectively (Hartmann et al., 2022; Lazzarini et al., 2016; Michel et al., 2021). Hereby, steak's EP is overestimated, whereas chicken's EP is underestimated (Hartmann et al., 2022) and even perceived as comparable to that of various meat substitutes (Lazzarini et al., 2016; Siegrist and Hartmann, 2019).

Considering these findings, it appears that steak and chicken are perceived as "opposites" (within the meat product category) regarding various attributes. Specifically, steak may be the participants' mental prototype (i.e. "best example") of a meat product, whereas chicken is viewed as a meat product with opposing attributes. To illustrate this, consider this observation by Michel et al. (2021, p.6): "Steak is almost always perceived as more extreme than the other products. It is perceived as the most festive, healthy, masculine, expensive, tasty, natural, filling, and protein rich among the tested foods." Studies describing the link between meat, power, and masculinity (Adams, 2018; Oleschuk et al., 2019; Rozin et al., 2012; Ruby and Heine, 2011; Sobal, 2005) also note that steak symbolises meat in its "rawest" form as cavemen ate it. In stark contrast to this are the consumers' associations with chicken (breast), which include freshness, leanness, blandness, femininity, and weight reduction (Kennedy et al., 2004). These opposing associations that consumers apparently have for steak and chicken (i.e. indulgence vs. restriction, masculinity vs. femininity, richness vs. leanness) could be the reason why these two products stood out strongly from the large variety of options in the buffet, and thus appear to have been two important "choice anchors" in the participants' meal selection (Chernev et al., 2015).

In summary, it appears as though the eco group took several "shortcuts" in their environmentally friendly decision-making. First, the eco group did not choose foods based on perceived tastiness and appeal, but instead identified meat and fish as the food categories that needed to

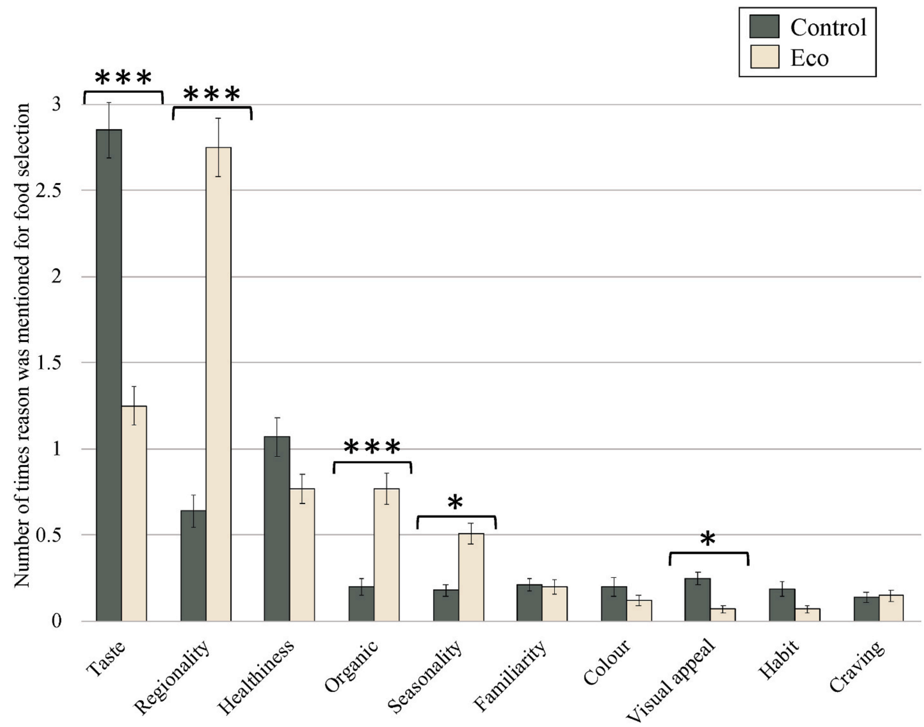

Fig. 6. Number of times certain food selection reasons were mentioned.
Shown are *M (SE)*. Displayed are only the most frequently mentioned selection reasons. Regionality refers to the production country being Switzerland. $^{*}p < .05$, $^{***}p < .001$.

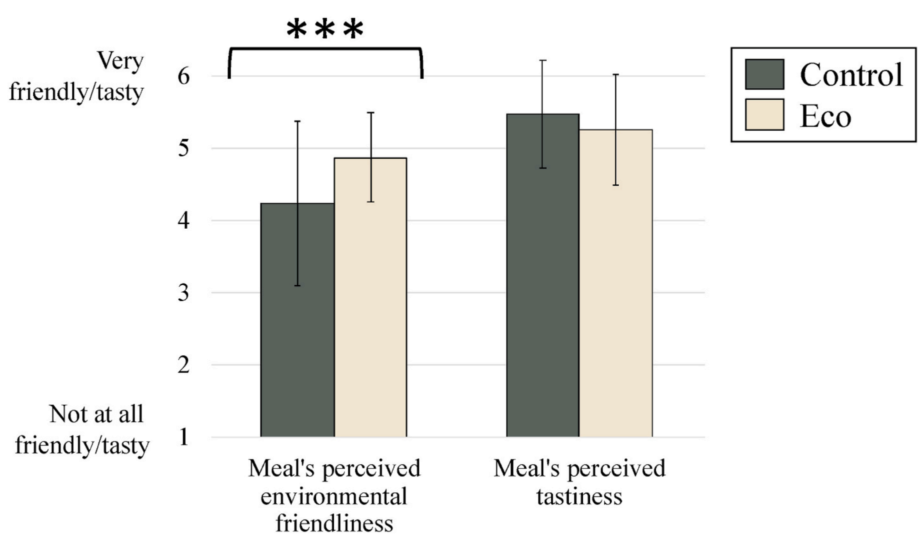

Fig. 7. Participants' ratings of the environmental friendliness and tastiness of their own meals.
Shown are *M (SE)*. Participants gave these ratings after they had composed their meal. $^{***}p < .001$.

be excluded (or reduced) from their selection in order to keep their meal's EP low. Then, it is possible that the eco group applied a combination of the dichotomy and prototype heuristic. Our results indicate that they identified steak (a possible mental prototype of meat products) as the environmentally "unfriendly" meat product and thus did not select it. In contrast, it is possible that chicken was identified as the environmentally "friendly" counterpart that was deemed acceptable in their meal selection.

6.2.2. How approach 1 could have been improved: The eco group could have selected less animal-based foods (e.g. egg, dairy)

The only animal-based products that the eco group chose significantly less of in comparison to the control group were steak and salmon. However, other meat and fish products, as well egg and dairy products (e.g. cheese, desserts), also have a high environmental impact when compared to the other buffet foods (Fig. 3). Thus, these foods ideally should have also been excluded from the eco group's meal selection. This finding suggests that consumers are either unaware of the extent of the environmental impact of different animal-based products (Hartmann et al., 2022; Lazzarini et al., 2016), or that they possibly had such a focus on one specific heuristic (e.g. "skip the steak!") that it lead them to overlook other foods that are almost equally as important to dietary environmental friendliness.

Table 4
Spearman's rank correlations of study variables.

	1	2	3	4	5	6	7	8	9	10
1 Condition (0 = control, 1 = eco)		−.06	.05	.06	−.08	.10	.03	.30***	−.15	−.31*
2 Age			−.17*	.08	.21***	−.09	.05	.18*	.07	.11
3 Gender (0 = m, 1 = f)				.01	−.35***	−.14	.07	.04	.15	−.13
4 Education					−.09	.11	.16*	.14	.03	−.18*
5 BMI						.05	−.17*	−.14	.08	.22*
6 Knowledge about food environmental impact							<.001	−.02	−.18*	−.20*
7 Health concern								.12	.04	−.04
8 Meal's perceived environmental friendliness									.06	−.27***
9 Meal's perceived tastiness										.07
10 Meal's environmental impact (in EP)										

Note. *$p < .05$, ***$p < .001$.

Table 5
Linear regression with consumer characteristics predicting the logarithmically transformed meal's environmental impact (in EP).

	Control (n = 85)					Eco (n = 84)				
	B	*SE*	β	*t*	*p*	B	*SE*	β	*t*	*p*
Constant	7.24	1.08		6.69	<.001***	8.40	.78		9.663	<.001***
Gender (0 = m, 1 = f)	−0.30	0.17	−0.18	−1.65	.103	−0.01	.15	−0.01	−0.12	.948
BMI	0.07	0.03	0.26	2.41	.018*	0.02	.03	0.11	0.69	.364
Knowledge about food env. impact	−0.07	0.03	−0.24	−2.24	.028*	−0.03	.03	−0.13	−1.04	.267
Health concern	−0.08	0.09	−0.10	0.89	.371	−0.10	.08	−0.15	−1.08	.170
	$R^2 = .16$, $F(4, 80) = 3.68$, $p = .008$*					$R^2 = .06$, $F(4, 78) = 1.22$, $p = .309$				

Note. *$p < .05$, ***$p < .001$.

6.2.3. Approach 2: The eco group selected more meat substitutes than the control group

Overall, the eco group selected more meat substitute products than the control group. However, amongst these products, it was only the falafels that the eco group selected more of as compared to the control group. The eco group did not have a higher selection of novel "meat-mimicking" products (e.g. Quorn nuggets and filet, plant-based "chicken," Beyond Meat Burger). This is in line with previous findings that consumers appear to have a negative perception of many novel meat substitutes: Not only has it been shown that novel meat-mimicking substitutes are perceived as less environmentally friendly than traditional plant-based high-protein foods like falafel and tofu (Estell et al., 2021; Lazzarini et al., 2016), they are also falsely perceived to have an equal or higher environmental impact than some meat products (Hartmann et al., 2022; Lazzarini et al., 2016; Siegrist and Hartmann, 2019).

Two closely related heuristics could explain this negative perception of novel meat-mimicking products. Firstly, humans act upon a familiarity heuristic, i.e. they prefer to choose the familiar versus the unfamiliar (Park and Lessig, 1981; Whittlesea and Williams, 2001). Many meat-mimicking products only entered the market in the past decade, which could explain why our participants preferred a traditional food like falafel instead. Secondly, consumers often use the perceived naturalness as a heuristic cue to form negative judgements about new technologies since they lack the technological knowledge to come to a more objective evaluation (Siegrist and Hartmann, 2020). The perceived unnaturalness appears to also be a great barrier to consumer acceptance of novel meat substitutes (Hartmann and Siegrist, 2017; Hoek et al., 2011; Michel et al., 2021). This is closely related to the finding that consumers perceive meat-mimicking products as being highly processed. This has been described as potentially clashing with the image of plant-based, vegetarian options being healthy, clean, and natural (Jahn et al., 2021; Varela et al., 2022), which potentially acted as a dissonance that could have additionally contributed to a consumer's negative perception of the products.

In summary, our findings suggest that the eco group followed a potentially effective approach for composing an environmentally friendly meal. It appears as though they chose to replace meat and fish with a meat substitute. For this, however, they chose falafels far more frequently than any of the novel meat-mimicking products. Past research indicates that this could possibly be due to the negative attributes linked to novel meat substitute products: they are unfamiliar, perceived as unnatural, and perceived to have a high level of processing (in comparison to a food like falafel).

6.2.4. How approach 2 could have been improved: The eco group could have selected more plant-based foods (e.g. novel alternative proteins)

Apart from meat substitutes, the buffet offered many plant-based, low environmental impact foods like vegetables, fruits, and starches (e.g. grain). Despite this, the eco group did not have a higher selection of these foods as compared to the control group. However, individuals excluding meat and fish from their meals can profit from a heightened intake of calorie-dense plant-based foods, such as grains, and high-protein vegetables, such as legumes.

Why did the eco group not select more plant-based foods in comparison to the control group? A lack in variety does not appear to have been responsible for this, since the buffet included a large number of plant-based options (Bucher et al., 2011). Instead, it appears that many high-protein plat-based foods are unpopular with consumers: beans, lentils, and peas are underused in the current food system (Asif et al., 2013), and not frequently consumed in Northern European countries (Henn et al., 2022). While these legumes are perceived to be healthy and tasty, consumers avoid eating them mainly because they are perceived to cause digestive problems and to be difficult to prepare (Henn et al., 2022). Furthermore, it is possible that our participants' behaviour illustrates Western consumers' tendency to compose meals according to a certain three-component-format: (1) starchy foods (e.g. pasta, potatoes), (2) meat or fish, and (3) vegetables (Uzhova et al., 2018; Woolhead et al., 2015). Since meal composition behaviour is highly habitual, it can be hard to deviate from the usual "meal format" (van't Riet, Sijtsema, Dagevos, & De Bruijn, 2011). As a result, the eco group did not consider selecting an entirely plant-based meal.

6.2.5. Approach 3: The eco group chose foods because they were organic, regional, and seasonal

As opposed to the control group, our results suggest that the eco group did not choose foods primarily based on perceived tastiness and visual appeal. Instead, our findings indicate that the eco group chose foods because they were regional, organic, and seasonal. Past studies showed that these attributes are associated to a food's perceived environmental friendliness (Annunziata and Mariani, 2018; Aprile et al., 2016; Bosona and Gebresenbet, 2018; Petrescu and Petrescu-Mag, 2015; Siegrist and Hartmann, 2019; Siegrist et al., 2015; Wallnoefer et al., 2021). To the best of our knowledge, this is the first study which indicates that these attributes may also act as heuristic cues for making environmentally friendly food choices.

However, to what extent did the eco group's heuristics actually improve the meals' environmental friendliness? In other words, are regional, organic, and seasonal foods really associated with environmental friendliness? There appears to be no straight-forward answer to this, since so many different variables and uncertainties are involved when investigating this question. Some studies report that, sustainability-wise, there are neither advantages nor disadvantages associated with the consumption of seasonal (Macdiarmid, 2014) and organic foods (Leifeld, 2012; Poore and Nemecek, 2018). Other studies report that regional (vs. non-regional) food consumption has the potential to be more damaging to the environment (Avetisyan et al., 2014). The inconsistent findings of past research suggest that the organic production method, regionality, and seasonality may not be the most reliable indicators of food environmental friendliness.

Therefore, our results indicate that our eco group might have overestimated the role of organic production method, regionality, and seasonality in relation to food environmental friendliness. While these food attributes may entail some sustainability benefits (Nemecek et al., 2016), they are "only one small aspect of a sustainable diet and in terms of dietary change […] and should not overshadow some of the potentially more difficult dietary behaviours to change that are likely to have greater benefits (e.g. overeating or meat consumption)" (Macdiarmid, 2014, p. 373). For example, it can be viewed as problematic that consumers mistakenly perceive the environmental friendliness of an organic meat product as higher than a non-organic, soy-based meat substitute (Siegrist and Hartmann, 2019). It is likely that this perception arises from a consumer's focus on a heuristic cue (i.e. organic vs. non-organic production method) that is far less influential on environmental impact than other food attributes (i.e. animal vs. plant origin). As another example, consuming less food correlates to consuming less EP (Table A1). Since Western individuals consume approximately 1300 kcal more per day than needed (UN Food and Agriculture Organization (FAO), 2018), simply eating less is a viable approach to reducing the EP of one's diet. While the eco group's meals did have less calories as compared to the control group, none of the participants mentioned food amount or calories during the Think Aloud task. Therefore, while consumers appear to have subconsciously selected less calories than usual to make a more environmentally friendly meal, this does not appear to be a conscious food selection approach for dietary sustainability.

The finding that consumers do not use the most effective heuristics for environmentally friendly food consumption (which potentially even overshadow the comparatively more effective heuristics) supports that consumer's knowledge about the factors contributing to their food's environmental impact is low (Hartmann et al., 2021). However, the results of our regression analysis highlight the importance of this knowledge when a consumer is externally prompted to make environmentally friendly food choices.

6.3. Limitations

Certain limitations concerning the methodology and interpretation of the results are present. (A) Participants were asked to assemble a meal that was "environmentally friendly", but not "maximal" environmentally friendly. It is possible that this difference in phrasing could have impacted participants' performance; (B) Some participants did not consistently think aloud throughout the experiment. Thus, they had to be encouraged to talk via the Think Aloud protocol. This likely could have impacted the results; (C) The reasons participants mentioned for *not* choosing certain foods were not recorded. This would give further insights into food selection decision processes; (D) It is noteworthy that the sample appeared to be more educated than the average consumer, as half of the participants had an applied university or university degree; (E) While our interpretation focused on heuristic decision making, many other factors (e.g. hunger, attention, availability, cultural preferences, social norms) influence food choices. For example, choosing foods from a buffet is a social practice (Reckwitz, 2002). Thus, our participants were not only influenced by individual cognitive factors (e.g. heuristics), but also by social norms of the practice. For example, consumers may have been aware that animal proteins have a large environmental impact. However, they may also have perceived it as the social norm to select (at least a minimum amount of) meat at a buffet, as it is a highly valued and expensive food. Hargreaves (2011, p. 83) concludes that "bringing about pro-environmental patterns of consumption, therefore, does not depend on educating or persuading individuals to make different decisions, but instead on transforming practices to make them more sustainable".

6.4. Implications and conclusion

Our daily meals have a great impact on the environment. Many consumers are becoming more aware of this and wish to improve their behavior. To support this, it is important to understand consumers' decision process when they are trying to make environmentally friendly food choices. Past research may have identified the food attributes consumers associate with sustainability. However, our daily food choices are highly complex: Foods are chosen in certain settings (e.g., at a cafeteria, a buffet), meals consist of multiple foods (e.g., side dishes, desserts), and foods are not always selected based on rationality, but sometimes on mental "rules of thumb." To this end, the current study is unique in that it places consumers in a "real life" food choice scenario, lets participants compose an entire meal, and requires participants to verbalise their decision-making in "in real time."

Our results suggest that the consumers' approaches to making environmentally friendly food choices were suboptimal. The eco group's main heuristic principle for composing an environmentally friendly meal—which appears to have been to choose less meat and fish, whilst choosing more meat substitutes—is likely to have improved the environmental friendliness of their meals. However, some of the finer selection mechanisms involved were less facilitating of their meal's environmental friendliness: (1) The eco group excluded mainly steak from their selection (presumably because it was their mental prototype of a meat product) in order to reduce the environmental impact of their meal. However, since other animal-based products, like dairy and egg, are also high in EP, a reduction of these foods could have further lowered the environmental impact of their meals. (2) The eco group did not have a higher selection of novel meat-mimicking meat alternatives, fruits, vegetables, or grains as compared to the control group. However, eating more of these foods as a substitute for animal-based products can be a viable approach to improving the environmental friendliness of one's meal. (3) The eco group used a food's production method (organic vs. non-organic), regionality, and seasonality as selection heuristics. However, other dietary factors—such as food amount, which was never mentioned by participants as something they paid attention to during the buffet task—are more likely to ensure environmental friendliness.

A shift towards more environmentally friendly food selection behaviour will likely require changes in consumers' perception and knowledge, as well as efforts from food producers and policy makers. Firstly, consumers' awareness of the environmental unfriendliness of animal products (including eggs and dairy) needs to be increased and refined. With this, it is also important that consumers become more aware that the correlation between certain food attributes (e.g. regionality) and environmental friendliness may not be as large as perceived. Hopefully, this will allow consumers' focus to shift to more effective approaches (e.g. eating more plant-based foods, not overeating).

Secondly, consumers' openness towards "new" concepts of food and eating that focus on food sustainability needs to be increased. Specifically, it would be beneficial for consumers to gain a greater flexibility regarding their "typical meal format" (which usually includes meat and fish) by adopting a more plant-based diet, which not only has benefits for the environment, but also for human health. Lastly, a greater acceptance of novel, sustainable food products would likely contribute towards more sustainable eating behaviours. This not only includes the plant-based alternative proteins presented in our buffet, but other foods, like insects, in vitro meat, or microalgae. For this, it is important that food producers focus on creating delicious products in order to ensure optimal consumer acceptance. Furthermore, policy makers need to increase their promotion of sustainable consumption, for example by introducing regulations centred around food's environmental impact (e.g., taxes), or supporting research about and companies of novel alternative proteins. Despite the initial scepticism these unfamiliar products may elicit, they are likely to play an important role in enabling a more sustainable protein supply in the future.

Heuristics can be useful tools for navigating through life, as they can help us make fast yet reasonable decisions. However, when consumers are trying to choose environmentally friendly foods, the heuristics they seem to follow do not always appear to be the most effective or refined. Thus, it is of utmost importance that consumers gain more awareness about the environmental friendliness of foods and food-related attributes.

Transparency declaration

The lead author affirms that this manuscript is an honest, accurate, and transparent account of the studies being reported, that no important aspects of the studies have been omitted, and that any discrepancies from the studies as planned have been explained.

CRediT authorship contribution statement

Bianca Wassmann: Conceptualization, Formal analysis, Investigation, Writing – original draft, Visualization, Project administration. **Michael Siegrist:** Conceptualization, Writing – review & editing, Supervision, Funding acquisition. **Christina Hartmann:** Conceptualization, Writing – review & editing, Supervision, Project administration, Funding acquisition.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Acknowledgments

We thank Beatrix Junghardt for her support during the data collection.

Appendix

Table A1
Spearman's rank correlations of variables related to the selected meal

	1	2	3	4	5	6	7	8
1 Environmental impact (EP)		.81***	.62***	.60***	.25***	.20*	.49***	.69***
2 Calories (kcal)			.14*	.71***	.38***	.45***	.77***	.62***
3 Environmental impact per calorie (EP per kcal)				.18*	−.02	−.13*	.38***	.38***
4 Weight (g)					.51***	.38***	.46***	.45***
5 Number of food items selected						.16*	.48***	.35***
6 Carbohydrates (g)							.34***	.24***
7 Fats (g)								.50***
8 Proteins (g)								

Note. *$p < .05$, ***$p < .001$.

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